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Ser BPMOW.jpl/0241

APR 23 2013

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SUBJECT: FINAL REMEDIAL DESIGN/REMEDIAL ACTION WORK PLAN, INSTALLATION RESTORATION SITE 2, ALAMEDA POINT, ALAMEDA, CALIFORNIA

Dear Ms. Tran, Mr. Fyfe, and Mr. West:

Enclosed is the Final Remedial Design/Remedial Action Work Plan, IR Site 2, Alameda Point, Alameda, California, dated April 2013. The Response-to-Comments matrix documenting the Navy's responses to reviewer's comments on the 90% Draft Remedial Design/Remedial Work Plan document package is enclosed as Attachments 13 and 14.

If you have questions, please contact Jacques Lord at (619) 532-0902 or me at (619) 532-0905.

Sincerely,

DEREK J. ROBINSON
BRAC Environmental Coordinator
By direction of the Director

Enclosure: Final Remedial Design/Remedial Action Work Plan, IR Site 2, Alameda Point, Alameda, California, dated April 2013.

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CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

FINAL

REMEDIAL ACTION WORK PLAN

April 2013

DCN: RMAC-0809-0009-0004

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

FINAL
REMEDIAL ACTION WORK PLAN
April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

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ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
BRAC	Base Realignment and Closure
BSU	Bay Sediment Unit
Cal/EPA	California Environmental Protection Agency
CCR	*California Code of Regulations*
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMP	corrugated metal pipe
^{60}Co	cobalt-60
COC	contaminant of concern
^{137}Cs	cesium-137
CSO	Caretaker Site Office
CTO	Contract Task Order
DCAMP	Dust Control and Air Monitoring Plan
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DDx	sum of 4,4′-DDD, 4,4′-DDE, and 4,4′-DDT
DoD	Department of Defense
DON	Department of the Navy
DTSC	(California) Department of Toxic Substances Control
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FFA	Federal Facility Agreement
FWBZ	first water-bearing zone
GPS	global positioning system
HCH	hexachlorocyclohexane
HDPE	high-density polyethylene

ABBREVIATIONS AND ACRONYMS
(Continued)

IC	institutional control
IR	Installation Restoration (Program)
LLRW	low-level radioactive waste
LUC	land-use control
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCE	maximum credible earthquake
MEC	munitions and explosives of concern
mm	millimeter
NaI	sodium iodide
NAS	Naval Air Station
NAVFAC SW	Naval Facilities Engineering Command Southwest
NRC	Nuclear Regulatory Commission
OEW	ordnance and explosive waste
PCB	polychlorinated biphenyl
PCOMMP	Post-Closure Operations, Maintenance, and Monitoring Plan
PCQC	Project Contractor Quality Control
PPE	personal protective equipment
PQCM	Project Quality Control Manager
QA	quality assurance
QC	quality control
^{226}Ra	radium-226
RA	remedial action
RACR	Remedial Action Completion Report
RadWP	Radiological Work Plan
RASO	Radiological Affairs Support Office
RAWP	Remedial Action Work Plan
RCA	radiological control area
RD	remedial design
RI	remedial investigation
ROC	radionuclide of concern

ABBREVIATIONS AND ACRONYMS
(Continued)

ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RPP	Radiological Protection Plan
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
Sr	strontium
^{90}Sr	strontium-90
SWBZ	second water-bearing zone
SWPPP	Stormwater Pollution Prevention Plan
^{232}Th	thorium-232
TtEC	Tetra Tech EC, Inc.
TCRA	time-critical removal action
^{238}U	uranium-238
Water Board	Regional Water Quality Control Board
WMP	Waste Management Plan

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1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) describes the activities and procedures for implementing the remedial action (RA) at Installation Restoration (IR) Site 2, at the former Naval Air Station (NAS) Alameda (now referred to as Alameda Point) in Alameda, California (Figure 1-1). This RAWP describes the activities that will implement the soil and groundwater remedies selected for IR Site 2 in the approved final Record of Decision (ROD) (DON 2010). This work will be conducted under Contract No. N62473-10-D-0809, Contract Task Order (CTO) No. 0009 and in conjunction with Tetra Tech EC, Inc.'s (TtEC's) United States Nuclear Regulatory Commission (NRC) Service Provider Radioactive Materials License.

The 100% Remedial Design (RD) is included as Attachment 1 of this submittal. The 100% RD presents the design drawings, specifications, and geotechnical analysis for implementation of the ROD remedy for soil. This RAWP expands on the 100% RD to describe the historical background, regulatory framework, and specific activities that must take place once the final RD and this RAWP have been approved in order to implement the remedy for soil and groundwater at IR Site 2.

A Radiological Work Plan (RadWP) is included as Attachment 2 and is to be used in conjunction with this RAWP. The RadWP provides a summary of previous radiological investigations and describes procedures for radiological scanning, soil sampling, and dose and risk modeling.

An Accident Prevention Plan/Site Safety and Health Plan for all fieldwork associated with the RAWP will be submitted under separate cover.

The Federal Facility Agreement (FFA) signatories who provide regulatory oversight for the IR Site 2 RA are the U.S. Environmental Protection Agency (EPA), the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board). Other local and/or state agencies may also provide some degree of oversight and/or guidance during various phases of the RA work. The Naval Sea Systems Detachment Radiological Affairs Support Office (RASO) provides technical oversight for the radiological aspects of the IR Site 2 RA.

1.1 SITE LOCATION AND DESCRIPTION

IR Site 2 is located at the southwestern edge of Alameda Point and encompasses approximately 110 acres bordered by San Francisco Bay to the south and west (Figure 1-1). IR Site 2 consists of a former landfill, wetlands area, the interior margin, and the coastal margin. The former landfill covers approximately 60 acres and is bounded to the north by the interior margin and the east by runways and tarmacs. The former landfill was reportedly used for disposal of wastes generated by former NAS Alameda activities from 1956 through early 1978 (DON 2010).The wetland covers approximately 33 acres and is bounded by the landfill to the north and east and by the coastal margin adjacent to the San Francisco Bay on the south and west. The remaining 17 acres within the IR Site 2 boundary is known as the interior margin and the coastal margin.

1.2 SCOPE OF WORK

To achieve the selected remedies for soil and groundwater, the scope of the RA in IR Site 2 consists of the following tasks:

- Radiological site control and safety monitoring during site activities
- Mobilization and site preparation
- Destruction of existing soil gas monitoring wells
- Demolition of existing weir structures, and perimeter fencing
- Site grading to subgrade elevation as specified in the 100% RD
- Radiological surface scan of subgrade surface and removal of radiologically impacted surface soil if readings are greater than 2 times background levels
- Collection of soil samples from the subgrade surface for radiological dose and risk modeling
- Installation of soil cover, including animal intrusion barrier, and final grading as specified in the 100% RD
- Radiological surface scan of the finished cover to document effective remedy in place
- Wetlands creation/restoration
- Installation of access roads and new landfill soil gas monitoring probes
- Implementation of institutional controls (ICs)
- Demobilization of equipment and personnel
- Production of a Remedial Action Completion Report (RACR) to document the implementation of the RA

1.3 POINTS OF CONTACT

The following is a list of the key project, Department of the Navy (DON), and regulatory points of contact:

Entity	Project Title	Contact Information
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Abbreviations and Acronyms:

BRAC – Base Realignment and Closure
Cal/EPA – California Environmental Protection Agency
CDPH – California Department of Public Health
CSO – Caretaker Site Office
DTSC – Department of Toxic Substances Control
ECM – Environmental Compliance Manager
EPA – U.S. Environmental Protection Agency
EPM – Environmental Program Manager
NAVFAC SW – Naval Facilities Engineering Command Southwest
NAVSEA – Naval Sea Systems Command
PESM – Project Environmental Safety Manager
PjM – Project Manager
PMO – Program Management Office
PQCM – Project Quality Control Manager
QAO – Quality Assurance Officer
QCPM – Quality Control Program Manager
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
RSO – Radiation Safety Officer
RSOR – Radiation Safety Officer Representative
SSHO – Site Safety and Health Officer
TtEC – Tetra Tech EC, Inc.

A project organization chart is presented as Figure 1-2 and contains the contact and relational information for the key personnel on the project.

1.4 PROJECT SCHEDULE

The project schedule is presented as Figure 1-3. Field activities are anticipated to commence in early 2013.

1.5 WORK PLAN ORGANIZATION

This RAWP is organized as follows:

- **Section 1.0** provides the introduction, scope of work, project points of contact, and plan organization.
- **Section 2.0** describes the site background, history, and selected RA for soil and groundwater.
- **Section 3.0** describes preconstruction activities.
- **Section 4.0** describes the project plans to be used in conjunction with this RAWP.
- **Section 5.0** describes the construction activities associated with the implementation of the RA.
- **Section 6.0** describes sustainability measures to be used during construction activities.
- **Section 7.0** describes the final reporting and landfill certification procedures.
- **Section 8.0** presents the references.
- **Tables and figures** are included after the text.
- **Attachment 1** presents the 100% RD.
- **Attachment 2** presents the RadWP.
- **Attachment 3** presents the Radiation Protection Plan (RPP).
- **Attachment 4** presents the Sampling and Analysis Plan (SAP).
- **Attachment 5** presents the Project Contractor Quality Control (PCQC) Plan.
- **Attachment 6** presents the Environmental Protection Plan (EPP).
- **Attachment 7** presents the Wetland Mitigation Plan.
- **Attachment 8** presents the Stormwater Pollution Prevention Plan (SWPPP).
- **Attachment 9** presents the Dust Control and Air Monitoring Plan (DCAMP).
- **Attachment 10** presents the Waste Management Plan (WMP).
- **Attachment 11** presents the Post-Closure Operations, Maintenance, and Monitoring Plan (PCOMMP).
- **Attachment 12** presents the Land-Use Control (LUC) RD.
- **Attachments 13 and 14** present the responses to comments on the Draft RAWP, dated May 4, 2012.

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2.0 SITE BACKGROUND

Former NAS Alameda was an active military installation from the 1930s to the 1990s, which primarily provided facilities and support for fleet aviation activities. The area of present day IR Site 2 was originally open water until 1956 when a sea wall was constructed along the southern and western shorelines to confine and protect the area. Dredged fill was hydraulically placed within the seawall creating the area encompassed by IR Site 2.

The IR Site 2 landfill, also called the West Beach Landfill, was used as the main disposal area for the Alameda Point from approximately 1952 through 1978. An estimated 1.6 million tons of waste was deposited (E&E 1983). Historical waste disposal methods at the site generally consisted of trench-and-fill operations. Wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB)-containing liquids, batteries, low-level radioactive waste (LLRW) including but not limited to radioluminescent dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E 1983). Munitions and explosives of concern (MEC), may have also been deposited in the 2.5-acre (approximate) Possible Ordnance and Explosives Waste (OEW) Burial Site located in the southern part of the landfill. Previously identified areas of buried waste are shown on Figure 2-1.

In 1978, the DON developed plans to close the landfill in accordance with the requirements of the Water Board's *Minimum Criteria for Proper Closure of Class II Solid Waste Disposal Sites* (Resolution No. 77-7). In 1983, the Water Board issued Order No. 83-35 to implement a final cover, leachate cutoff barrier, methane gas control, earthquake damage control, drainage control, and erosion control, and to generate compliance reports for the former landfill. Between 1983 and 1995, the DON responded by placing a partial clay-soil cover, installing an 820-foot-long, 2-foot-wide and 20- to 30-foot-deep slurry wall to restrict potential contaminant migration to San Francisco Bay. A gas venting system was installed for methane gas control, and repairs were made to the seawall also during this time period. In 1986, 20,000 cubic yards of imported fill soil was spread on the former landfill, which was insufficient in achieving a uniform cover layer of appropriate thickness over the landfill area. Also in 1986, the landfill was graded to prevent ponding, and an earthen perimeter berm was constructed around the landfill.

In August 1999, IR Site 2 was officially added to the EPA's National Priority List of Superfund sites and assigned Comprehensive Environmental Response, Compensation, and Liability Information System identification number CA2170023236.

2.1 SITE CHARACTERISTICS

In addition to the former landfill, IR Site 2 has been historically divided into the West Beach Wetlands, coastal margin, and interior margin (Figure 2-2). Based on disposal history, IR Site 2 is considered a Radiologically Controlled Area. A fence surrounds the northern and eastern sides of the site and access is controlled via a locked gate. Within IR Site 2, an earthen perimeter berm, 16 feet high and 25 feet wide, surrounds a majority of the former landfill.

The West Beach Wetlands contains two perennial ponds. The northern pond (North Pond) is connected to the bay by a culvert installed in the seawall to hydraulically connect San Francisco Bay to waters within the seawall. The southern pond (South Pond) was created by removal of dredged materials for use as landfill cover. Freshwater has since filled the excavation area and created the pond. The only material known to have been deposited in the West Beach Wetlands is scrap metal (E&E 1983).

A thin strip of land between the western margin of the landfill and West Beach Wetlands and the bay is referred to as the coastal margin. It is composed of the perimeter berm and riprap seawall constructed of large boulders. The narrowest width of the coastal margin is 100 feet at the southeast corner of IR Site 2.

The interior margin lies outside the landfill and West Beach Wetlands to the north and east. It also contains part of the perimeter dike and includes all areas outside the dike to the north and east. Two earthen former ammunition bunkers and two guard shacks are located in a fenced area to the north of the landfill in the interior margin. To the west of the fenced area, also in the interior margin, is the location of a former radioactive waste storage shack known as the RadShack Area.

The RadShack Area was the site of a former small wood frame structure surrounded by a security fence that was used to store radioactive material while awaiting disposal (Weston Solutions, Inc. 2007). It was in use as early as 1973 and remained in use until 1980. Between 1980 and 1983 the structure was emptied. It was demolished except for the support posts prior to 1998, and in 1999 the remaining support posts were removed and the soil beneath and surrounding the shack was excavated and replaced with clean backfill (Weston Solutions, Inc. 2007).

2.1.1 Topography

IR Site 2 topography gently slopes overall from the north and east to the south and west towards San Francisco Bay. Elevations across the site range from 5 to 15 feet above mean sea level.

2.1.2 Geology

There are no known faults directly at or in the near vicinity of IR Site 2. No earthquake fault zones (Alquist-Priolo Zones) have been designated at the sites. The nearest active fault is the Hayward Fault, which is about 6.5 miles east of the site. Another nearby active fault is the San Andreas Fault within the hills on the west side of San Francisco Bay at a distance of about 12 miles. Other major faults in the region include the Calaveras Fault system on the east side of the East Bay Hills and the Green Valley and Greenville Fault systems, which are located farther to the east.

Quaternary-time (within the past 2 million years) sedimentary rock units have been identified as underlying IR Site 2. These sedimentary units record a sequence of fillings and evacuations of San Francisco Bay in response to global glacial/climate changes and local tectonics. The rock units, from youngest to oldest, are the Young Bay Mud/Bay Sediment Unit (BSU), Posey/Merritt/San Antonio Formation, and the Yerba Buena Mud. These sedimentary units are overlain by artificial fill deposited by mechanical processes.

2.1.2.1 Artificial Fill

The fill encountered at most of the site is composed of mixtures of sand, silt, and clay dredged from the surrounding bay and a rock dike to retain the fill in place. The fill ranges in thickness from about 25 feet in the northwest to 45 feet in the southwest part of IR Site 2. The varying thickness is a result of natural variation in the depth of the estuary before filling, which began in the late 1800s. The BSU and upper Posey/Merritt/San Antonio Formation served as primary sources of the fill. The fill typically has abundant shell fragments and debris including gravel. The strength of the fill varies widely because of the wide variety of materials it contains.

The existing waste material in the fill is not entirely defined due to lack of sufficient information on the waste disposal history at the site. Solid wastes deposited in the disposal area included dredge spoils, batteries, ordnance, radiological materials (instrument dials with radium paint), asbestos, scrap metal, and spent sandblast abrasives. Liquid wastes placed in the disposal area include solvents, paints, plating bath sludge, waste oil, PCBs, pesticides, and medical wastes (TtEMI 1999; E&E 1983). Also, the existence of material potentially posing an explosive hazard at the site has been a major concern and a critical part of recent investigation and remediation activities.

2.1.2.2 Young Bay Mud/Bay Sediment Unit

The Young Bay Mud is thinnest in the eastern and southern parts of IR Site 2 and is thickest in the northern part of IR Site 2 where it appears to represent an ancient channel fill. In previous reports (TtEMI 1999), the Young Bay Mud unit was considered to consist of both the mud (clay, silty clay, clayey silt) and some of the underlying sands, and these were combined into a unit called the BSU. Recent geotechnical investigations revealed that most of the sands underlying the upper soft mud are generally soft to moderately dense sands, silts, and clayey sands, and these appear to also be Holocene-age bay deposits. Adopting the terminology from previous reports, these are the BSU and range from about zero to 50 feet thick and also appear to represent an ancient channel. Both the Young Bay Mud and the BSU appear to pinch out to the south, where they may have been removed by dredging in the offshore area (TtFW 2004).

2.1.2.3 Merritt Sand (Posey/Merritt/San Antonio Formation)

The Posey/Merritt/San Antonio Formation consists of contemporaneous non-marine sediments that underlie younger (Young Bay Mud/BSU) and overlie older (Yerba Buena Mud) marine sediments (Rogers and Figuers 1991). The upper part of the unit has been ubiquitously referred to as the Merritt Sand in previous Alameda Point investigations; however, the lithologies observed in the western part of Alameda Point are more consistent with the Posey and San Antonio Formations than with the Merritt Sand. Merritt Sand is described in literature as an aeolian sand deposit and immature blow sand, and the lithologies encountered below the Young Bay Mud/BSU at IR Site 2 were dense sands with silt, silty sands, and clayey sands.

2.1.2.4 Yerba Buena Mud (Old Bay Mud)

The Yerba Buena Mud was deposited during an interglacial period and traditionally has been referred to as the "Old Bay Mud," a homogeneous, widespread stratigraphic marker of the erosional surface of the underlying Alameda Formation (developed during previous glacial periods). The unit is composed primarily of dark greenish gray marine clay. The clay is generally very plastic and commonly very stiff to hard. However, a thin (10 to 15 feet thick) sandy, shell-rich zone is commonly found in the middle of the unit. The Yerba Buena Mud reportedly occurs at depths between approximately 80 feet below ground surface (bgs) in the southern portion of the site to approximately 110 feet bgs in the northern portion of the site.

2.1.3 Hydrogeology

Two distinct aquifers have been defined at IR Site 2, a shallow and deep. The deep aquifer occurs below the Yerba Buena Mud in the Alameda Formation.

The shallow aquifer is composed of the first and second water-bearing zones, and the general groundwater flow direction is towards San Francisco Bay (to the west and southwest). The first water-bearing zone (FWBZ) beneath IR Site 2 is an unconfined (i.e., water table) aquifer, generally occurring in the artificial fill material and above the BSU aquitard. Depth to groundwater ranges from 2 to 8 feet bgs. Groundwater in this water-bearing zone is typified by shallow gradients and low hydraulic conductivities, indicating relatively low groundwater velocities. Therefore, groundwater discharge rates from this zone are also relatively low. Based on tidal studies performed at the site, the FWBZ is influenced by tidal fluctuations of San Francisco Bay (Shaw 2005).

The second water-bearing zone (SWBZ) is semi-confined and generally occurs in the Posey/Merritt/ San Antonio Formation where these units exist and/or in the lower portion of the BSU where this unit consists of coarser-grained material. The SWBZ is confined from the FWBZ by the BSU aquitard where present and varies in thickness up to approximately 50 feet, with greater thicknesses appearing to result from historical erosion associated with a northeast-to-west-trending paleochannel at Alameda Point.

A tidal influence study was conducted in 2004 at IR Sites 1 and 2 in an attempt to quantify the influence of tides on water levels in Alameda Point wells (Shaw 2005). The magnitude of tidal influence measured was quantified in terms of tidal range and tidal efficiency. Tidal range is the absolute difference in water elevation between low and high tide at a given point. Tidal efficiency is the tidal range in the groundwater at a specific groundwater monitoring well location divided by the tidal range at the adjacent shoreline. Wells located along the shoreline, in the interior of the former landfill, and on the eastern boundary of IR Site 2 were included in the study and were either shallow (above 15 feet bgs) or intermediate (ranging between 32 to 40 feet bgs) in depth. Tidal efficiencies for the shallow wells ranged from 0.15 percent to 83.3 percent. Tidal efficiencies for the intermediate wells were greater and ranged from 2 percent to 100 percent. Tidal influence was greatest at the shoreline, decreasing with distance with little to no influence recorded at wells in the central portion and on the eastern boundary of IR Site 2.

2.1.4 Ecological Setting

Alameda Point was originally created by filling existing tidelands, marshlands, and sloughs with dredged material from the San Francisco Bay and Oakland Inner Harbor. The site is generally considered "highly disturbed" due to historical filling and landfilling activities. The site is ecologically isolated (particularly for mammals that may use the site), bordered by San Francisco Bay to the south and west and by roads, runways, and other hardened or impermeable (e.g., concrete) surfaces to the north and east. The site is fenced along its entire onshore boundary. Certain higher trophic-level species that exist at the site are managed to ensure protection of a least tern colony at a nearby runway.

The surface soils and sediments at the site consist largely of coarser-grained, well drained sands. The site generally consists of three distinct habitat types—upland, non-inundated persistent emergent salt marsh wetlands (i.e., wetlands), and wetland ponds. It is important to note that the areas defined as upland, wetland, and wetland pond demonstrate variability in their extent, depending on changes in water levels resulting from seasonal rainfall and tidal variability.

In general, the upland portion of IR Site 2 is considered a disturbed environment due to historical filling and landfilling activities. Under current conditions, this area of the site does not support a large diversity or density of wildlife species. The wetland areas support a variety of wetland plant species and avian species that use the site for breeding, foraging, and/or refuge. However, the wetlands themselves do not support a high diversity or density of invertebrates or mammals. Similarly, the wetland ponds may be used by a variety of avian species but do not appear to support aquatic vegetation or significant invertebrate and fish populations (Battelle and BBL 2008).

Further details on the ecological setting are provided in the Wetland Mitigation Plan (Attachment 7).

2.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Numerous investigations have been conducted at IR Site 2. Table 2-1 summarizes the investigation activities, objectives, and findings for previous investigations and reports. A summary of previous radiological, OEW, and landfill and wetlands delineation investigations is provided below.

2.2.1 Radiological Investigations

In 1983, a DON Initial Assessment Study (E&E 1983) reported the use of radioactive materials at Alameda Point starting in the 1940s, particularly at the dial painting section of the instrument shop at Building 5. Dial painting consisted of a two-step process. First, refurbished old aircraft dials were scraped and cleaned in solvent. Then the dials were repainted with radioluminescent paint containing radium-226 (^{226}Ra). Radium-impacted waste (e.g., scraping solids, rags, and used paint brushes from refurbishing dials and gauges) was collected from the shop and discarded at IR Sites 1 and 2. The radium painting shop was closed in the early 1960s (exact date unknown), and a contractor decontaminated the facility.

Disposal of radioluminescent devices containing radium was not controlled by specific procedures until the late 1960s. Before that time, it was common practice throughout private industry and the military to dispose of radioluminescent instruments and articles by burial in landfills. Other radionuclides were used in radioluminescent devices, but ^{226}Ra is the primary radionuclide of concern (ROC). This survey and previous radiation surveys by PRC Environmental Management, Inc. (1997) and Supervisor of Shipbuilding, Conversion and Repair, Portsmouth (1999) substantiated these conclusions.

Preliminary radiological surveys were completed at IR Site 2 in September 1995. One anomaly was recovered from the landfill based on this survey. In 1998/1999, a gamma radiation survey using 2-inch by 2-inch sodium iodide (NaI) scintillation detectors was conducted at the landfill. Fifty locations with the highest readings were excavated and discrete anomalies removed. In 2004, Tetra Tech FW, Inc. conducted radiological characterization surveys at IR Site 2 (TtFW 2005). Soil samples collected indicated ^{226}Ra at levels above background concentrations.

In 2006, TtEC performed additional radiological surveys of the shoreline and the interior margin. The results of these surveys were used to determine the location of radiological anomalies, which were subsequently removed under a time-critical removal action (TCRA) scope of work (TtEC 2009). The primary objective of the TCRA was to mitigate the potential risk posed by material potentially presenting an explosive hazard and radiological contamination at IR Sites 1, 2, and 32 and the threatened release of hazardous substances to the environment. The radiological removal action objectives were: 1) To prevent ingestion, dermal contact, or inhalation of radiological anomalies with concentrations that significantly exceed background concentrations (6,000 counts per minute) and 2) To ensure that the total effective dose equivalent received through all potential pathways from the radium-impacted waste in the surface and subsurface to any member of the public does not exceed 15 millirems per year. During the TCRA, items and soils contaminated with ^{226}Ra were identified and removed from IR Site 2. However, the horizontal and vertical extent of contamination was greater than expected and complete removal was not feasible. Field conditions indicated that ^{226}Ra contamination is still present throughout IR Site 2.

The RadShack Area is an approximately 32-foot by 42-foot area formerly the site of a small structure (RadShack) used to store radioactive material while awaiting disposal. The RadShack Area was originally a small wood frame structure surrounded by a locked security fence north of the former landfill and west of the ammunition bunkers. At various points throughout its operation from approximately 1973 to 1980, the RadShack was used as a turn-in point for radioactive items to be disposed of either within IR Site 2 or at an off-site location. A number of remediations to remove ^{226}Ra devices were conducted. Soil samples in the area of the RadShack indicate that ^{226}Ra levels are above background concentrations.

2.2.2 Munitions and Explosives of Concern Investigations

In 2002, Foster Wheeler Environmental Corporation conducted a surface ordnance explosives waste characterization across IR Site 2, exclusive of the West Beach Wetlands (FWENC 2003). The surface characterization was accomplished by sweeping the site in 200- by 200-foot grids using a Schonstedt GA-52CX, a handheld sensor that can detect large, subterranean ferromagnetic items at depths approaching 3 meters. In the area identified as the Possible OEW Burial Site (discussed separately below), the grid size was reduced to 20 by 20 feet. During the surface characterization of IR Site 2, one inert land mine and one 20 millimeter (mm) target practice projectile were found. None of the MEC encountered contained any explosives or energetics. The 20mm projectile was subsequently demilitarized and disposed of as nonhazardous scrap metal. The inert land mine was transferred to the DON for disposal.

Based on the results of the surface scan at the Possible OEW Burial Site, a 2.3-acre area located at the southern part of IR Site, a TCRA was performed (FWENC 2002). The identification of this site was based on the results of a geophysical survey of the area, the previous use of the site, and interviews conducted with former NAS Alameda Weapons Department personnel. Attempts to geophysically discriminate several large, subsurface masses and anomalies as ordnance or construction debris/waste were unsuccessful due to the high background noise of the area and the large amount of debris present. Information from survey results, personnel interviews, and archive data indicate that the area was once used as a burial site for inert ordnance and that buried MEC/unexploded ordnance might be present at the site (SSPORTS 1999). The TCRA, which involved the removal and sifting of topsoil to a depth of 1 foot bgs, resulted in the removal and demilitarization of 8,882 20mm target practice rounds and some miscellaneous ordnance and explosives scrap in the form of casing fragments. Although no live MEC was located, MEC items recovered verified that the Possible OEW Burial Site was used to bury MEC as documented in Alameda Point historical records. All of the target practice projectiles found were demilitarized and shipped to a Class III landfill facility for disposal as nonhazardous scrap steel.

2.2.3 Landfill and Wetlands Boundary Delineation

In addition to radiological and MEC investigations, the landfill and West Beach Wetlands were the subject of extensive sampling during the remedial investigation (RI) in 2004 (Battelle and BBL 2006). The RI included a geophysical survey of the landfill and West Beach Wetlands (exclusive of the two ponds) to determine the extent of waste, exploratory trenching to determine waste type, soil and groundwater sampling in both landfill and wetlands areas to determine the nature and extent of soil and groundwater contamination, sediment and surface water sampling in the wetlands area, and tissue sampling of flora and fauna. Based on the results of the RI and previous site history and investigations, the extent of the landfill was defined in the ROD (See Figure 2-2). However, it was noted in the ROD that the specific boundaries for the multilayer soil cover would be finalized after additional trenching northeastern and northwestern corners of the site to determine if the cover should be extended to those areas (DON 2010).

As part of the development of the 60% RD (KCH 2011) and pursuant to the ROD, 39 exploratory trenches were completed in the interior margin, adjacent to the north and south ponds, and along the eastern margin to investigate for the presence of landfill waste and to determine the extent of the cover. Trenches in the northeastern corner of IR Site 2 in the vicinity of the ammunition bunkers did not contain any waste. Locations in the northeastern corner of IR Site 2, west of the ammunition bunkers and in the vicinity of the former RadShack Area, reported the presence of waste in all the trenches. Waste was reported in trenches completed at three of the four locations adjacent to the eastern margins of both the north and south ponds.

Based on the results of exploratory trenching in the RadShack area and adjacent to the ponds, and the potential presence of soil with ^{226}Ra levels above background concentrations around the former ammunition bunkers, the extent of the cover has been expanded to include the northern portion of IR Site 2 and the area between the former landfill (as presented in the ROD) and a small area along the eastern margins of the north and south ponds. The current extent of the landfill cover is shown on Figure 2-3 and encompasses 78.8 acres.

Also as part of the development of the 60% RD, a wetlands delineation to determine the extent of tidal and seasonal wetlands was conducted west of the landfill in the West Beach Wetlands and north of the landfill in the interior margin. The results of the wetlands delineation identified the presence of 9.4 acres of open water and 11.91 acres of wetlands (KCH 2011). The tidal and seasonal wetlands as mapped during the delineation are shown on Figure 2-3. Additional information on the wetlands delineation is provided in the Wetland Mitigation Plan (Attachment 7).

2.2.4 Geotechnical and Seismic Evaluation

A geotechnical and seismic evaluation was performed as part of the OEW Investigation (FWENC 2003). For the geotechnical evaluation, subsurface information was collected via 21 cone penetrometer tests, 12 test pits, and 15 soil borings (nine upland borings and six offshore borings). Representative disturbed and relatively undisturbed soil samples were retrieved for geotechnical analyses. Standard penetration test blow counts for granular soils were recorded for liquefaction evaluations. The seismic evaluation included field testing to determine static and dynamic soil parameters. Data generated from this previous study were used in the geotechnical and seismic evaluation presented in the Geotechnical Report included in Attachment 1.

2.3 CURRENT AND FUTURE LAND USE

IR Site 2 was used as a landfill between the mid-1950s and late 1970s. There was no land use at the site prior to 1956, when the perimeter sea wall was constructed and the site was first formed by using dredged fill. Due to its historical use solely as a landfill, no persons have resided or currently reside at the site.

IR Site 2 has been designated for federal agency (DON) to federal agency (Office of Veterans Affairs) transfer. The proposed future use at IR Site 2 includes low-impact recreational uses such as a recreational trail around the site. Land use and activity restrictions are detailed in the LUC RD (Attachment 12).

2.4 BASIS FOR REMEDIAL ACTION

Potentially significant risk to human and ecological receptors due to exposure to contaminants of concern (COCs) in soil under a recreational use scenario is the basis for this Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial action being undertaken by the DON. The DON, EPA, Cal/EPA DTSC, and Water Board considered the factors in accordance with the remedy selection criteria and concluded that a remedial action is necessary to minimize exposure of sensitive habitats and species to impacted soil at IR Site 2. The DON developed the following remedial action objectives to address the human health and ecological risk:

- Protect sensitive human receptors, avian species, and mammal species from exposure to COCs in surface soil in the landfill and wetland portions of the site
- Protect viable wetland area in the southwest portion of the site from impacts associated with the landfill
- Protect sensitive human receptors from exposure through external radiation from surface soil in the landfill and wetland portions of the site
- Protect beneficial uses of the surface water in San Francisco Bay from the potential for discharge of site groundwater containing COCs

2.5 CONTAMINANTS OF CONCERN

Potential sources of contamination in soil and groundwater at IR Site 2 include general household waste and several industrial process wastes, including, but not limited to, asbestos, pesticides, sandblasting grit, waste oils and solvents, painting and plating wastes, ordnance, low-level radioactive waste, and medical waste.

Specific COCs identified for soil in the ROD (DON 2010) include benzo(a)pyrene, cadmium, chromium, lead, molybdenum, total DDx (represented by the sum of the 4,4′-isomers of dichlorodiphenyltrichloroethane [DDT], dichlorodiphenyldichloroethane [DDD], and dichlorodiphenyldichloroethene [DDE]), total PCBs, and zinc.

Specific COCs for groundwater were not identified in the ROD. Groundwater beneath IR Site 2 is not considered a potential drinking water source; however, groundwater was assessed for potential impacts to surface water in San Francisco Bay. Chemicals historically detected in FWBZ groundwater monitoring wells in excess of California Toxics Rule surface water quality criteria (40 *Code of Federal Regulations* Section 131.38) and background metals concentrations include arsenic, copper, nickel, pesticides (aldrin, alpha chlordane, a-hexachlorocyclohexane [HCH], b-HCH, 4,4′-DDE, 4,4′-DDT, dieldrin, endrin, gamma chlordane, heptachlor, and heptachlor epoxide), and diethylhexyl phthalate (DON 2010).

2.6 RADIONUCLIDES OF CONCERN

ROCs identified in the ROD for soil at IR Site 2 include cesium-137 (^{137}Cs), cobalt-60 (^{60}Co), ^{226}Ra, strontium-90 (^{90}Sr), thorium-232 (^{232}Th), and uranium-238 (^{238}U) (DON 2010). The radiological aspects of IR Site 2, including history and release criteria, are provided in Attachment 2, the RadWP.

2.7 SELECTED REMEDIAL ACTION

The DON conducted a feasibility study (Battelle and BBL 2008) to evaluate potential remedial alternatives for IR Site 2 and prepared a ROD (DON 2010) to document the selected remedy for the site. The DON and the FFA signatories (the EPA, Cal/EPA DTSC, and Water Board) concurred on the selected remedy for the site. The decision agreed to in the ROD is based on information contained in the administrative record file as well as extensive field investigations, laboratory analyses, interpretation of the data, review of current and future conditions, and assessment of the potential human health and ecological risks, and an evaluation of potential remedial alternatives.

The selected remedy for soil, as outlined in the ROD, is Alternative 2, a multilayer soil cover, engineering controls and ICs, and monitoring. This alternative consists of installation of an engineered soil cover over the former landfill to isolate buried waste and soil contaminants and prevent animal burrowing; implementation of engineering controls and LUCs to protect human health and soil cover integrity; provision for any necessary wetlands mitigation if impacts to wetlands occurs; monitoring of the soil cleanup action and wetlands mitigation to ensure their proper construction and long-term effectiveness; and conducting of methane gas monitoring as necessary.

The selected remedy for groundwater, as outlined in the ROD, is Alternative 2 – Monitored Natural Attenuation. This alternative consists of regularly monitoring groundwater quality using shoreline groundwater monitoring wells to ensure that there are continued stable to decreasing trends in contaminant concentrations; protection of the beneficial uses of surface water in San Francisco Bay; and implementation of engineering controls and ICs to protect human health and the groundwater remedy.

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3.0 PRE-REMEDIAL ACTION ACTIVITIES

A number of pre-remedial action activities will be completed prior to mobilization. The pre-remedial action activities will include providing appropriate notifications, establishing necessary permits and agreements, securing base access, and holding a pre-remedial action conference. These activities will be performed in coordination with Base Realignment and Closure (BRAC)/Naval Facilities Engineering Command Southwest (NAVFAC SW), RASO, and the regulatory agencies.

Each of the pre-remedial action tasks is described in greater detail below.

3.1 SUBCONTRACTING AND PROCUREMENT

Subcontracting and procurement will be performed prior to initiating on-site activities. As needed, staff in the field may also perform subcontracting and/or procurement activities, which may include:

- Delivery, setup, and maintenance of an on-site office trailer, utilities, and sanitation facilities
- Analytical laboratory coordination
- Survey coordination
- Temporary fencing delivery and installation
- General material and supply delivery
- Waste transportation and disposal coordination
- Soil delivery, stockpile management, and geonet delivery

Materials and supplies that will be procured for the field include daily expendables, construction and support materials, tools and small equipment, and other items as necessary.

The Army Joint Munitions Command, on behalf of the DON, will separately contract with a licensed radiological waste broker who will be solely responsible for the handling and disposal of all LLRW identified through the course of the IR Site 2 RA. The licensed radiological waste broker will provide appropriate LLRW storage containers, which will be filled by IR Site 2 RA workers. LLRW, once placed in appropriate containers, will be relinquished to the sole custody of the licensed radiological waste broker for storage, management, and disposal separate from the IR-02 Landfill project. LLRW waste management is further described in the RadWP (Attachment 2). Non-LLRW waste generated during the IR Site 2 RA will be handled, managed, and disposed of, if necessary, as a direct component of the project as detailed in the WMP (Attachment 10).

3.2 NOTIFICATIONS AND PERMITS

Prior to field activities, the DON Remedial Project Manager (RPM), Alameda Point Caretaker Site Office (CSO) representative, Resident Officer in Charge of Construction (ROICC), the RASO Environmental Program Manager, appropriate City of Alameda representative, and regulatory agency (i.e., EPA, Cal/EPA DTSC, Water Board, and California Department of Public Health [CDPH]) representatives will be notified of the planned field activities and the associated schedule at least 2 weeks in advance of initiating site work.

All necessary authorizations will be obtained from the BRAC/NAVFAC SW, RASO, and/or regulatory agencies prior to mobilization of any equipment and personnel and before conducting any on-site project activities.

Because the IR Site 2 RA is being performed under CERCLA, no permits are specifically required for the on-site elements of the project. However, substantive provisions of federal and state applicable or relevant and appropriate requirements (ARARs) will be adhered to as required by CERCLA and the NCP. Section 121(e) of CERCLA provides that no federal, state, or local permit shall be required for on-site remedial actions.

All radiological components of the IR Site 2 RA will be performed under a valid NRC or California Agreement State license maintained by TtEC. Appropriate and timely notification will be given to the NRC or CDPH, as applicable, that the corresponding TtEC NRC or California Agreement State license will be invoked in support of the IR Site 2 RA.

3.3 PRECONSTRUCTION MEETING

Prior to beginning field activities, a preconstruction meeting will be held on-site, as described in Attachment 5 (PCQC Plan). The purpose of the preconstruction meeting, typically attended by key contractor site management personnel, the RPM, the ROICC, the RASO, and the CSO representative, is to discuss and develop a mutual understanding of the project requirements and arrange for weekly contractor quality control meetings during construction. Minutes of the meeting will be prepared by TtEC and submitted to the DON.

4.0 APPLICABLE PROJECT PLANS

IR Site 2 RA activities will be implemented in accordance with this RAWP, including a stand-alone Accident Prevention Plan/Site Safety and Health Plan and the supporting plans included as attachments to this RAWP and discussed briefly below. Controlled copies of all plans will be maintained at the project site during the execution of the remedial action.

4.1 REMEDIAL DESIGN DRAWINGS, SPECIFICATIONS, CALCULATIONS

The 100% RD (Attachment 1) provides the 100 percent level of design documents for the selected soil remedy. The 100% RD presents the drawings, specifications, and geotechnical analysis for the implementation of the cover at IR Site 2.

4.2 RADIOLOGICAL WORK PLAN

The RadWP (Attachment 2) provides the radiological procedures and methodologies for radiological control, surveys and implementation, release criteria, decontamination, radioactive materials management, documentation, and reporting.

4.3 RADIOLOGICAL PROTECTION PLAN

The RASO-approved RPP (Attachment 3) identifies the day-to-day management of radiologically impacted sites, remediation, surveys, training requirements, health and safety concerns, and material handling requirements for this CTO.

4.4 SAMPLING AND ANALYSIS PLAN

The SAP (Attachment 4) specifies the radiological soil sampling, data quality objectives, waste characterization sampling, and laboratory analytical and reporting requirements. Sampling requirements for waste characterization are further discussed in the WMP (Attachment 10).

4.5 PROJECT CONTRACTOR QUALITY CONTROL PLAN

The PCQC Plan (Attachment 5) provides project-specific quality assurance (QA)/quality control (QC) information. This plan discusses the QA/QC organization and management system, requirements for handling and managing project-related QC records, requirements for testing laboratory certification, and QC inspection and testing, reporting, and documentation.

4.6 ENVIRONMENTAL PROTECTION PLAN

The EPP (Attachment 6) describes the applicable or relevant and appropriate environmental regulatory requirements for the implementation of the RA for soil and groundwater at IR Site 2.

4.7 WETLAND MITIGATION PLAN

The Wetland Mitigation Plan (Attachment 7) provides the design for mitigation of the wetland areas that will be impacted during the construction of the multilayer soil cover.

4.8 STORMWATER POLLUTION PREVENTION PLAN

The SWPPP (Attachment 8) provides the activities that will be undertaken to protect against stormwater spills or releases and sediment discharges during construction activities.

4.9 DUST CONTROL AND AIR MONITORING PLAN

The DCAMP (Attachment 9) describes the dust control measures to control fugitive dust during construction activities at the site and also provides procedures for air monitoring during construction activities. The air monitoring described in this plan is in direct support of the radiological control activities described in the RadWP and the RPP (Attachments 2 and 3, respectively).

4.10 WASTE MANAGEMENT PLAN

The WMP (Attachment 10) provides details for the management of potential hazardous waste, nonhazardous waste, and Toxic Substances Control Act waste, as well as the transportation and disposal of the waste. This plan will ensure that wastes are managed in a manner protective of human health, worker safety, and the environment in full compliance with applicable state and federal regulations. Radiological waste management is addressed in Attachment 2.

4.11 POST-CLOSURE OPERATIONS, MAINTENANCE, AND MONITORING PLAN

The PCOMMP (Attachment 11) describes the groundwater monitoring strategy for the site, post-closure landfill monitoring plan, operations and maintenance for the cover, a post-closure cost estimate, and the schedule, documentation, and reporting requirements.

4.12 LAND-USE CONTROLS REMEDIAL DESIGN

The LUC RD (Attachment 12) describes the IC activity and land use restrictions as designated in the ROD (DON 2010).

4.13 ACCIDENT PREVENTION PLAN

A separate Accident Prevention Plan, containing a Site Safety and Health Plan and Activity Hazard Analyses, has been developed for the project (TtEC 2012). The plan discusses health and safety procedures to be followed while conducting activities associated with the RA. The plan addresses worker health and safety; chemical, physical, and biological hazards and associated mitigation measures; training requirements; and general spill prevention and response procedures.

5.0 REMEDIAL ACTION IMPLEMENTATION

The following sections describe construction activities associated with the construction of the cover.

5.1 MOBILIZATION

Mobilization for construction activities for this project is anticipated to begin in early 2013, and earthwork activities are anticipated to begin shortly thereafter. Mobilization activities are described in the following subsections. Figure 5-1 shows locations of site features that will be used to support the RA.

5.1.1 Field Support Facilities

The field support facilities will be located north of IR Site 2 at the west end of the runway area (Figure 5-1). The field support facilities will include parking for construction personnel and visitors, a temporary field office trailer, and storage containers. The support area will have temporary sanitary facilities (lavatory and hand washing), electrical power, and telecommunications capabilities. Electrical power will be provided by an appropriately sized portable generator. Site water will be acquired via a temporary pipeline running from a water hydrant located at the southeast corner of the runway. Drinking water will be supplied by a water service.

5.1.2 Barge Unloading Area

A fenced area to the southeast of the remediation area will be designated for the transfer of backfill from a material barge to trucks, which will transport the material to either a staging area or directly to the landfill (Figure 5-1).

5.1.3 Site Access Controls

Access to the support and work areas will be controlled by a network of fences, barricades, and signage to prevent entry by unauthorized personnel and vehicles. Figure 5-1 reflects the plan for fencing the site and shows the access and egress from the work areas. All work taking place within radiologically controlled areas (RCAs) will be subject to radiological controls in accordance with the RadWP and the RPP (Attachments 2 and 3, respectively).

5.2 ECOLOGICAL RESOURCE SURVEYS AND MONITORING

A pre-construction ecological resource survey will be performed no sooner than 30 days prior to ground disturbance activities in order to identify sensitive, threatened, or endangered species in the work area and will consist of four separate site visits. Survey activities and required monitoring actions before and during construction are provided in the EPP (Attachment 6).

5.3 UTILITY LOCATION

Existing above- or belowground utilities including gas, electrical, communication, and pressurized water lines are not present within the former landfill and wetlands area bounded by the constructed perimeter berm or the ammunition bunker area. Geophysical utility surveys have been conducted in association with the numerous historic site investigations at the site and those data, along with generator's knowledge, confirm the area free of energized utilities. Underground Service Alert of Northern California was notified regarding field work by TtEC in 2002, 2004, and 2007, and for each notification they confirmed that there are no municipal services in the area. Additionally, the Caretaker Site Office for Alameda has also confirmed that there are no energized Navy utilities in the area. Aboveground vaults and exposed conduits in the area have been investigated in the past and confirm the lack of energized systems. Although historic geophysical investigations by others may have identified lineaments suspected to be utility lines, these likely represent abandoned utility conduits. TtEC will not perform additional geophysical surveys prior to excavations based on historic findings and the fact that the site is a former landfill area and abundant documentation exists indicating the site contains metal debris that interferes with geophysical surveys.

There are known aboveground and subsurface stormwater conveyance channels in the area that have been identified by past surveys. These systems will be protected and maintained during the construction period.

The approximate locations of known surface features are shown on Sheet C-1 of the design drawings (Attachment 1).

5.4 EROSION AND DRAINAGE CONTROLS

Erosion and drainage control measures will be implemented per the EPP (Attachment 6) and the SWPPP (Attachment 8). Stormwater best management practices will be implemented during the entire duration of the RA activities per the SWPPP.

5.5 DEMOLITION OF EXISTING FEATURES

IR Site 2 includes existing soil gas monitoring wells, passive perimeter gas vents, a weir structure, and site chain-link fencing. Prior to landfill cover construction, well destruction and demolition of these existing features will be necessary. See Sheet C-2 of the 100% RD (Attachment 1) for locations of features to be demolished. Waste disposal for these materials is discussed in the WMP (Attachment 10). All work taking place within RCAs will be subject to radiological controls in accordance with the RadWP and the RPP (Attachments 2 and 3, respectively). Neither the ammunition bunkers nor the associated guard towers will be demolished; however, the doors to the bunkers will be welded shut. The existing groundwater monitoring wells within the footprint of the cover will be protected during construction.

5.5.1 Soil Gas Monitoring Well Destruction

There are 5 multi-depth soil gas monitoring wells existing at IR Site 2 that will be destroyed. The soil gas monitoring wells that will be destroyed are listed below and are shown in Figure 5-2. Multi-depth soil gas monitoring wells proposed for destruction are the following:

- MG2-01-S,D
- MG2-02-S,D
- MG2-03-S,D
- MG2-04-S,D
- MG2-05-S,D

The soil gas monitoring wells will be destroyed by pressure grouting per California Well Standards Bulletin 74-90 and Alameda County Water District requirements. Specifications for well destruction are provided in Attachment 1.

5.5.2 Passive Perimeter Gas Collection System Destruction

If the existing passive gas collection system located along the northern margin of the former landfill is impractical to save during cover placement, it will be destroyed (see Sheet C-2 of the 100% RD [Attachment 1]). The existing system consists of buried horizontal 4-inch slotted pipe backfilled with gravel material connected to a series of 4-inch riser pipes. The 4-inch riser pipes connected to the slotted pipe will be cut and capped with appropriate polyvinyl chloride fitting below grade so as to remain undamaged during fill activities. If the gas collection system is usable after grading, the risers will be reconnected. If not usable, the system will be replaced with a similar system as shown in Sheet C-16 of the 100% RD (Attachment 1).

5.5.3 Removal of Weir

The weir structure is located on the northeast area of the landfill and is composed of wood and steel materials. The weir connects a drainage swale on the east side of IR Site 2 to the interior drainage area of IR Site 2 (see Sheet C-2 of the 100% RD [Attachment 1]). A 36-inch corrugated metal pipe (CMP) connects the weir structure to the drainage swale and passes through the perimeter berm. The weir structure is no longer required to maintain water levels inside the landfill and will be removed during the initial phase of construction.

The structure will be dismantled starting at the top and sections removed in manageable pieces. The pieces will be laid out on plastic material with the perimeter of the landfill in order that radiological surveys can be performed on the pieces in accordance with the appropriate radiological standard operating procedures (SOPs). Once the pieces are characterized, they will be placed in appropriate bins for off-site disposal or recycling. The CMP pipe will be excavated from within the berm using large excavator type equipment and that material will be processed in a similar manner to the structure material. The berm soil will be incorporated into the subgrade. The drainage swale on the east side of the berm will be preserved, and any damage incurred during the CMP removal will be repaired.

5.5.4 Removal of Site Fencing

Currently, there are chain-linked fences on the east and north side of IR Site 2, around the RadShack Area, and surrounding the ammunition bunkers. To perform the RA, the permanent fence will be removed and replaced with temporary fencing during the construction phase of the project. The existing fence will be cut off at the base to avoid removal of soil material and cut into manageable sections.

The temporary fence used during the construction phase of the work will be of such quality to ensure control of site access and radiological screening activities (Figure 5-1).

At the same time the fencing is removed from around the bunkers, the doors to the bunkers will be welded shut.

5.6 MULTILAYER SOIL COVER CONSTRUCTION

Specifications and design drawings for cover construction are included in the 100% RD (Attachment 1).

5.6.1 Vegetation Clearance

Construction of the cover will require the clearing of vegetation within the extent of the planned boundary. Clearing is expected to occur immediately prior to placement of the soil cover. The designated limits of the cover will be cleared of large rocks and debris. Trees, shrubs, and grasses will be cut flush with the land surface. Vegetation that has been radiologically screened and cleared will be disposed of off-base at a local composting facility. Trucks hauling cleared vegetation will be passed through the radiological portal monitor prior to leaving the site. The radiological portal monitor will be operated in accordance with the RadWP (Attachment 2) and the appropriate SOPs. Vegetation that fails radiological screening will be handled and disposed of per procedures described in the RadWP and the WMP (Attachments 2 and 10, respectively).

5.6.2 Dust Control

Dust control measures will be implemented throughout field activities. Dust control measures will consist of keeping the work areas moist and covering or stabilizing soil stockpiles. Work with heavy equipment will be terminated in high wind conditions. Real-time air monitoring and dust control measures are described in the DCAMP (Attachment 9).

5.6.3 Surveying

An aerial topographic survey of IR Site 2 was conducted in 2002 and is the basis for the engineering design. The project engineer will establish grade fills for the subgrade prior to grading. Field survey controls will be established by a California-licensed professional land surveyor. A combination of trained grade checkers, surveyors, and global positioning system (GPS)-equipped grading equipment will be used by the project to build each soil layer to the design grade. The GPS equipment incorporates a base station at the site established by the surveyors. Earth-moving equipment including motorgraders used during construction will be equipped with GPS equipment on the equipment blades that automatically adjusts the height of the blade allowing the operators to traverse the fill area and place the fill to final grade. The 100% RD (Attachment 1) includes a series of construction drawings that will be used to establish grades for earthwork activities.

5.6.4 Barge Delivery and Stockpile of Soils

There are currently two methods by which import soil and rock material for the filling operations will be delivered to the site. The DON is currently stockpiling soil and rock material generated by other Alameda projects in the runway areas north and east of IR Site 2. Fill material imported from off-base will be transferred to the site by barges operated by an experienced dredging subcontractor. This import material (Decker Island Aggregates) has been chemically and radiologically tested for use on other Navy projects including Hunters Point Naval Shipyard, and testing results will be provided prior to use. Moisture density, sieve analyses, Atterberg limits, and soil classification will be performed on the import material daily or for every 8,000 cubic yards for the first week and weekly or for every 40,000 cubic yards after the first 5 consecutive passing tests (Attachment 1, Specification 31 00 00). Visual inspection will be conducted continuously. The IR Site 2 area is bordered by the San Francisco Bay on the west and south sides and is separated from the water by a riprap seawall. These areas have been inspected by the subcontractor, and docking areas to spud the off-loading barge are available.

The import fill material will be loaded onto product barges at the borrow site located on the Sacramento River near Rio Vista, California. The product barges then will be moved down the Sacramento River into the San Francisco Bay and dock to a temporary off-loading barge spudded at the northwest portion of IR Site 2. The off-loading barge will be equipped with a loader and telescoping radial conveyor system. The loader will unload the soil from the product barges and feed the conveyor which will stockpile the soil material on shore. The material transferred from the barge will be stockpiled temporarily at the off-loading area and moved onto the fill area by use of conveyors, front end loaders, dump trucks, and scrapers as appropriate. Deliveries of materials will be coordinated with the subcontractor to match fill production to avoid long-term stockpiling of materials.

5.6.5 Reuse of Material from Previous Alameda Projects

It is anticipated that approximately 100,000 cubic yards of suitable fill material from previous Alameda or other projects will be available for subgrade preparation only and will not be used on the cover soil. The material is currently stockpiled near IR Site 2 as shown on Figure 5-1. The material has been characterized as nonhazardous and radiologically screened. The material will also be tested for geotechnical properties per Specification 31 00 00 (Attachment 1) and compared with the design specifications to confirm suitability for fill.

5.6.6 General Site Grading and Multilayer Soil Cover Construction

The proposed cover will be 2 feet thick to provide required isolation from the waste, and will consist of three distinct layers—220-mil-thick high-density polyethylene (HDPE) geonet used as an animal intrusion barrier, a 1.5-foot-thick layer of fill to provide adequate soil moisture holding capacity, and a 6-inch-thick layer of top soil amended to help establish vegetation. Fill added to achieve the subgrade elevation is not considered as part of the proposed cover.

Prior to commencing site grading in the ammunition bunker area, existing structures will be assessed for structural integrity. Grading in the ammunition bunker area will accomplished by placing and compacting approved soil around the structures without any modifications being made to the structures themselves. Grades established for the cover system are 1.5 percent to account for potential settlement and maintain positive drainage over the cover system. Several drainage channels will be within the limits of the cover to collect and convey the sheet flow off the landfill cover. These channels are designed for a minimum slope of 1 percent with the exception of the northern perimeter channel draining from west to east at 0.5 percent. Grading and drainage details are included in the 100% RD (Attachment 1).

Four phases of work are incorporated into the site grading task. These include:

- Subgrade preparation and fill
- Installation of the animal intrusion barrier layer
- Installation of the cover soil
- Installation of the vegetative layer

5.6.6.1 Subgrade Preparation and Fill

At the completion of grubbing and demolition activities discussed above, fill activities will begin for the subgrade. The subgrade will consist of fill materials, in situ soils, and material from previous Alameda Point projects. The 100% RD has eliminated cuts into the existing subgrade except for the perimeter berm. This reduces the need for additional radiological controls. Limited shallow cut areas may be required to provide drainage. Fill material will be placed in 6-inch lifts to obtain the specified compaction values. The majority of the earthwork placement will use combination of tracked equipment and rubber-tired scrapers. Additionally, the existing perimeter berm on the north and east side of the landfill will be incorporated into the fill. The berm is composed of soil and rock material dredged from the San Francisco Bay and not considered to contain waste or to be radiologically impacted. However, radiological control technicians will monitor work and assess if the material requires further controls as discussed in the RadWP (Attachment 2).

The subgrade will be compacted to a minimum of 90 percent of the maximum dry density based on American Society for Testing and Materials 1557 where there is a minimum of 6 inches of fill overlying the subgrade. Where there is less than 6 inches of fill overlying the subgrade, the compaction will be at 85 percent. The existing subgrade and fill will be compacted using vibrating sheepsfoot rollers, steel rollers, or heavy equipment and receive moisture conditioning as necessary to meet compaction criteria. Compaction testing will be conducted at the specified frequency for each 6 inches of compacted fill. Subgrade elevations will be achieved by use of grade checkers, surveyors, and GPS technology as discussed above.

As required by the RadWP (Attachment 2), the final subgrade surface will have an initial radiological survey performed to evaluate a baseline for radiological dose and risk. This survey is described in subsequent sections of this RAWP. To efficiently maintain schedule and eliminate long-term stockpiles, the filling operation will be conducted at a fill rate that approximates import rates.. As subgrade is achieved, the initial radiological surveys will be performed. This will allow the areas where surveys are completed to receive the next layer of cover material.

5.6.6.2 Installation of Animal Intrusion Barrier Layer

The animal intrusion barrier layer will be installed once the radiological surface scan has been completed, any hot-spots removed to a depth of 1 foot and backfilled, and samples collected as described below and in the RadWP (Attachment 2). A 220-mil layer of HDPE geonet with approximately half-inch openings will be used. The material is delivered in rolls and requires no specialized seaming. The material will be placed using a loader with a special attachment that will allow the material to be unrolled as it transverses the surface. The geonet will be sealed around pipe penetrations pursuant to detail in the 100% RD (Attachment 1). The specifications for the material and the installation are provided in the 100% RD (Attachment 1).

The HDPE geonet was selected as an alternative to a rock layer for the following reasons:

- High strength and durability
- An approximately half-inch opening size, which is too small for burrowing animals
- Consistent barrier quality—no variety in rock or crushed concrete size or thickness as with a rock layer, uniformity in installation and at seams and penetrations
- Reduced mass for increased seismic stability of cover
- Lower profile
- Sustainability (lower fuel use, less to transport, no compaction necessary)
- EPA's Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, July 1989 indicated "There also is little evidence that insects or burrowing animals destroy polymer liners or cover materials. In tests done with rats placed in lined boxes, none of the animals were able to chew their way through the FMLs [flexible membrane liners]. Thus, degradation from a wide spectrum of biological sources seems highly unlikely."
- Specification sheets from a geonet manufacturer (Tenax) circulated in January 2009 indicated that the example geonet materials had a hardness of about 68 on "Shore D" scale. This hardness is in the same class as some soft, non-ferrous metals, or the covering on a golf ball, or a typical hard hat (approximately 75).
- Precedents and technical basis exist for the use of geonets and other polymeric materials to impede animals in cover systems for solid waste containment:
  - HDPE geonet was the EPA-recommended design for Casmalia Resources Disposal Site, and was agency-approved for use at the Concord Site 1 landfill.
  - HDPE geonet was approved for a burrowing animal barrier in 2010 by DTSC in a landfill cover at Naval Air Weapons Station China Lake (TtEC 2010).
  - HDPE geonet was used for a CERCLA action at the Site 300 landfill located at the U.S. Department of Energy facility, Lawrence Livermore National Laboratory (U.S. Department of Energy 1997).

5.6.6.3 Cover Soil

After the animal intrusion barrier is placed, filling operations of the cover soil will begin. The soil for this 18-inch layer will be exclusive to the import material that will be barged to the site. Previously stockpiled material from other Alameda projects will not be used. The import material will be delivered to the site already meeting geotechnical specifications and conditioned for moisture. This material will be transported and stockpiled at the completed edge of the animal intrusion barrier, and low ground pressure tracked equipment will push the soil out over the geonet in a lift size that will be protective of the geonet and still achieve compaction and lift requirements. As an appropriate layer is placed for the geonet protection, other pieces of heavy equipment will be used to place and compact the fill in accordance with the specifications. The cover soil layer will be compacted to a minimum of 90 percent of the maximum dry density based on American Society for Testing and Materials 1557. Grade elevations will be achieved by use of grade checkers, surveyors, and GPS technology.

5.6.6.4 Vegetative Layer

The vegetative layer is a 6-inch lift that requires only 85 percent compaction and is amended with a higher percentage of fine material to help establish vegetation. This material is similar to the cover material and will be delivered by barges from the same borrow site. As cover material is placed and certified as meeting compaction, the vegetative layer placement will immediately follow. The placement will be similar to the cover placement except for lower compaction requirements. Grade elevations will be achieved by use of grade checkers, surveyors, and GPS technology.

The vegetative layer will be protected from erosion by covering with native vegetation using hydroseeding. The hydroseed mixture will contain native species of grasses and other plants suitable for the location, and will be applied during the rainy season to promote growth. The hydroseed mixture and application details are included in the design specifications in the 100% RD (Attachment 1). Erosion damage, if it occurs, will be monitored and repaired as described in the PCOMMP (Attachment 11).

The vegetative surface will contain an access road composed of 6 inches of California Department of Transportation-type aggregate base at locations as shown in the 100 % RD (Attachment 1). These roads will be surveyed and staked as the cover is being placed to avoid excavations at the end of the filling operations. The material will be placed and compacted in accordance with the design specifications.

5.6.7 Drainage and Swale Installation

The final surface will be graded to sheet flow surface water toward the perimeter of the cover. Two reinforced turf mat channels will be constructed to provide drainage swales. An existing concrete channel located on the eastern boundary of the site will be maintained throughout construction and incorporated into the final drainage system. The reinforced turf mat channels will consist of a geosynthetic matting that prevents soil erosion while allowing vegetation to grow through the matting. The matting is anchored into the final cover. The drainage and swale design is presented on Sheet C-14 of the 100% RD (Attachment 1), and the materials for the reinforced turf mat channels are included on Sheet D-5.

5.6.8 Settlement Monuments

Four settlement monuments will be installed on the final grade of the multilayer soil cover system as specified in the 100% RD (Attachment 1). Locations are shown on Sheets C-9, C-10 and C-12 of the 100% RD (Attachment 1). Markers will be located where the depth of fill is the greatest and therefore settlement potential the highest. The monuments will be located so that settlement rate and trends can be monitored and assessed. Construction details are shown on Sheet D-1 of the 100% RD (Attachment 1). Settlement monitoring is described in Section 3.5 of the PCOMMP (Attachment 11).

5.7 RADIOLOGICAL SURFACE SCANNING AND SAMPLING

Radiological surface scans and soil sampling are detailed in the RadWP (Attachment 2) and are summarized below. Where applicable, radiological survey activities will be conducted in accordance with the guidelines in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NRC NUREG-1575 (DoD et al. 2000).

5.7.1 Initial MARSSIM Survey of Subgrade Prior to Installation of Cover

Upon completing the initial site grading and establishing subgrade elevation and prior to placement of the animal intrusion barrier HDPE and cover, an initial MARSSIM survey of the subgrade surface will be performed. The entire footprint of the subgrade surface will be subdivided into survey units no larger than 2,000 square meters in surface area. Each survey unit will be 100-percent gamma surveyed.

Hot spots that indicate levels greater than twice background during the gamma survey will be remediated to a depth of 1 foot and then filled in to subgrade as described in Attachment 2. Remediated materials will be turned over to the sole custody of the radiological waste broker selected and contracted separately by the Army Joint Munitions Command on behalf of the DON.

Once the gamma surveys and any subsequent remediations are performed, soil will be collected and analyzed from each survey unit so as to perform baseline dose and risk assessments using RESRAD. Samples will be analyzed by gamma spectroscopy for ^{137}Cs, ^{60}Co, and ^{226}Ra at a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) accredited laboratory per the SAP (Attachment 4). Additionally, 10 percent of the samples from each survey unit will be analyzed by alpha spectroscopy for ^{238}U and ^{232}Th and total strontium (Sr)/^{90}Sr analysis for ^{90}Sr. Furthermore, any soil sample exceeding the ^{137}Cs release criterion will be analyzed for total Sr/^{90}Sr analysis for ^{90}Sr. Scan equipment and specifications, number of samples, sample locations, and survey units are further discussed in the RadWP (Attachment 2).

5.7.2 Final MARSSIM Survey of Finished Cover

Once the final cover is in place, a final MARSSIM survey will be performed. The entire footprint of the cover will be subdivided into survey units no larger than 2,000 square meters in surface area. Each survey unit will be 100-percent gamma surveyed. Areas indicating levels exceeding the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area, will be further investigated to ensure no further action is needed. Characterization samples will be collected and analyzed from each source of material used for the cover to ensure that the cover material meets release criteria as discussed in the RadWP (Attachment 2). Samples will be analyzed by gamma spectroscopy for ^{137}Cs, ^{60}Co, and ^{226}Ra at a DoD ELAP accredited laboratory per the SAP. Additionally, 10 percent of the samples from each survey unit will be analyzed by alpha spectroscopy for ^{238}U and ^{232}Th, and total Sr/^{90}Sr analysis for ^{90}Sr. Scan equipment and specifications, number of samples, sample locations, and survey units are further discussed in the RadWP (Attachment 2).

5.8 POST-COVER-PLACEMENT CONSTRUCTION

The following sections describe the features that will be installed once the cover has been completed. LUCs are additionally discussed in Attachment 12. The proposed access roads, landfill gas monitoring probes are shown on Sheets C-9 through C-13 of the 100% RD (Attachment 1).

5.8.1 Installation of Access Roads

As described above, the access roads will be constructed of a 6-inch-thick aggregate base and placed within the vegetative cover (see Sheet D-4, Attachment 1). The roads will provide access to the landfill area during the operation and maintenance period and includes roads leading to groundwater monitoring wells located within the cover. Travel on unpaved portions of the cover will be restricted to eliminate the formation of preferential drainage channels that would erode the cover in a manner that would impact the cover performance. Portions of the access road may be used as a recreational trail after construction is completed.

5.8.2 Installation of Landfill Gas Monitoring Probes

New landfill gas monitoring probes will be installed to support post-closure monitoring. Post-closure monitoring is discussed in the Post-closure Monitoring Plan (Attachment 11).

Nine new landfill gas monitoring probes installed around the perimeter of the multi-layer soil cover will be constructed as shown in the100% RD (Sheets C-9 through C-11, Sheet D-2, Attachment 1). The probes will be installed in accordance with local and state requirements. Drilling will be accomplished with the use of direct-push equipment and the appropriate well casing, filter pack, and bentonite materials installed in accordance with the specifications included in the 100% RD (Attachment 1).

5.8.3 Installation of Landfill Gas Passive Vent System

The existing landfill gas passive vent system is shown on Sheet C-16 of the 100% RD (Attachment 1). The existing system will be left in place to the maximum extent possible. If vent risers or other venting system components are required to be removed during cover construction; the components will be replaced. Then after cover construction, as a part of Operations and Maintenance, methane monitoring will be performed to determine the minimum venting system required, after which unnecessary risers and components will be removed, and riser height will be reduced, if warranted. Visual impacts will be reduced to the extent possible by using materials and colors that blend with vegetation and landscape. Anti-perching devices will be installed on all vent risers. Construction details and specifications are provided in Attachment 1.

5.8.4 Installation of Institutional Controls

At the completion of all work activities, the temporary fencing will be removed from the site. Signage will be placed where appropriate to protect the soil cover and the hydroseeding and wetlands restoration areas.

The DON will enforce LUCs that include land use restrictions and ICs to limit the exposure to hazardous substances by current and future landowner(s) and user(s) of the property and to maintain the integrity of the remedial action. The LUCs are detailed in the LUCs RD (Attachment 12).

5.9 GEOTECHNICAL RECOMMENDATION

The geotechnical recommendation is provided in the revised Geotechnical Report included with the 100% RD (Attachment 1). The purpose of the Geotechnical Report is to review and evaluate prior geotechnical reports and associated site-specific data and discusses seismic hazards including slope instability, large permanent deformations, and liquefaction.

The Draft Geotechnical Report included in Attachment 1 of the 90% Remedial Design (May 4, 2012) indicated that a wide range of permanent seismic deformations and liquefaction-induced flow failures were predicted for a potential maximum credible earthquake (MCE) event at IR Site 2. That report recommended ground improvement including cement deep soil mixing to mitigate the predicted seismic deformation and flow failure. In order to confirm that those ground improvements provided best value for this project, the Navy performed additional analyses and focused modeling of permanent seismic deformations and flow run-outs to more accurately quantify the impact of an MCE event. The Final Geotechnical Report presents these additional analyses, and indicates that ground improvements are not required because:

- Solid refuse is not anticipated to be released into the San Francisco Bay by the predicted permanent seismic deformations and /or flow run-outs; and

- The site will remain isolated from and will not be flooded by waters of the San Francisco Bay.

The predicted nature and magnitude of the seismic displacements and deformations are quantified in the attached revised Geotechnical Report, and summarized in Section 12 of that report. Since the waste will still be isolated from the San Francisco Bay following an MCE event and therefore the cover integrity to act as a pathway interruption between the landfill waste and human and environmental receptors is expected to remain effective; the MCE would not compromise the CERCLA remedy and ground improvements such as cement deep soil mixing are not warranted. However, some level of damage to the cover and seawall should be anticipated after an MCE event, and will require repair.

5.10 WETLANDS RESTORATION

Although most of the wetland area in the southwest corner of the site will not be disturbed, approximately 3 acres of mostly seasonal and some tidal wetlands will be destroyed during construction. They will be replaced with high-quality tidal wetlands outside the cover but within the IR Site 2 boundary. Wetlands protection and restoration are detailed in the Wetland Mitigation Plan included in Attachment 7. The report of wetland delineation performed in 2010 for IR Site 2 (KCH 2011) is included as Appendix A to Attachment 7.

The DON recognizes that the existing culvert that connects the North Pond to San Francisco Bay is critical to the life of the IR Site 2 tidal wetlands, as without the culvert, there would be no tidal circulation. As a part of defining successful hydrology for the tidal wetlands, the DON will perform a qualified structural engineering evaluation of the culvert (as it is known to be significantly rusted and damaged) as soon as is practical during cover construction activities. The DON will make necessary repairs, modifications or replacement to maintain tidal circulation as recommended by the structural assessment of the culvert, and do so during remedy construction if warranted.

5.11 FINAL CLEANUP AND DEMOBILIZATION

The following sections describe final cleanup and demobilization field activities.

5.11.1 Final Topographic Survey

At the completion of work activities, an aerial photographic survey will be completed over the entire IR Site 2 area. A California licensed surveyor will set the control for the survey and work with the aerial photography vendor to produce a site map with 1-foot contours.

5.11.2 Site Inspection

A preliminary final inspection will be conducted to ensure adherence to design requirements and to produce final closure documentation. The Project Quality Control Manager (PQCM) will be responsible for developing a specific punch list of incomplete and/or unacceptable work, and will provide this list to the ROICC office. Any outstanding items will be noted in the punch list and will be corrected prior to the final inspection. The final inspection will be scheduled by the PQCM and attended by CSO,ROICC, and regulatory agency representatives.

5.11.3 Demobilization

Demobilization will consist of decontaminating equipment, policing the project site, and completing final inspections. The activities will include decontamination and removal of construction equipment and materials as well as collection and disposal of contaminated material, including decontamination water, disposable equipment and items for which decontamination is inappropriate. Waste management and disposal procedures are provided in the WMP (Attachment 10). LLRW will be managed pursuant to procedures described in the RadWP (Attachment 2).

Equipment decontamination will be conducted as required based on the usage requirements of each piece of heavy equipment. Heavy equipment will be decontaminated using dry decontamination or, alternatively, by using a pressure washer and/or steam cleaner. Special attention will be paid to the removal of material on and within the bucket and undercarriage of the excavator. Prior to removal from the site, all decontaminated equipment and material will be inspected and accepted by the Site Safety and Health Officer and the Project Superintendent. These individuals will ensure that the decontamination is performed for all equipment and materials. Decontamination and management of potentially radiologically impacted equipment are described in the RadWP (Attachment 2).

Site restoration will include repair of any erosion or runoff-related damage, finish grading of laydown and support areas, removal of excess construction materials, and removal of construction equipment. The site trailer will be disconnected and office, storage trailers, and portable generators will be removed.

5.12 LAND-USE CONTROLS

The DON is responsible for implementing, inspecting, reporting, maintaining, and enforcing LUCs, including land use restrictions and activity restrictions (or ICs), as described in the Final ROD (DON 2010).

The DON will implement the land use restrictions, ICs, and associated maintenance actions with frequency and requirements for periodic inspections as presented in the LUC RD (Attachment 12). Procedures for the LUCs, which include landfill maintenance, monitoring, inspection, and reporting activities, are included in the PCOMMP (Attachment 11). As required by the ROD, the LUC RD (Attachment 12) includes the following:

- Requirements for CERCLA 5-year remedy review
- Frequency and requirements for periodic monitoring and/or visual inspections
- Annual reporting for monitoring and inspections
- Notification procedures to the regulators for planned property conveyance, changes, and/or corrective action required for the remedy
- Identification of land use restrictions and parties to be provided copies of the deed language once executed
- Identification of responsibilities for the FFA signatories, other government agencies, and the new property owner for implementation, monitoring, reporting, and enforcement of ICs
- A list of ICs with the expected duration
- Maps identifying where ICs are to be implemented

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6.0 SUSTAINABILITY MEASURES

This section describes sustainability measures that will be used to minimize the carbon footprint of remediation and support activities during implementation of the RA. These measures are based on the Executive Order for Federal Leadership in Environmental, Energy, and Economic Performance dated October 5, 2009. Implementation of the sustainability measures is subject to a number of factors including practicality, availability of facilities, regulatory and DON approvals, and cost and schedule impact. The impact of these factors will determine the effectiveness of the sustainability initiative on this project.

The proposed measures are included within the appropriate sections of this RAWP, and are summarized in this section as follows:

- Reduction of imported soil and reuse of material from other Alameda projects in cover foundation layers
- Barging for material delivery
- Conservation of vehicle and equipment fuel
- Water conservation
- Reduction and recycling of miscellaneous wastes

6.1 MINIMIZATION OF IMPORTED SOIL

Reduction of the cover thickness by one-half foot from the 60% Design eliminates approximately 63,000 cubic yards of import material and associated fuel usage for transportation and placement. In addition, and after DON approval, approximately 100,000 cubic yards of confirmed nonhazardous and non-radiologically impacted soil material excavated from previous Alameda Point projects (notably IR Site 17) will be recycled and used as subgrade material, saving on both off-site disposal and import from off-site.

6.2 USE OF BARGING FOR DELIVERY OF MATERIALS

The sustainability and community impact advantages of barging are significant compared to trucking on a project of this magnitude. Over 22,000 semi-truckloads would be needed to deliver the estimated fill material required. The U.S. Army Corps of Engineers has determined that barging is over eight times more fuel efficient, and produces 90 percent less greenhouse gasses than trucking. Trucking to the site would also disrupt communities, including Alameda, creating congestion, additional road maintenance, and potential accidents. Barges travel by water and often at night, virtually unnoticed by most residents.

6.3 CONSERVATION OF VEHICLE AND EQUIPMENT FUEL

Fuel usage can be minimized through the following:

- Reducing slope and thickness of the cover design resulting in placement and compaction of less material
- Use of barge for delivery of material
- Shortened distance for hauling backfill to site
- Reduced engine idling of equipment and vehicles
- Downsized job site vehicles
- Reduced usage of portable generators
- Carpooling

The most significant fuel savings results from reducing the slope and thickness of the cover as well as using barges to deliver import materials as described in the previous section. Fuel consumption by construction equipment and trucks will be reduced through an engine idling policy, where engines are shut off unless work activities are in progress (except for warm-up). The use of biodiesel will also be evaluated. Mid-size pickup trucks and vans will be used as practicable instead of typical full-size vehicles. If available, temporary electric power for the site trailer and other equipment will be connected to existing electrical service to eliminate the need for portable generators, which are not fuel efficient. Carpooling to the site will also be encouraged.

6.4 WATER CONSERVATION

Water conservation measures will be employed during dust control and soil moisture conditioning required during soil consolidation, stockpiling, backfilling, and loading activities. Imported soil will be moisture conditioned at the borrow facility using a pugmill, where the operator will be able to accurately control and monitor the moisture content. This method is more efficient than using water trucks and hoses in the field because moisture conditioning is completely uniform, with no excess water added to soil or water runoff. Based on the approximately 400,000 to 600,000 cubic yards of soil that will be imported, thousands of gallons of water will be diverted to the source quarry via moisture conditioning. In addition, using moisture conditioned soil reduces the on-site water needs for dust control and during stockpiling and loading. Stockpiling will be minimized by matching delivery rates with production rates to the extent practicable. The Project Superintendent and field engineer will monitor these water-intensive activities to ensure water use is minimized. Decontamination procedures will also emphasize water conservation using dry methods where practicable.

6.5 REDUCTION AND RECYCLING OF MISCELLANEOUS WASTES

Reduction and recycling of miscellaneous wastes include recycling of paper, plastic, and other products; use of 5-gallon water dispensers instead of single-serving bottles of drinking water; and minimization of personal protective equipment (PPE) (e.g., reducing disposable PPE and reusing hard hats, safety glasses, and vests), containers, and other wastes.

Recycling containers for paper (e.g., office waste paper and newspaper), cardboard, glass, plastic, and aluminum will be placed in the office and in the lunch/break areas. Use of the recycling containers will be discussed during site orientation meetings and will be reviewed periodically during morning tailgate meetings. Recyclable material will be brought to a recycling center as needed and at the end of the project.

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7.0 REPORTING AND CERTIFICATION

TtEC will submit a RACR to the DON, EPA, DTSC, and Water Board for approval and certification that the IR Site 2 remedy has been implemented according to the requirements of the approved final design and according to appropriate sections of the *California Code of Regulations* (CCR) Title 27, Section 21880. The RACR will include certification and final design drawings completed by a registered civil engineer and will include a construction completion report with supporting documentation. The report will include a final Construction Quality Assurance Report pursuant to 27 CCR Sections 20323 and 20324, and any other documentation necessary to support the certification. The RACR will meet the criteria provided in the DoD and EPA Joint Guidance Recommended Streamlined Site Closeout and NPL Deletion Process for DoD Facilities.

Preparation of the RACR will begin immediately following the completion of field activities. The report will be prepared pursuant to DON guidance, and will provide a record of activities conducted under the project, document decisions regarding work options, and describe the basis for considering the work complete. In addition, as-built drawings of site features will be included.

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TABLES

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TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Date	Reference Title	Author	Objective	Summary of Findings
Apr-83	Initial Assessment Study	Ecology and Environment, Inc. (E&E)	Identify and assess sites posing a potential threat to human health or to the environment due to contamination from past use of hazardous materials.	IR Site 2 was used for disposal of wastes generated by former Naval Air Station (NAS) Alameda activities from 1956 through early 1978. Low-level radioactive wastes (mainly radium-226 [Ra-226] from the rework of dials and gauges) were deposited at Installation Restoration (IR) Sites 1 and 2.
Aug-99	Alameda Naval Air Station Landfill #1 and #2 Final Radiological Survey Report	Supervisor of Shipbuilding, Conversion, and Repair, Portsmouth (SSPORTS) Environmental Detachment Vallejo	To report the results of comprehensive characterization surveys at IR Sites 1 and 2.	A total of 66 acres were surveyed at IR Sites 1 and 2. The area to the north and the east of the berm was surveyed at IR Site 2 and consisted of approximately 17.2 acres. There were 1.5 acres of land located north and east of the berm that could not be surveyed.
Aug-98	IR Sites 1, 2, 5 and 10 Radiological Removal Action, Action Memorandum/Final Interim Remedial Action Plan	Tetra Tech EM, Inc. (TtEMI)	Evaluate and recommend an alternative to address materials contaminated with Ra-226 and document Navy's decision to undertake a removal action at subject sites.	A 1995 survey identified radioactive materials at IR Site 2 above background levels (walkover transect survey not conducted in "wetland area" [outside of bermed landfill]). A 1996 survey of jogging trail at IR Site 2 and former Radiological Shack (RadShack) area was performed. Eight anomalies were found in RadShack area. Seventeen sources were recovered and removed.

TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Date	Reference Title	Author	Objective	Summary of Findings
Sep-99	Removal of Buried Radioactive Devices and Adjacent Contaminated Soil	SSPORTS Environmental Detachment Vallejo	To resolve 30 indicated anomalies of greater than 20,000 counts per minute and to resolve the overall RadShack site.	Hand digging was performed at 50 locations. Soil samples were collected. Removal continued until no levels above 20,000 counts per minute and all soil samples were below 5 picocuries per gram (pCi/g). Eight drums of material, including soil, rock, and concrete, were removed from the RadShack area.
Oct-99	Unexploded Ordnance Site Investigation Final Summary Report, Operable Unit 3	SSPORTS Environmental Detachment Vallejo	To investigate and determine if buried unexploded ordnance exists at IR Sites 1 and 2.	Walkover grid survey of entire site. Identified an area of concern at IR Site 2 of approximately 2.25 acres in size (ordnance and explosives waste [OEW] disposal area).
Apr-00	Historical Radiological Assessment – Naval Air Station, Alameda – Volume 1	Pearl Harbor Naval Shipyard	To investigate and report on radioactive materials associated with the Navy Nuclear Propulsion Program and NAS Alameda.	Until 1978, dredge spoils (primarily from the pier areas), turning basin, and entrance channel were disposed of in the West Beach Landfill.

TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Date	Reference Title	Author	Objective	Summary of Findings
Jan-04	Final Ordnance and Explosives Waste/Geotechnical Characterization Report	Tetra Tech Foster Wheeler, Inc. (TtFW)	Complete a surface OEW characterization and to complete geotechnical and seismic evaluations of IR Site 2.	The upland areas of the site were cleared of vegetation and a surface sweep for OEW was performed within the bermed landfill. The possible OEW burial site was swept using a 20-by-20-foot grid. One M56 anti-tank/anti-personnel inert land mine and one 20–millimeter target practice projectile were found during surface characterization. An additional 8,675 target practice projectiles were uncovered during the Time-Critical Removal Action (TCRA). None of the OEW encountered contained any explosives or energetics. Liquefaction potential and seismic slope instability were identified as seismic hazards for IR Site 2. Additionally, geotechnical improvements are needed to increase the static factors of safety for site stability.
Mar-04	Final Geotechnical Feasibility Study Report for Installation Restoration Site 2	TtFW	Evaluate options for remedial actions to address geotechnical hazards at IR Site 2.	Soil cement gravity wall and stone columns were determined to be the most feasible remedial option.
Feb-05	Fall 2004 Tidal Study for Installation Restoration Sites 1 and 2	Shaw Environmental, Inc. (Shaw)	Determine the effect of tidal influences in monitoring wells at the sites.	The study concluded that groundwater monitoring wells near the San Francisco Bay are moderately to strongly influenced by tidal fluctuations in San Francisco Bay.

TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Date	Reference Title	Author	Objective	Summary of Findings
Aug-05	Final Installation Restoration Site 2 Radiological Characterization Survey Report	TtFW	Characterize the extent and depth (to approximately 20 inches) of Ra-226 contamination. Performed 100 percent surface scan and collected soil samples (could not survey berm side slopes, under some trees, or in areas covered with water).	Twenty-three areas were identified at IR Site 2 with counts above two times background. Areas with elevated readings are generally located in the north and east portions of IR Site 2 around the magazines. Four of the five soil samples had Ra-226 above background (maximum concentration was 0.397 pCi/g compared to 0.365 pCi/g).
Jun-06	Final Remedial Investigation Report, IR Site 2 West Beach Landfill and Wetlands	Battelle and Blasland, Bouck, and Lee, Inc. (BBL), Inc.	Document characterization and investigation methods employed at the site, provide and summarize the data generated and data interpretation and evaluation completed, and develop conclusions regarding the nature and extent of contamination and the human health and ecological risk posed by the contamination.	Polychlorinated biphenyls (PCBs), certain metals, polycyclic aromatic hydrocarbons, pesticides, radionuclides, and polychlorinated dibenzodioxins/polychlorinated dibenzofurans are the primary human health and/or ecological risk drivers in soil at the site.
Jun-07	Final Historical Radiological Assessment – Volume 2	Weston Solutions, Inc.	Assess the likelihood of potential radioactive contamination and migration pathways. Designate sites as impacted or non-impacted.	IR Site 2 was designated as impacted.

TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Date	Reference Title	Author	Objective	Summary of Findings
Sep-07	Radiological Characterization Survey Report, Radiological Survey at IR Site 32 and the Shorelines of IR Sites 1 and 2	TtEC	To document removal of previously identified surface and subsurface radiological anomalies at IR Site 2. To survey areas previously considered inaccessible (shorelines of IR Sites 1 and 2 and the former RadShack area).	Three areas of elevated radiological counts were identified during the scan survey of the former RadShack area within IR Site 2. No elevated readings were identified in the shoreline areas of IR Site 2.
Oct-08	Final Feasibility Study Report, IR Site 2, West Beach Landfill and Wetlands	Battelle and BBL	The Feasibility Study (FS) provides an evaluation of potential remedial alternatives for IR Site 2.	The areas of IR Site 2 potentially requiring remediation based on the remedial action objectives are the majority of the landfill area inside the berm, two isolated areas in the northwestern interior margin, four isolated areas in the northeastern margin, three isolated areas in the wetland, and two transitional areas between the landfill and the wetland. The preferred remedy for soil is a multilayer soil cover, engineering and institutional controls (ICs), and monitoring. The preferred alternative for groundwater is monitored natural attenuation (MNA) and engineering and ICs.
Feb-09	Technical Memorandum – Data Gap Investigation Results, Installation Restoration Sites 2, 4, 34,and 35 (Draft)	SulTech	To provide additional data to assess the potential for methane migration beyond the boundary of IR Site 2.	Seven soil gas samples were collected and analyzed in the field. Detections of methane in the samples were low (0.0 to 0.1 percent by volume) in all seven samples. Samples could not be collected at three of the planned locations.

TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Date	Reference Title	Author	Objective	Summary of Findings
Jul-09	Alameda Basewide 2008 Annual Groundwater Monitoring Report (Final) – Volume 2	Innovative Technical Solutions, Inc.	Collect basewide groundwater monitoring data from monitoring wells and soil gas sampling wells (five points with wells screens at two or three different depths) at regular intervals.	Groundwater and soil gas sample concentrations have been fairly consistent during recent monitoring events.
Aug-09	Proposed Plan for IR Site 2 (Final)	Navy	To present the preferred soil and groundwater cleanup remedy to the public and solicit comments.	The Proposed Plan was distributed to more than 700 households; businesses; local, state, and federal agencies; and regulatory agencies in August 2009. A public meeting was held on August 27, 2009, and a public review period was open from August 4 to September 14, 2009.
Sep-09	Final Time-Critical Removal Action Post-Construction Report for Installation Restoration Sites 1, 2, and 32, Alameda Point, Alameda, California	TtEC	Mitigate the potential risk posed by material potentially presenting an explosive hazard and radiological contamination at IR Sites 1, 2, and 32.	IR Site 2 activities focused on confirming elevated areas identified in 2004 and 2006 and removing discrete items outside of the bermed area. Ten discrete items were recovered from IR Site 2, one along the shoreline and the others from the area north of the berm. Surface survey for gamma-emitting radionuclides was conducted after the removal activities along the shoreline area and to the north of the bermed landfill. On October 11, 2007, the Navy agreed that excavation activities would not be required inside the perimeter of the IR Site 2 berm because the area is largely a seasonal wetland.

Source: KCH (Kleinfelder and CH2M Hill). 2011. Intermediate Draft Remedial Design Report, Installation Restoration Site 2, Alameda Point, Alameda, California. August.

TABLE 2-1

SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS FOR IR SITE 2

Abbreviations and Acronyms:
BBL – Blasland, Bouck, and Lee, Inc.
IC – institutional control
IR – Installation Restoration (Program)
MNA – monitored natural attenuation
NAS – Naval Air Station
OEW – ordnance and explosives waste
PCB – polychlorinated biphenyl
pCi/g – picocuries per gram
Ra-226 – radium-226
SSPORTS – Supervisor of Shipbuilding, Conversion, and Repair, Portsmouth
TCRA – time-critical removal action
TtEC – Tetra Tech EC, Inc.
TtEMI – Tetra Tech EM, Inc.
TtFW – Tetra Tech Foster Wheeler, Inc.

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FIGURES

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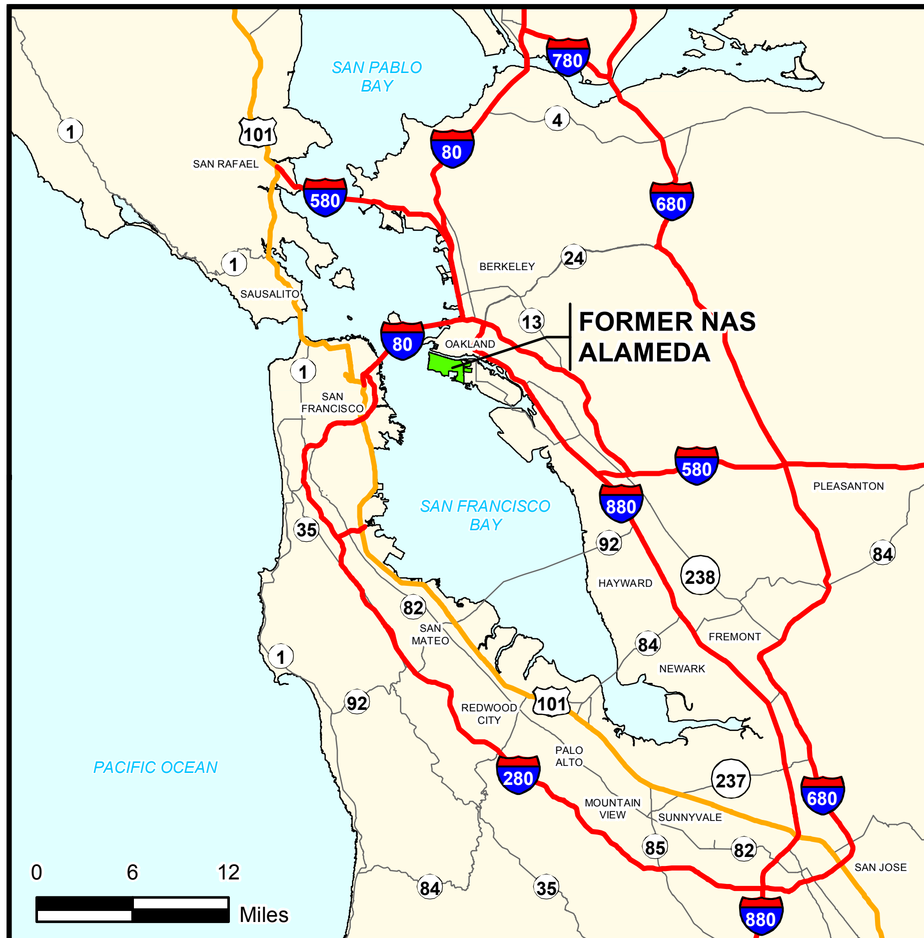

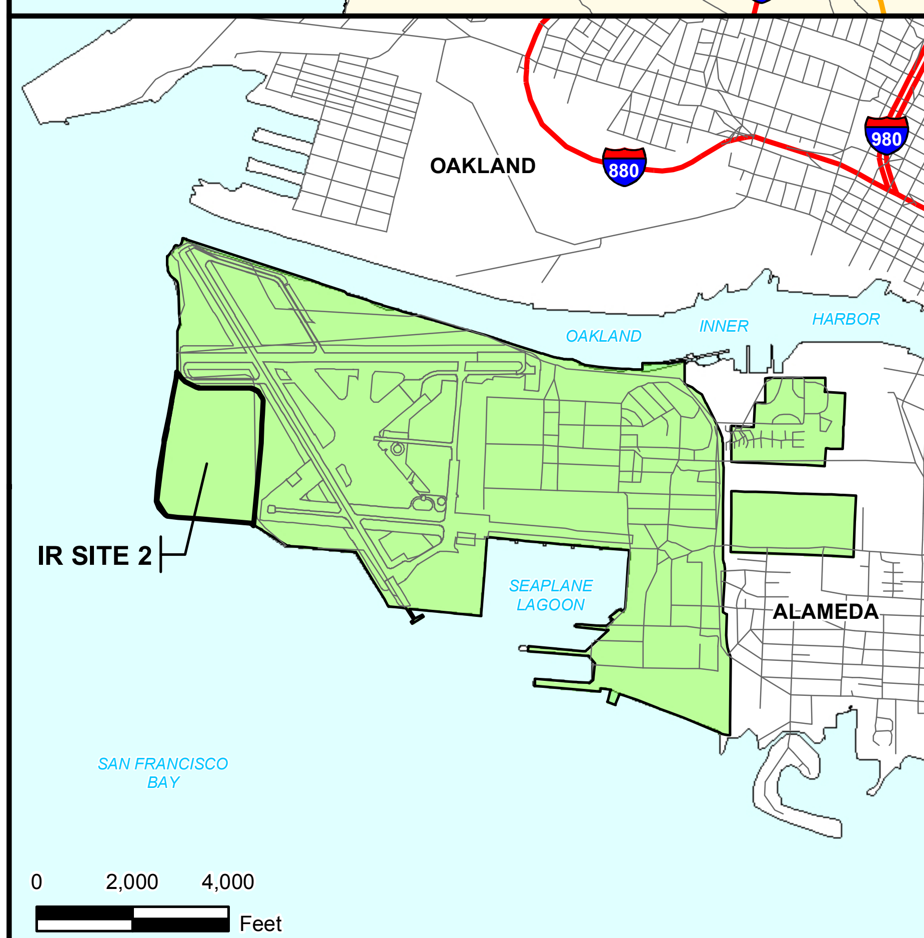

LEGEND

- ROAD/RUNWAY
- STATE HIGHWAY
- US HIGHWAY
- INTERSTATE HIGHWAY
- FORMER NAS ALAMEDA
- IR SITE 2 BOUNDARY

NOTES:
IR - INSTALLATION RESTORATION

N

225 0 225 450
Feet

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2

FIGURE 1-1

SITE LOCATION MAP

ALAMEDA POINT, ALAMEDA, CALIFORNIA

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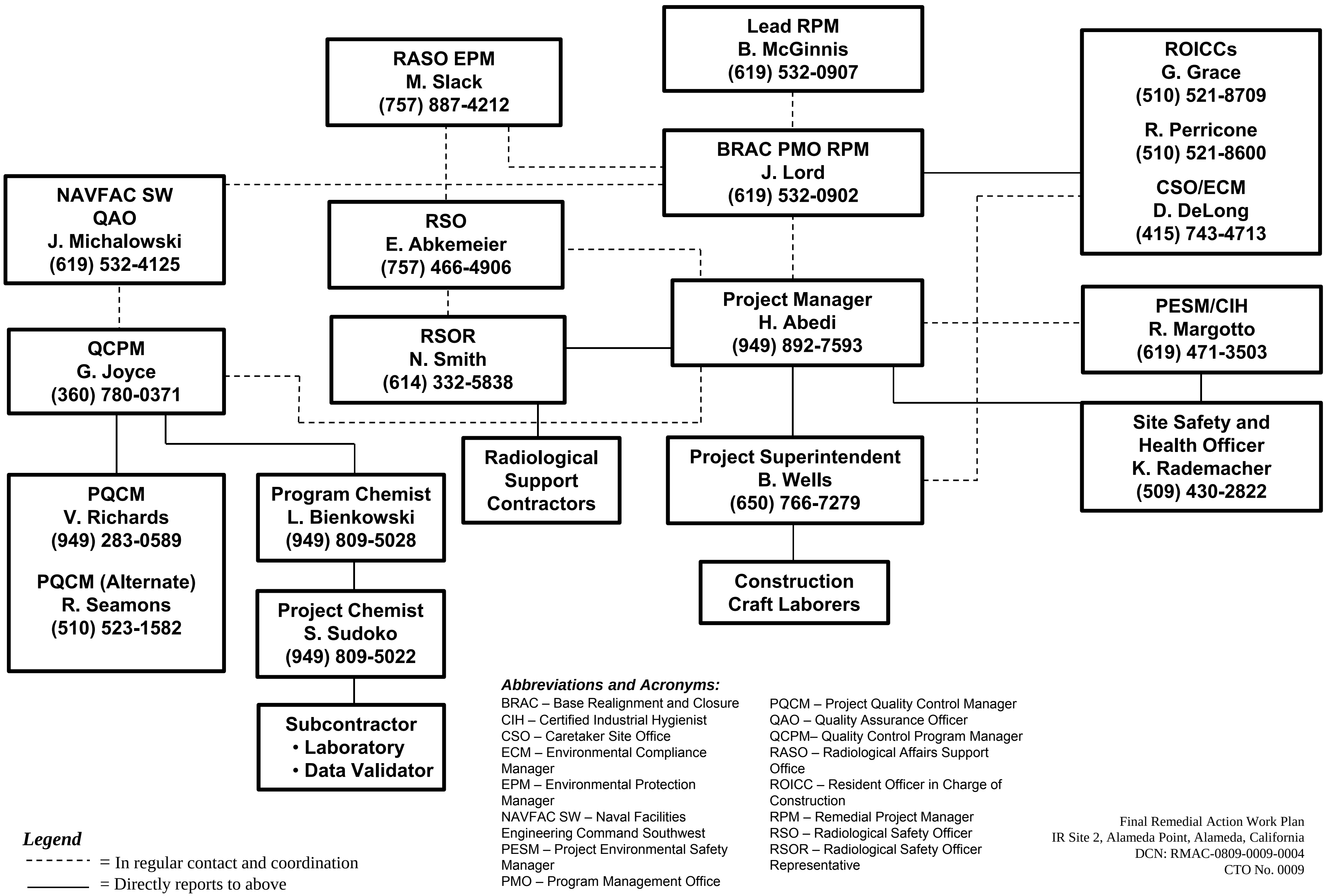
AUTHOR: MS
FILE NUMBER: 120118S7555.mxd

TETRA TECH EC, INC.

Figure 1-2
Project Organization Chart



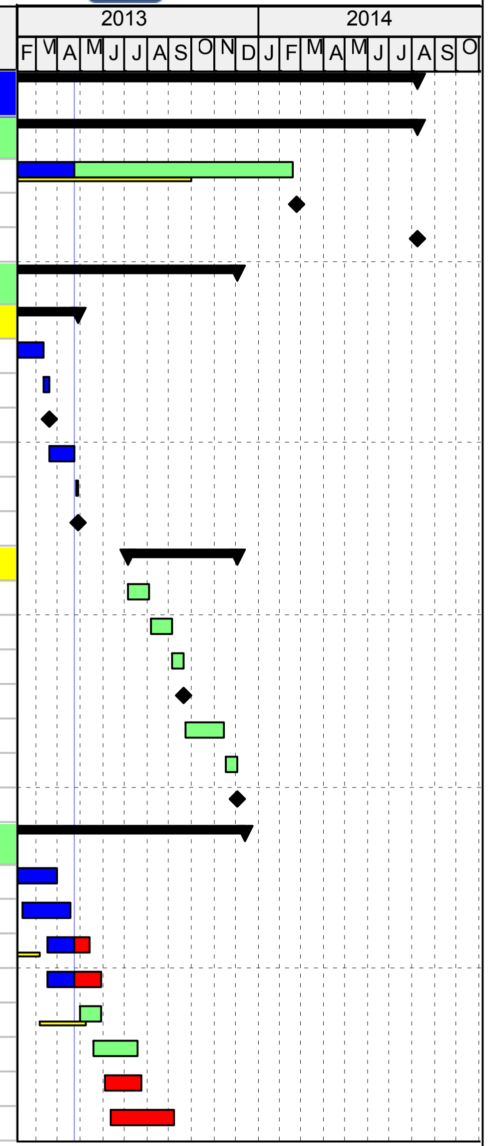
Abbreviations and Acronyms:

BRAC – Base Realignment and Closure
CIH – Certified Industrial Hygienist
CSO – Caretaker Site Office
ECM – Environmental Compliance Manager
EPM – Environmental Protection Manager
NAVFAC SW – Naval Facilities Engineering Command Southwest
PESM – Project Environmental Safety Manager
PMO – Program Management Office
PQCM – Project Quality Control Manager
QAO – Quality Assurance Officer
QCPM– Quality Control Program Manager
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
RSO – Radiological Safety Officer
RSOR – Radiological Safety Officer Representative

Contract No. N62473-10-D-0809
106-40440009

TETRA TECH EC, INC.

Activity ID	Activity Name	Remaining Duration	Start	Finish
RAD EMAC Task 9 - IR-02 Landfill		330	22-Aug-11 A	08-Aug-14
106-40440009 - RAD EMAC TASK 0010 IR-02 REMEDIAL ACTION		330	22-Aug-11 A	08-Aug-14
3	Project Management & Support	209	22-Aug-11 A	18-Feb-14
6	Contract Completion Date	0		22-Feb-14
5	Project Completion Date	0		08-Aug-14
Project Plans		157	19-Sep-12 A	04-Dec-13
RD/RA Work Plan - Includes: Post-closure Monitoring Plan, APP/HSP		5	19-Sep-12 A	29-Apr-13
50	Navy Review of RTCs, Redline Draft Final	0	19-Sep-12 A	11-Mar-13 A
20	Finalize Redline Draft Final RD/RAWP & Supporting Plans	0	12-Mar-13 A	20-Mar-13 A
21	Submit Redline Draft Final RD/RAWP & Supporting Plans	0		20-Mar-13 A
22	Agency Review Draft Final RD/RAWP & Supporting Plans	2	21-Mar-13 A	24-Apr-13
23	Prepare Final RD/RAWP & Supporting Plans	3	25-Apr-13	29-Apr-13
24	Submit Final RD/RAWP & Supporting Plans	0		29-Apr-13
Fact Sheet		106	05-Jul-13	04-Dec-13
32	Prepare Internal Draft Fact Sheet	22	05-Jul-13*	05-Aug-13
33	Navy review Internal Draft Fact Sheet	22	06-Aug-13	05-Sep-13
34	Prepare Draft Fact Sheet	11	06-Sep-13	20-Sep-13
35	Submit Draft Fact Sheet	0		20-Sep-13
36	Agency Review Draft Fact Sheet	40	23-Sep-13	15-Nov-13
37	Prepare Final Fact Sheet	11	18-Nov-13	04-Dec-13
38	Submit Final Fact Sheet	0		04-Dec-13
Remedial Action		164	30-Jan-13 A	13-Dec-13
40	Procurement and Mobilization	0	30-Jan-13 A	29-Mar-13 A
42	Clear & Grub, Demolition	0	11-Feb-13 A	19-Apr-13 A
72	Move Stockpiled Sediment from Runway into IR Site 2 (100,000 CY)	17	18-Mar-13 A	15-May-13
43	Prepare subgrade to design elevation (335,852 CY)	27	18-Mar-13 A	30-May-13
82	Import Subgrade (203,394 Tons)	22	30-Apr-13	30-May-13
44	RAD Scan (79 Acres)	43	20-May-13	19-Jul-13
46	Install Animal Intrusion Barrier (79 Acres)	35	05-Jun-13	24-Jul-13
47	Install General Soil Layer (190,747 CY)	61	12-Jun-13	06-Sep-13



Project Baseline Bar
Actual Work
Remaining Work
Critical Remainin...
Milestone
Summary

Figure 1-3
Project Schedule
RAD EMAC Task 9 - IR-02 Landfill
Alameda Point, Alameda, CA

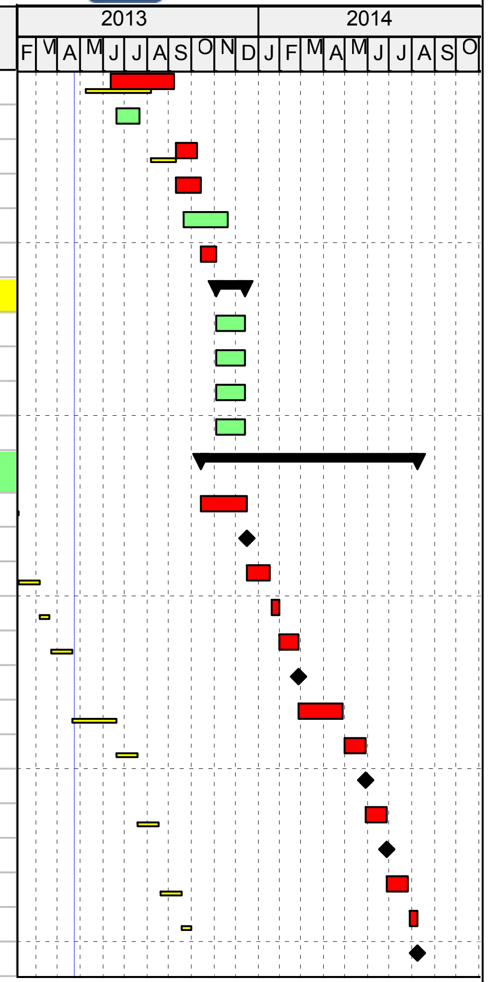
Layout: 40440009 RD
TASK filter: 40440009.

24-Apr-13 12:19

Contract No. N62473-10-D-0809
106-40440009

TETRA TECH EC, INC.

Activity ID	Activity Name	Remaining Duration	Start	Finish
87	Import General Soil Layer (289,935 tons)	61	12-Jun-13	06-Sep-13
45	Removal of LLRW & Confirmation Sampling	20	21-Jun-13	22-Jul-13
75	Import Vegetative Layer (96,645 tons)	24	09-Sep-13	10-Oct-13
48	Install Vegetative Layer (63,582 CY)	24	11-Sep-13	14-Oct-13
49	Final Rad Scan (79 Acres)	43	20-Sep-13	19-Nov-13
55	Demobilization	15	15-Oct-13	04-Nov-13
	Other Design Elements	27	05-Nov-13	13-Dec-13
51	Install Drainage, MWs, vapor probes	27	05-Nov-13	13-Dec-13
52	Install ICs (Fencing, Signage)	27	05-Nov-13	13-Dec-13
53	Install 8,500 Linear Feet of Roadway	27	05-Nov-13	13-Dec-13
54	Hydroseed (79 Acres)	27	05-Nov-13	13-Dec-13
	Remedial Action Completion Report (RACR)	208	15-Oct-13	08-Aug-14
57	Prepare Internal Draft RACR	43	15-Oct-13	16-Dec-13
58	Submit Internal Draft RACR	0		16-Dec-13
59	Navy Review Internal Draft RACR	22	17-Dec-13	17-Jan-14
60	Comment Resolution and RTC's	9	20-Jan-14	30-Jan-14
61	Prepare Draft RACR	19	31-Jan-14	26-Feb-14
62	Submit Draft RACR	0		26-Feb-14
63	Agency Review Draft RACR	43	27-Feb-14	28-Apr-14
64	Comment Resolution & Prepare RTCs to agency comments	21	29-Apr-14	28-May-14
65	Submit RTCs	0		28-May-14
66	Prepare Draft Final RACR	21	29-May-14	26-Jun-14
67	Submit Draft Final RACR	0		26-Jun-14
68	Agency Review Draft Final RACR	20	27-Jun-14	25-Jul-14
69	Prepare Final RACR	10	28-Jul-14	08-Aug-14
70	Submit Final RACR	0		08-Aug-14

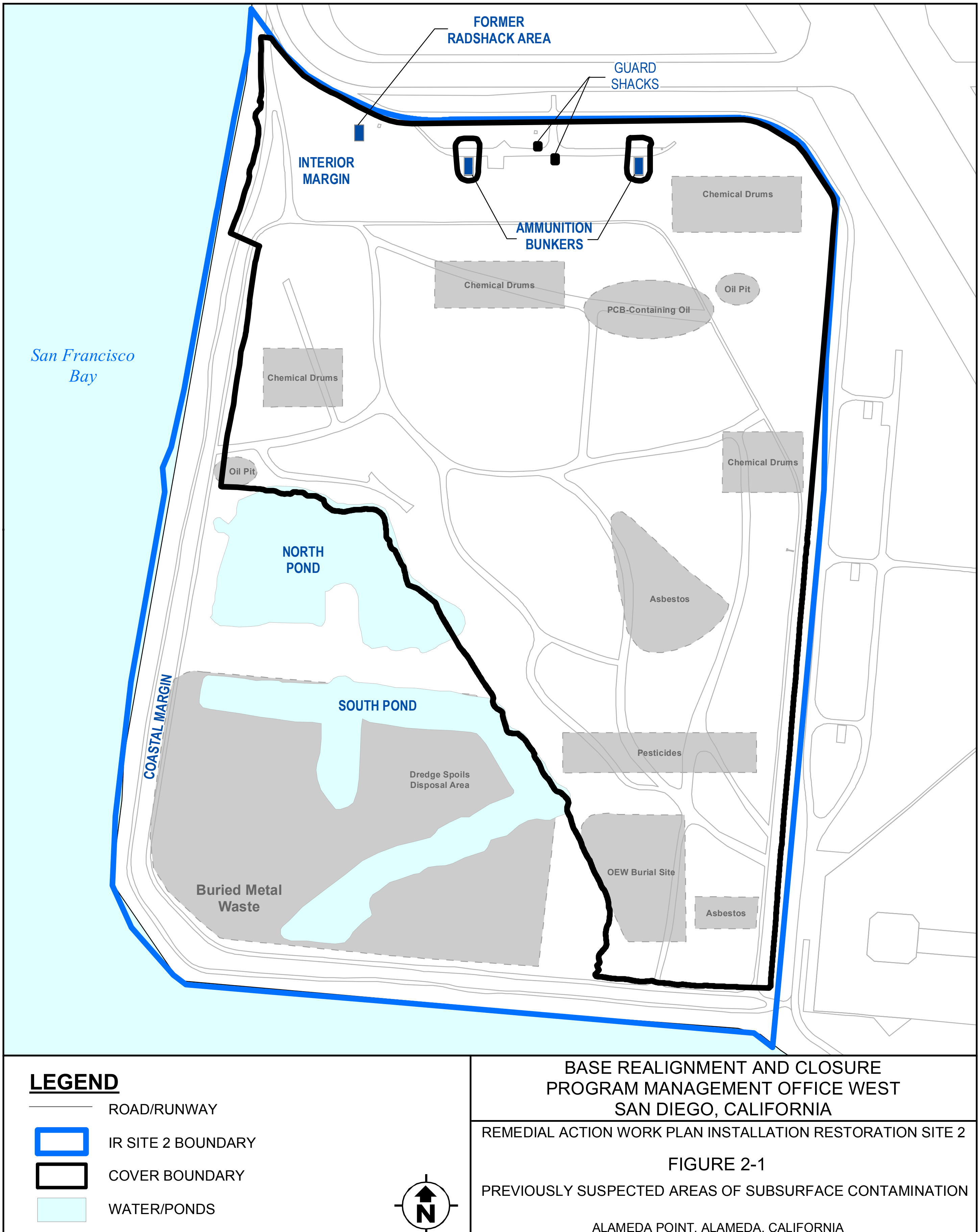


Project Baseline Bar
Actual Work
Remaining Work
Critical Remainin...
Milestone
Summary

Figure 1-3
Project Schedule
RAD EMAC Task 9 - IR-02 Landfill
Alameda Point, Alameda, CA

Layout: 40440009 RD
TASK filter: 40440009.

24-Apr-13 12:19



BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2

FIGURE 2-1

PREVIOUSLY SUSPECTED AREAS OF SUBSURFACE CONTAMINATION

ALAMEDA POINT, ALAMEDA, CALIFORNIA

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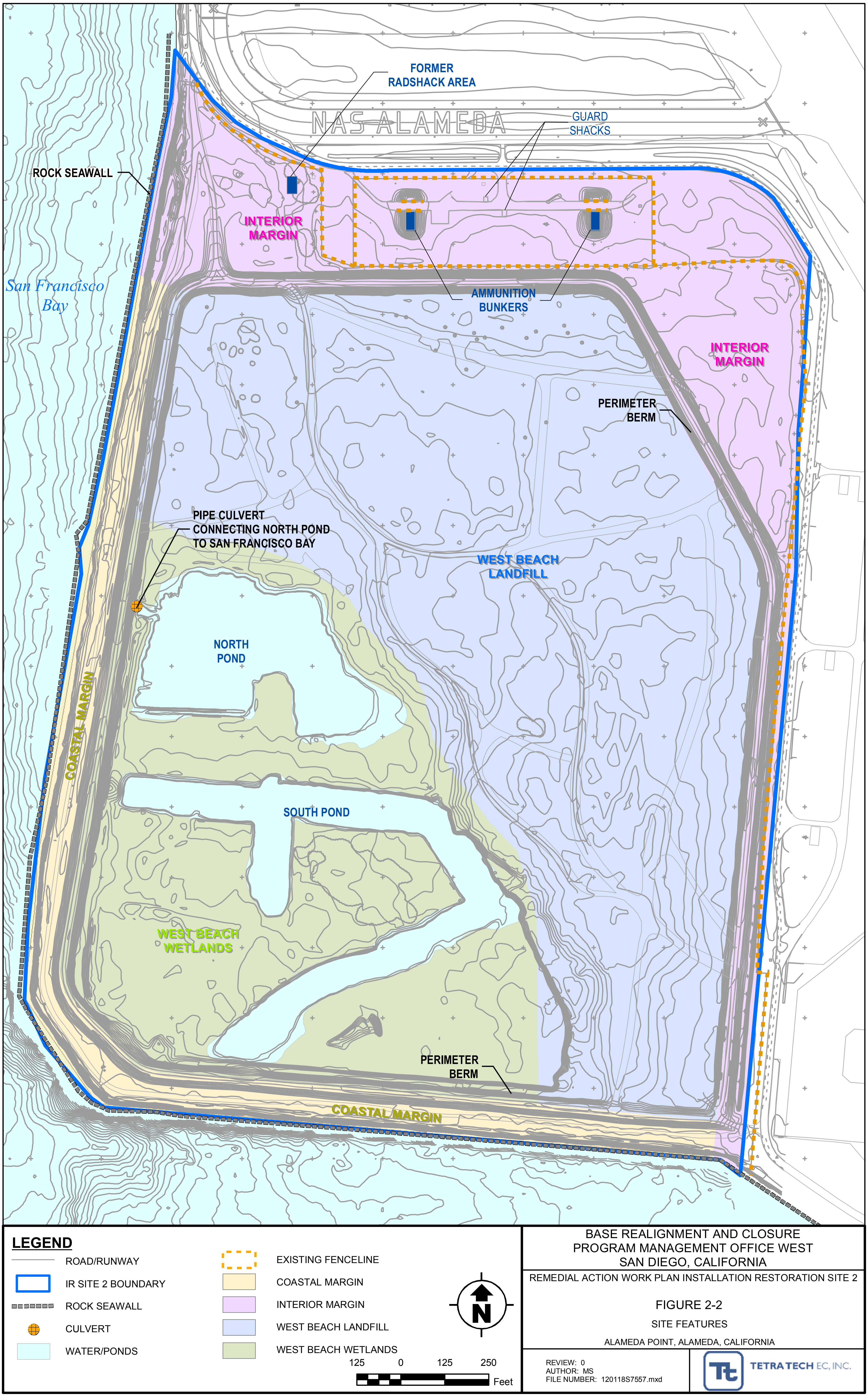
AUTHOR: MS
FILE NUMBER: 120118S7556.mxd

TETRA TECH EC, INC.



BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2

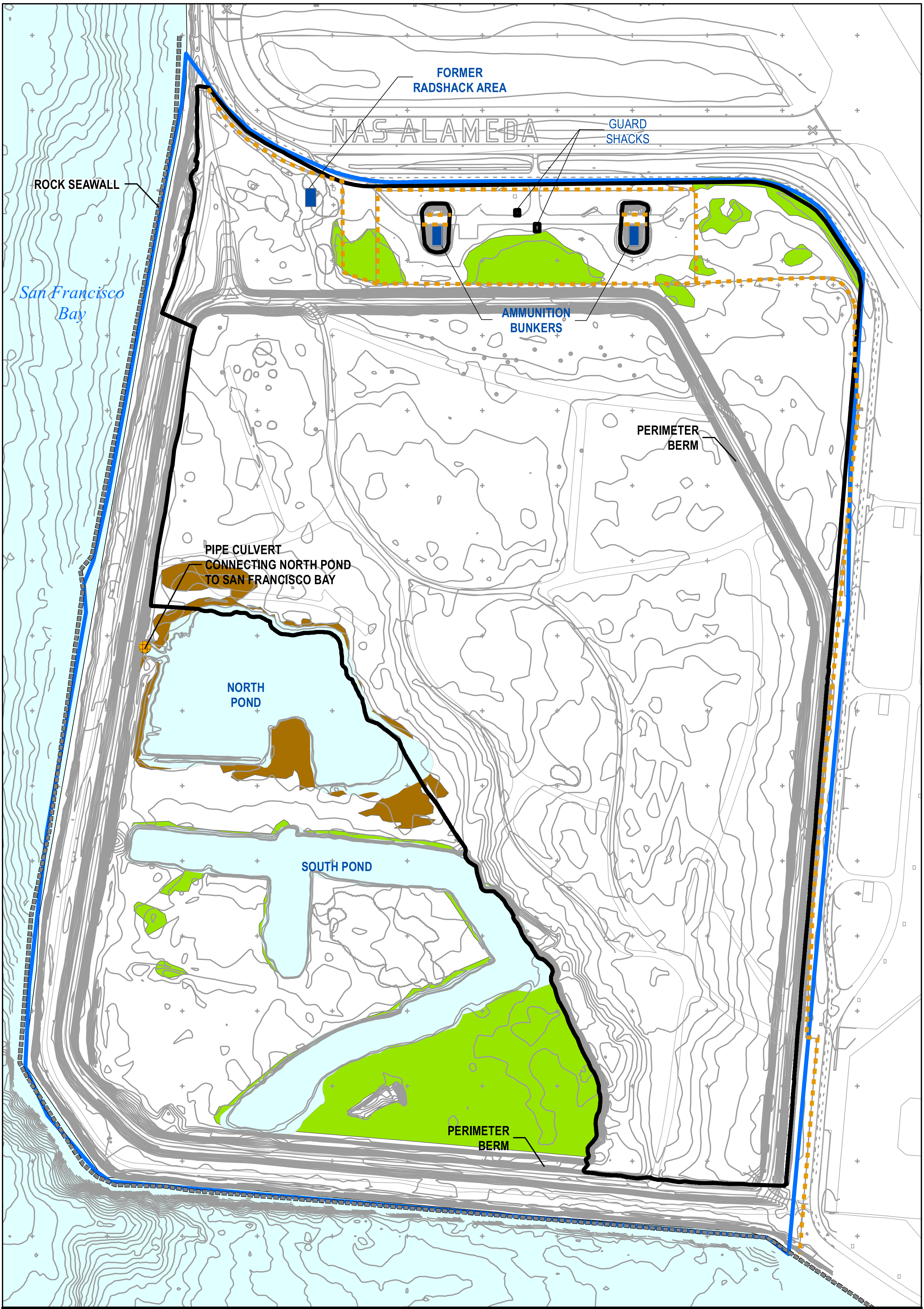
FIGURE 2-2

SITE FEATURES

ALAMEDA POINT, ALAMEDA, CALIFORNIA

REVIEW: 0
AUTHOR: MS
FILE NUMBER: 120118S7557.mxd

TETRA TECH EC, INC.



LEGEND

ROAD/RUNWAY
IR SITE 2 BOUNDARY
ROCK SEAWALL
CULVERT
WATER/PONDS
COVER BOUNDARY
EXISTING FENCELINE
SEASONAL WETLAND
TIDAL WETLAND

N

125 0 125 250
Feet

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2

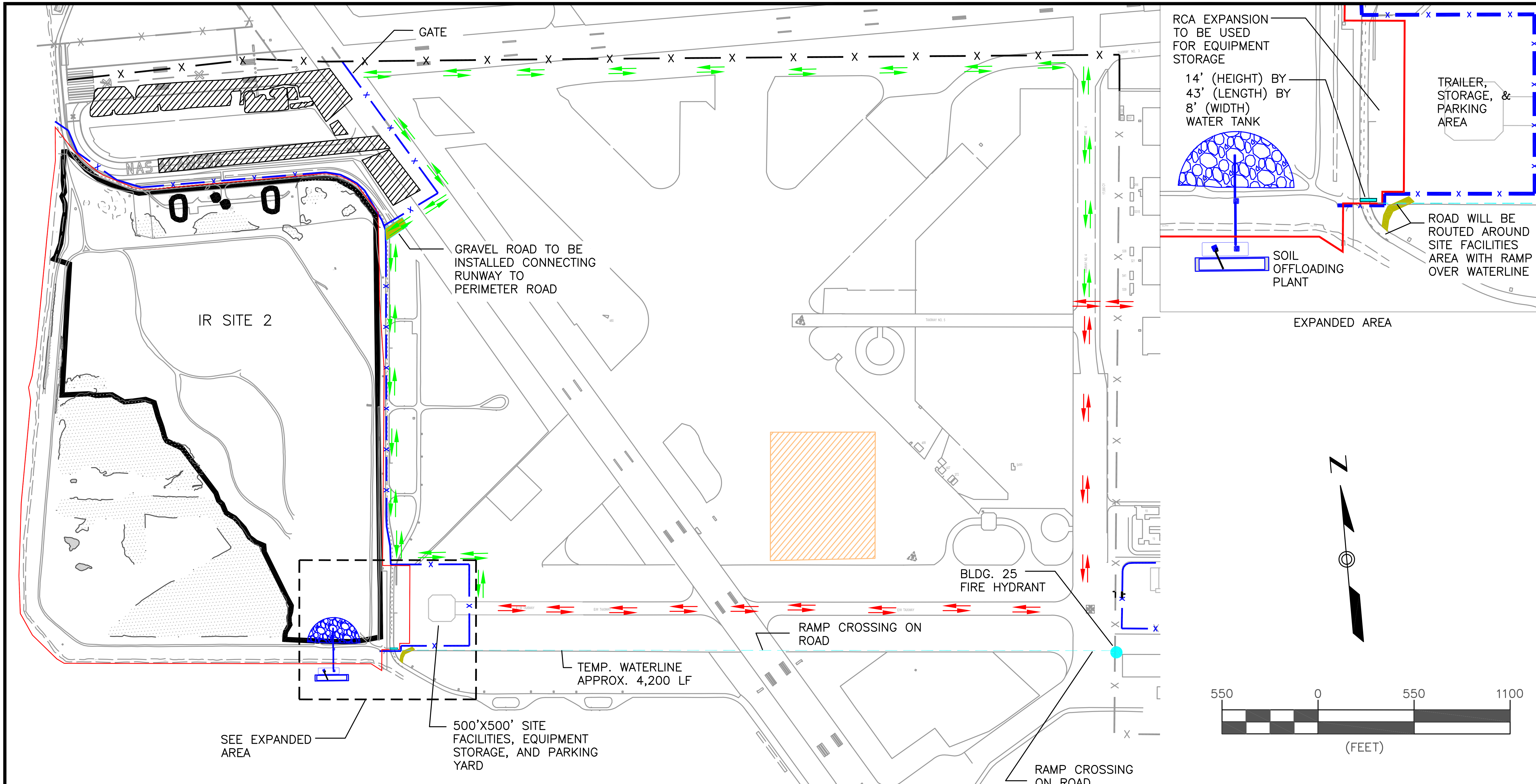
FIGURE 2-3

REVISED SOIL COVER BOUNDARY AND WETLANDS

ALAMEDA POINT, ALAMEDA, CALIFORNIA

REVIEW: 0
AUTHOR: MS
FILE NUMBER: 120118S7558.mxd

TETRA TECH EC, INC.



NOTE:

1. PROPOSED WATERLINE PLACEMENT SHALL ONLY OCCUR DURING CALIFORNIA LEAST TERN'S ABSENCE.
2. ROAD CROSSINGS WILL BE TRAFFIC RATED.
3. NORTHWEST OFFLOADING AREA UNUSABLE DUE TO SHALLOW WATER DEPTHS.

LEGEND

- COVER BOUNDARY
- PROJECT TEMPORARY FENCE LINE
- RADIOLOGICAL CONTROL AREA (RCA)
- PROPOSED 8-INCH WATERLINE
- CALIFORNIA LEAST TERN SANCTUARY
- STOCKPILED MATERIAL
- ACCESS/EGRESS – SEPT. 01 – MARCH 15
- ACCESS/EGRESS – MARCH 15 – SEPT. 01

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2

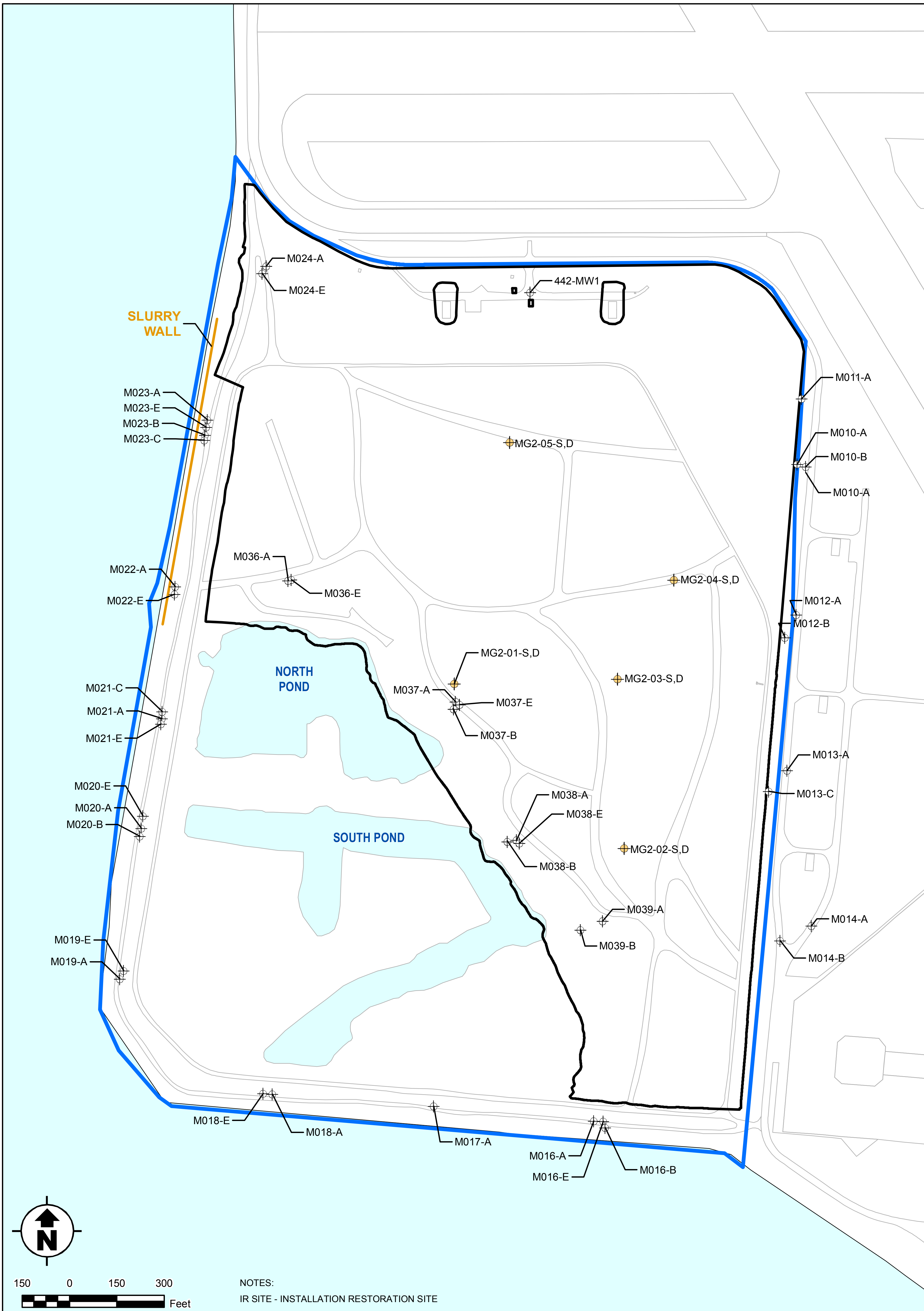
FIGURE 5-1

PROJECT FEATURES

ALAMEDA POINT, ALAMEDA, CALIFORNIA

REVIEW: 0
AUTHOR: RS
DATE: FEBRUARY 8, 2013
FILE NUMBER: FIGURE 5-1.dwg

TETRA TECH EC, INC.



NOTES:
IR SITE - INSTALLATION RESTORATION SITE

LEGEND

ROAD/RUNWAY
IR SITE 2 BOUNDARY
EXTENT OF SOIL COVER
GROUNDWATER MONITORING WELL
MULTI-DEPTH SOIL GAS MONITORING WELL TO BE DESTROYED DURING COVER PLACEMENT

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2

FIGURE 5-2
SOIL GAS MONITORING WELLS
PROPOSED FOR DESTRUCTION

ALAMEDA POINT, ALAMEDA, CALIFORNIA

REVIEW: A
AUTHOR: MS
FILE NUMBER: 120118L7565.mxd

TETRA TECH EC, INC.

ATTACHMENT 1

100% REMEDIAL DESIGN

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The 100% Remedial Design presents the following:

- **100% Remedial Design Drawings**
- **100% Remedial Design Specifications**
- **Final Geotechnical Report**

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DESIGN DRAWINGS

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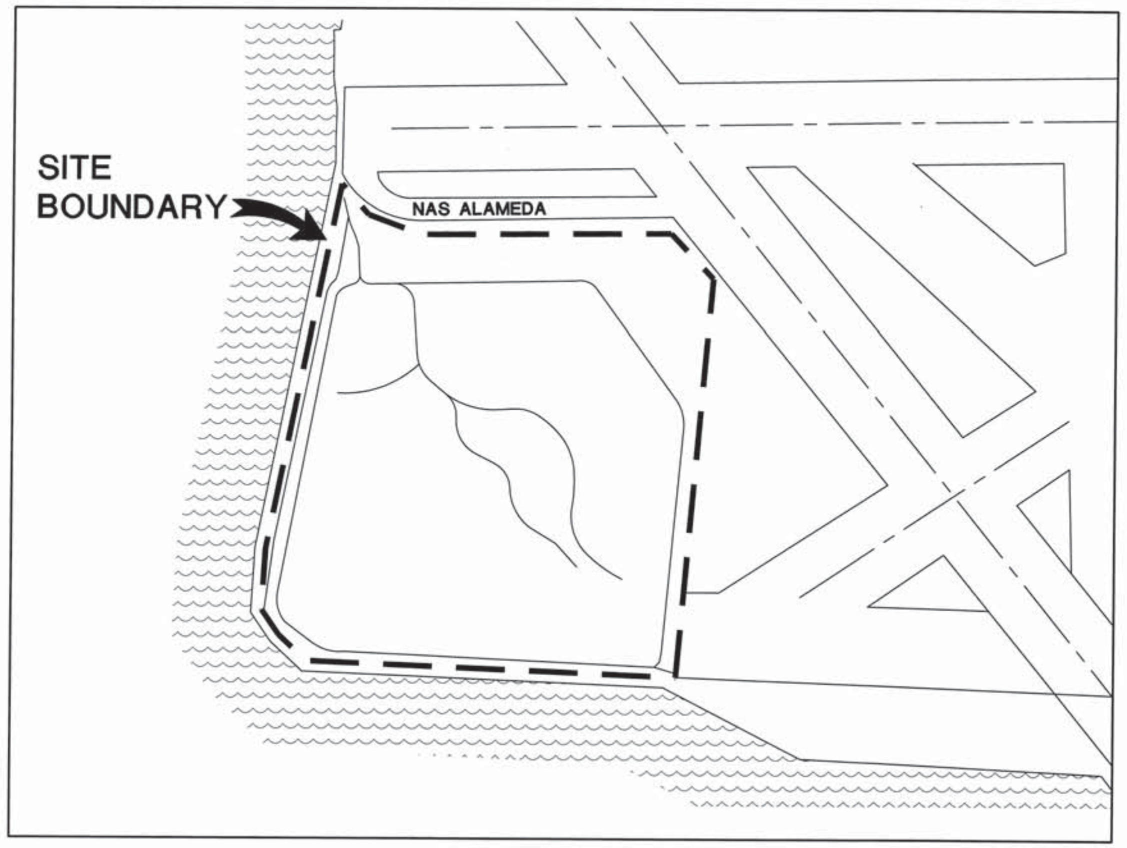
DESIGN-BUILD
INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
NAVAL AIR STATION
ALAMEDA POINT, ALAMEDA, CALIFORNIA

VICINITY MAP

SCALE: NONE

VICINITY MAP NORTH



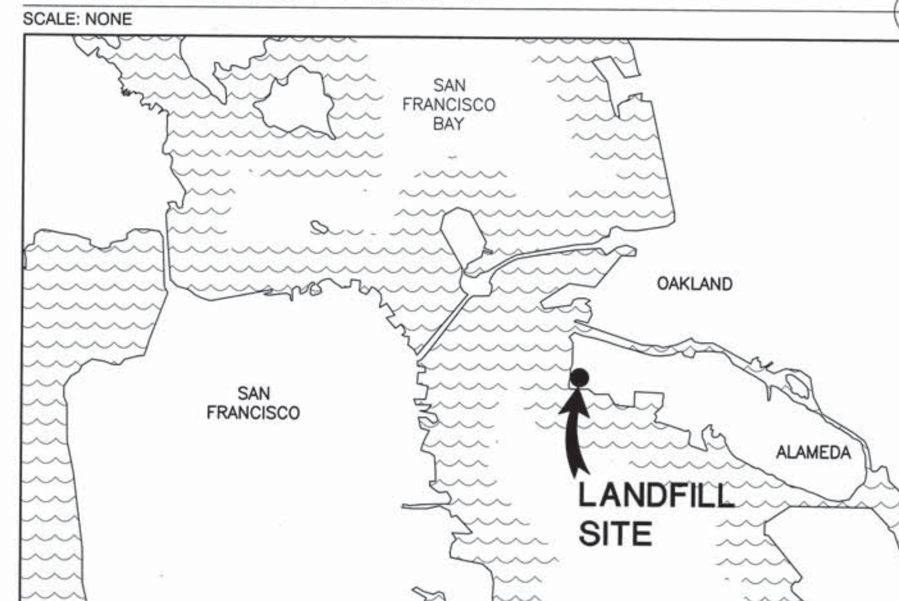
DRAWING INDEX

SHEET	DWG.	DESCRIPTION
1	T-1	TITLE SHEET
2	G-1	ABBREVIATIONS SYMBOLS AND LEGEND
3	C-1	SITE PLAN
4	C-2	DEMOLITION PLAN
5	C-3	SHEET INDEX
6	C-4	SUBGRADE PLAN-NORTHWEST
7	C-5	SUBGRADE PLAN-NORTHEAST
8	C-6	SUBGRADE PLAN-SOUTHWEST
9	C-7	SUBGRADE PLAN-SOUTHEAST
10	C-8	SUBGRADE PLAN-BUNKER
11	C-9	FINAL GRADING AND COVER PLAN-NORTHWEST
12	C-10	FINAL GRADING AND COVER PLAN-NORTHEAST
13	C-11	FINAL GRADING AND COVER PLAN-SOUTHWEST
14	C-12	FINAL GRADING AND COVER PLAN-SOUTHEAST
15	C-13	FINAL GRADING AND COVER PLAN-BUNKER
16	C-14	SEDIMENT AND EROSION CONTROL PLAN
17	C-15	SECTIONS
18	C-16	LANDFILL GAS PASSIVE VENT SYSTEM
19	C-17	LANDFILL GAS DETAILS
20	D-1	SITE DETAILS
21	D-2	SITE DETAILS
22	D-3	SITE DETAILS
23	D-4	SITE DETAILS
24	D-5	SITE DETAILS

LOCATION MAP

SCALE: NONE

LOCATION MAP NORTH



SYM | DESCRIPTION | DATE | APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALL CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
TITLE SHEET

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 1 OF 24	

T-1

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: C:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\01-0028TIL.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 - 2:07pm

GENERAL NOTES

1. EXISTING UTILITIES SHOWN ARE BASED ON BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION, SIZE, TYPE, AND ELEVATION OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CONTACT USA NORTH FOR IDENTIFICATION OF EXISTING UTILITIES PRIOR TO THE START OF CONSTRUCTION.
2. EXCAVATION LIMITS SHOWN IN THE DETAILS ARE GRAPHICAL REPRESENTATIONS ONLY AND DO NOT REPRESENT ACTUAL EXCAVATION LIMITS NECESSARY TO COMPLETE THE WORK.
3. SHEET C–1 SHOWS SURVEY CONTROL MONUMENTS IN THE PROJECT AREA AND PROVIDES REFERENCE TO THE SURVEY DOCUMENTS WHERE COORDINATES CAN BE OBTAINED FOR GROUND CONTROL. ALL COORDINATES AND STATIONS SHOWN ON THE DRAWINGS ARE GROUND.
4. REPLACEMENT AND RECONSTRUCTION OF ANY EXISTING FACILITIES DAMAGED DURING CONSTRUCTION SHALL BE COMPLETED AT THE CONTRACTOR'S EXPENSE.
5. THE CONTRACTOR SHALL APPLY VEGETATIVE EROSION CONTROL, PER SPECIFICATIONS AND DRAWINGS, TO AREAS DISTURBED BY CONSTRUCTION ACTIVITIES AND DRAINAGE COURSES.
6. ANY DISCREPANCIES FOUND BETWEEN THE DRAWINGS AND ACTUAL SITE CONDITIONS OR ANY INCONSISTENCIES OR AMBIGUITIES BETWEEN THE DRAWINGS AND OTHER COMPONENTS OF THE CONTRACT DOCUMENTS SHALL BE IMMEDIATELY REPORTED IN WRITING TO THE ENGINEER. THE ENGINEER WILL PROMPTLY CORRECT INCONSISTENCIES OR AMBIGUITIES IN WRITING IN COORDINATION WITH THE CLIENT.
7. ALL DRAINAGE DITCHES SHALL BE GRADED TO DRAIN IN THEIR ORIGINAL DIRECTION AND PROTECTED FROM EROSION BY THE CONTRACTOR BY HYDROSEEDING, UNLESS OTHERWISE NOTED. ALL DRAINAGE DITCHES SHALL REMAIN OPERABLE AT THE END OF EACH WORKDAY.
8. THE CONTRACTOR SHALL PROVIDE TEMPORARY FENCING AROUND THE OUTER LIMITS OF THE PERMANENT AND TEMPORARY CONSTRUCTION AREAS PRIOR TO ANY WORK. THIS INCLUDES, BUT IS NOT LIMITED TO,OFFICE AND STAGING AREAS, LIMITS OF EXCAVATION, AND STOCKPILE AREAS.
9. ALL DIMENSIONS, INCLUDING, BUT NOT LIMITED TO ELEVATIONS, STATIONS, AND DISTANCES ARE IN STANDARD ENGLISH UNITS.
10. NOMINAL SCALES (1"=X') PROVIDED ARE FOR FULL SIZE DRAWINGS (22"x34"). BAR SCALES PROVIDE THE NECESSARY SCALE ADJUSTMENT FOR ANY SIZE DRAWING.
11. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT IMPROVEMENTS FROM DAMAGE.
12. CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES FOR SEDIMENT AND EROSION CONTROL, INCLUDING HYDROSEEDING, STRAW MULCH, AND EROSION CONTROL BLANKET OVER FINAL GRADES, AND FIBER ROLLS, SILT FENCES, AND HAY BALE AS NECESSARY TO CONTROL SEDIMENT FROM LEAVING THE SITE OR IMPACTING WETLANDS.
13. CONTRACTOR PERSONNEL SHALL BE ADEQUATELY TRAINED TO IMPLEMENT THE REQUIREMENTS OF THE STORMWATER POLLUTION PREVENTION PLAN.
14. TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO START OF CONSTRUCTION.
15. CONTRACTOR SHALL MINIMIZE EROSION DURING CONSTRUCTION USING STANDARD CONSTRUCTION TECHNIQUES, SILT FENCE, AND CHECK DAMS.
16. CONSTRUCTION WITHIN WETLANDS SHOWN IS ACCEPTABLE WITHIN THE LIMITS OF THE COVER SYSTEM, BUT WETLANDS MUST BE PRESERVED OUTSIDE THE LIMITS OF THE COVER.
17. WASTES AT OR NEAR SURFACE MAY BE RADIOLOGICALLY CONTAMINATED. SURFACE VEGETATION WILL BE REMOVED. HOWEVER, GRUBBING OR OTHER EXCAVATION WILL BE LIMITED AND WILL BE SUBJECT TO PROJECT RADIOLOGICAL CONTROLS.
18. ANY MATERIALS AND EQUIPMENT IN THE RADIOLOGICAL AREA WILL BE SUBJECT TO RADIOLOGICAL RELEASES.
19. IR SITE 2 IS A DESIGNATED CERCLA SITE. NO PERMITS ARE REQUIRED, BUT ALL WORK WILL COMPLY WITH SUBSTANTIAL REQUIREMENTS UNDER CERCLA.

CONSTRUCTION NOTES

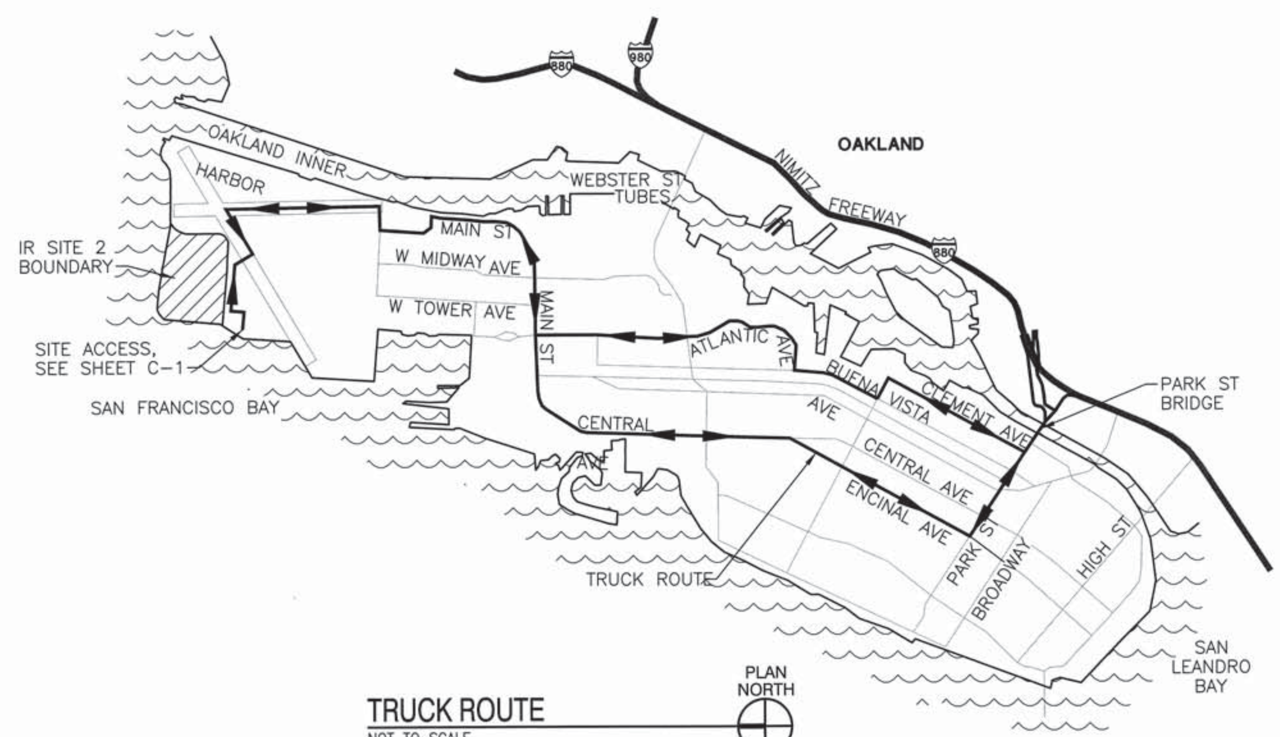
1. REMOVE AND DISPOSE OF EXISTING CHAIN LINK FENCE
2. REMOVE AND DISPOSE OF EXISTING WEIR STRUCTURE PER 2/D-3
3. PROTECT GAS VENT IN PLACE, REPLACE AS NECESSARY PER 1/C-17
4. ABANDON EXISTING SOIL GAS MONITORING PROBE PER SPECIFICATIONS
5. CLEAR VEGETATION
6. PROTECT IN PLACE
7. EXCAVATE/FILL TO CONTOURS SHOWN
8. CONSTRUCT FINAL COVER PER 1/D-1
9. CONSTRUCT ACCESS ROAD PER 5/D-4
10. INSTALL LANDFILL GAS MONITORING PROBE PER 1/D-2
11. INSTALL SETTLEMENT MONUMENT PER 3/D-1
12. NOT USED
13. CONVERT EXISTING MANHOLE TO DRAINAGE INLET PER 1/D-3
14. NOT USED
15. CONSTRUCT SILT FENCE PER 4/D-4
16. CONSTRUCT FIBER ROLLS PER 2/D-4
17. HYDRO SEED PER SPECIFICATIONS
18. TEMPORARY CONSTRUCTION/SECURITY FENCE
19. CONSTRUCT CHAIN LINK GATE PER 1/D-6
20. CONSTRUCT TURF REINFORCEMENT MAT TERMINATION AT EDGE OF ACCESS ROAD PER 6/D-4
21. CONSTRUCT TURF REINFORCEMENT MAT ANCHOR TRENCH PER 2/D-5
22. INSTALL PASSIVE GAS VENTING PER 1/D-4
23. CONSTRUCT TURF REINFORCEMENT MAT PER 1/D-5

LEGEND

Symbol	Description
— · — · —	WETLAND PRESERVE
—x—	EXISTING FENCE
—XX—	TEMPORARY CONSTRUCTION/SECURITY FENCE
— · · —	APPROXIMATE LIMIT OF WASTE
— — —	IR SITE 2 BOUNDARY
- - - - -	TOP/GB OR TOE OF SLOPE
━ ━ ━	COVER SYSTEM LIMITS
—829—	EXISTING CONTOUR
—829—	PROPOSED CONTOUR
— — —	CENTERLINE OF ROADWAY
— — —	ROCK SEAWALL
- - - -	LIMIT OF EXISTING RIP–RAP
—SD—	EXISTING STORM DRAIN
—·—	RIDGE
	CAB
℄	CENTERLINE
HP	HIGH POINT
LP	LOW POINT
(201.5)	EXISTING ELEVATION
	SETTLEMENT MONUMENT
	SURVEY CONTROL POINT
⊗	WATER VALVE
ø	DIAMETER
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING SOIL GAS MONITORING WELL
	NEW LANDFILL GAS MONITORING PROBE
■	EXISTING GAS VENT
	REPLACED GAS VENT
POINT NO. / ELEV.	EXISTING SURVEY CONTROL POINT
W–X	EXISTING WETLAND DESIGNATION AND BOUNDARY

ABBREVIATIONS

APPROX	APPROXIMATE
ASTM	AMERICAN INSTITUTE FOR TESTING AND MATERIALS
CONC	CONCRETE
CMP	CORRUGATED METAL PIPE
DIA	DIAMETER
DWG	DRAWING
GW	GROUNDWATER
IR	INSTALLATION RESTORATION
I.D.	IDENTIFICATION
L	LENGTH
MAX	MAXIMUM
MG	GAS PROBES
MIN	MINIMUM
MIL	A UNIT OF LENGTH EQUAL TO ON THOUSANDTH OF AN INCH
MPT	MALE PIPE THREAD
MW,MO	GROUNDWATER MONITORING WELL
N	NORTH
NAVFAC	NAVAL FACILITY
PVC	POLYVINYL CHLORIDE
SCH	SCHEDULE
SD	STORM DRAIN
SM	SETTLEMENT MONUMENT
SYM	SYMBOL
TYP	TYPICAL
W	WETLAND
WWF	WELDED WIRE FABRIC
YD	YARD



TRUCK ROUTE
NOT TO SCALE

TETRA TECH, INC.
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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAL... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

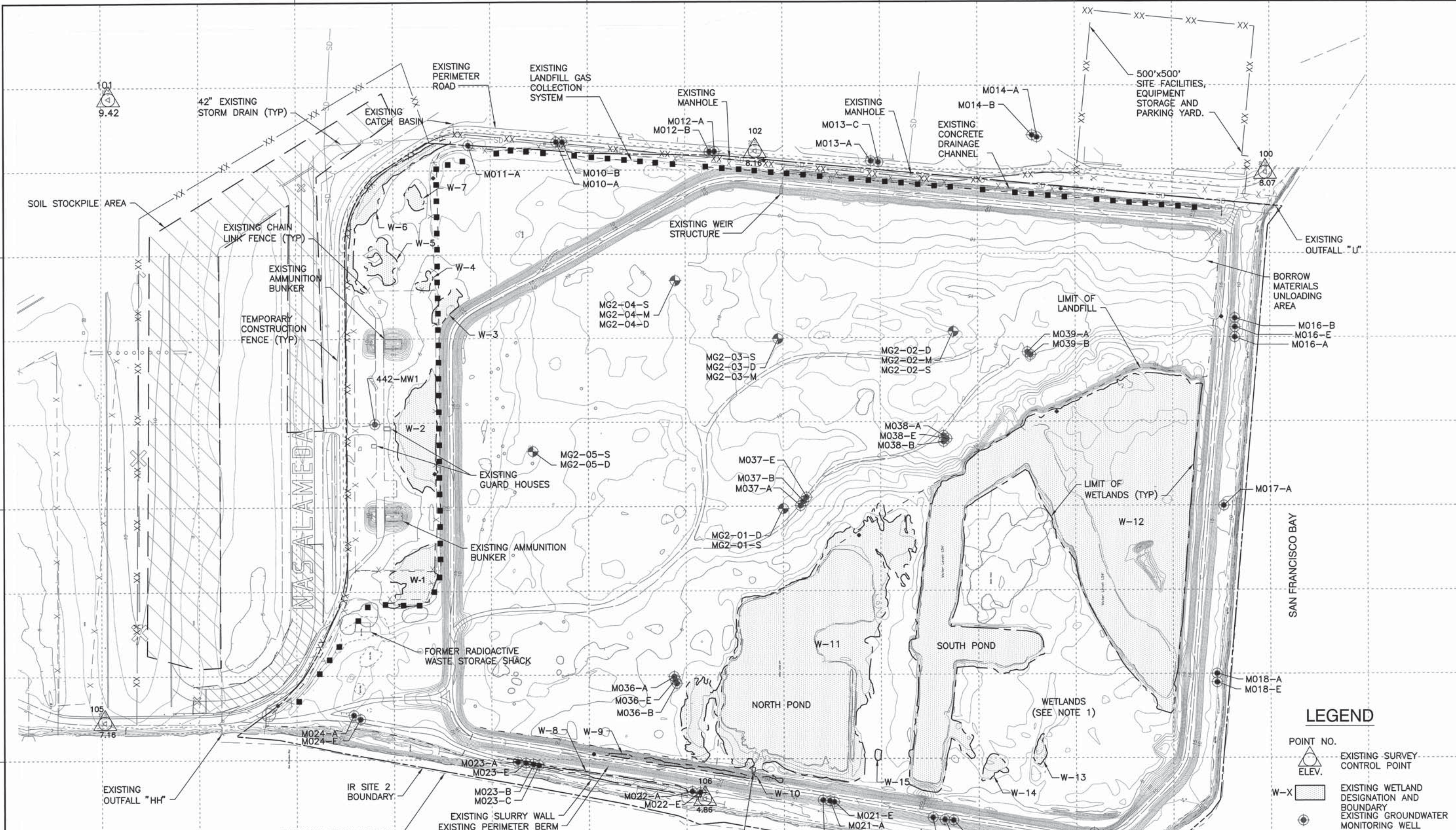
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
ABBREVIATIONS SYMBOLS AND LEGEND

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 2 OF 24	

G-1

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2–PLAN SET\PLAN SET\03–001GEN.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 – 2:07pm



LEGEND

POINT NO. / ELEV.	EXISTING SURVEY CONTROL POINT
W-X	EXISTING WETLAND DESIGNATION AND BOUNDARY
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING SOIL GAS MONITORING WELL
	EXISTING GAS VENTS
	LIMIT OF REFUSE
	IR SITE 2 BOUNDARY
SD	STORM DRAIN
X	EXISTING FENCE
XX	TEMPORARY CONSTRUCTION /SECURITY FENCE
	PROPOSED STOCKPILE AREA

BASIS OF SURVEY:

THIS MAP WAS PREPARED USING COMPUTER ASSISTED, PHOTOGRAMMETRIC METHODS BY HJW GEOSPATIAL, INC. IN OAKLAND, CALIFORNIA. CONTROL SURVEY PERFORMED BY KISTER, SAVIO & REI, RICHMOND, CA. IN AREAS OF DENSE VEGETATION, ACCURACY OF CONTOURS MAY DEVIATE FROM ACCEPTED ACCURACY STANDARDS.

SURVEY CONTROL IS BASED ON THE MONUMENT DESIGNATED "MAIN/ATL" AS DESCRIBED BY THE NATIONAL GEODETIC SURVEY. THE MONUMENT IS LOCATED AT THE NORTHWEST CORNER OF MAIN STREET AND ATLANTIC AVENUE.

COORDINATES ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM ZONE III NORTH AMERICAN DATUM OF 1927. THE NAD27 VALUE FOR "MAIN/ATL" WAS DERIVED FROM THE NADCON CONVERSION OF THE PUBLISHED NAD83 COORDINATES. THE COMPUTED NAD27 COORDINATES ARE:
NORTH 471,068.97'
EAST 1,482,604.56'
ELEVATIONS ARE BASED THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. THE PUBLISHED ELEVATION OF "MIN/ATL" = 6.69' NGVD29.

COORDINATES AND ELEVATIONS WERE OBTAINED USING RTK GPS TECHNIQUES AND CONVENTIONAL GROUND CONTROL SURVEY METHODS.

SITE PLAN

SCALE: 1"=150'

PLAN NORTH

GRAPHIC SCALE

150 75 0 150 300

(IN FEET)

NOTE:

1. WETLANDS BOUNDARIES BASED ON JULY 2010 WETLANDS SURVEY BY KCH.

EXISTING SURVEY CONTROL POINTS			
POINT NO.	NORTHING	EASTING	ELEVATION
100	471603.78	1472920.58	8.07
101	475136.51	1473153.00	9.42
102	473162.17	1472987.48	8.16
105	475151.12	1471252.25	7.16
106	473320.10	1471014.48	4.86
107	472039.32	1470837.94	8.65

SYM	DESCRIPTION	DATE	APPR

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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAUER CIVIL STATE OF CALIFORNIA

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2

SITE PLAN

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 3	OF 24

C-1

DRAWFORM REVISION: OCTOBER 2011

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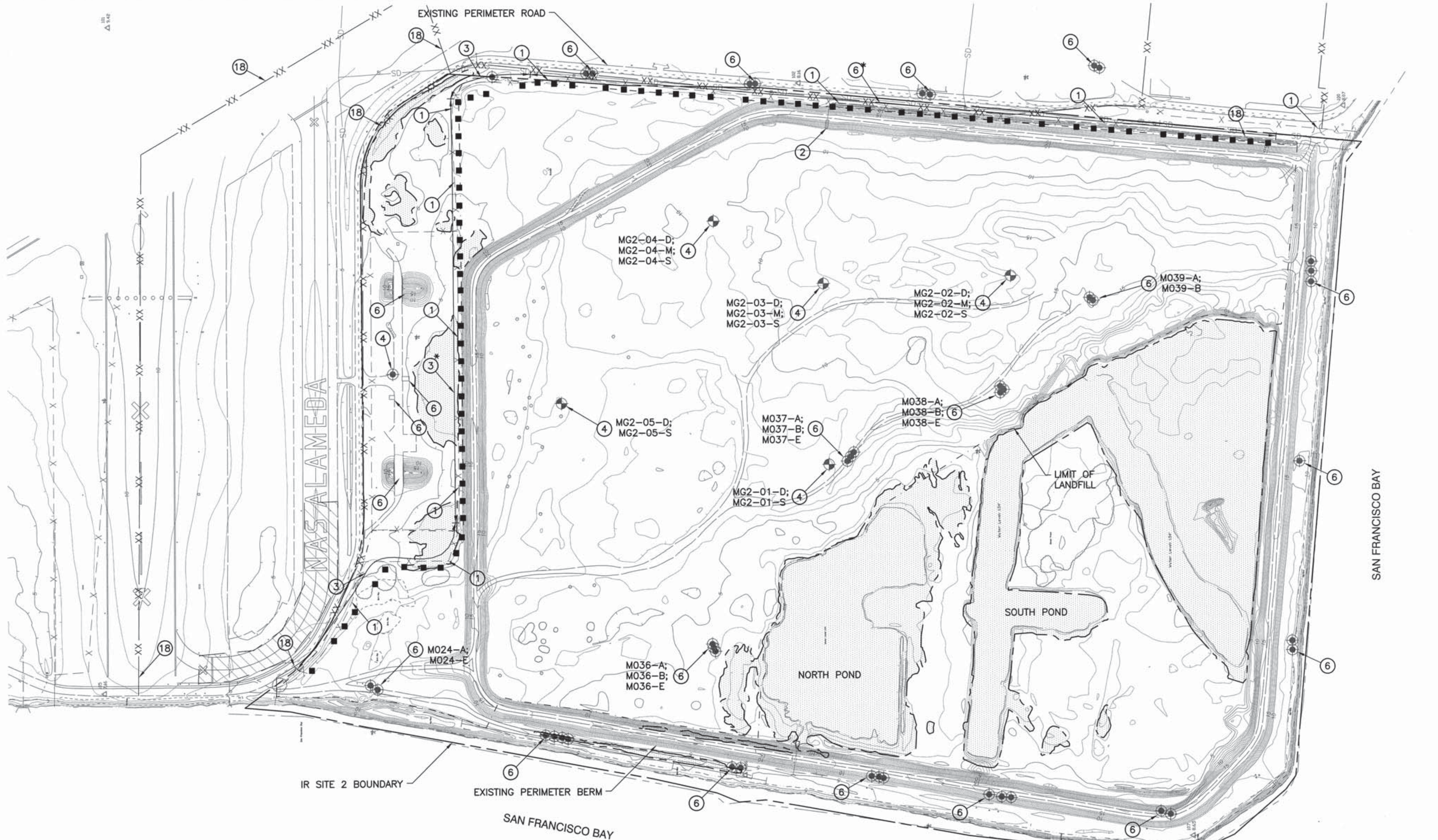

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CONSTRUCTION NOTES

1. REMOVE AND DISPOSE OF EXISTING CHAIN LINK FENCE
2. REMOVE AND DISPOSE OF EXISTING WEIR STRUCTURE PER 2/D-3
3. PROTECT GAS VENT IN PLACE, REPLACE AS NECESSARY PER 1/C-17
4. ABANDON EXISTING SOIL GAS MONITORING PROBE PER SPECIFICATIONS
6. PROTECT IN PLACE
18. TEMPORARY CONSTRUCTION/SECURITY FENCE

DEMOLITION PLAN

SCALE: 1"=150'

PLAN NORTH

GRAPHIC SCALE

150 75 0 150 300

(IN FEET)

NOTE:

* PROTECT IN PLACE GAS VENT TRENCH LOCATED ON OR OUTSIDE OF THE LIMITS OF REFUSE WHERE POSSIBLE. REPLACE AS NEEDED PER SHEET C-15.

LEGEND

WETLAND PRESERVE	WATER VALVE
EXISTING FENCE	DIAMETER
LIMIT OF REFUSE	EXISTING GROUNDWATER MONITORING WELL
IR SITE 2 BOUNDARY	EXISTING SOIL GAS MONITORING WELL
829 EXISTING CONTOUR	EXISTING GAS VENTS
ROCK SEAWALL	
LIMIT OF EXISTING RIP-RAP	POINT NO.
SD EXISTING STORM DRAIN	
XX TEMPORARY CONSTRUCTION/ SECURITY FENCE	ELEV. EXISTING SURVEY CONTROL POINT
(201.5) EXISTING ELEVATION	W-X EXISTING WETLAND DESIGNATION AND BOUNDARY
1 SURVEY CONTROL POINT	

SYM | DESCRIPTION | DATE | APPR

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REGISTERED PROFESSIONAL ENGINEER
GREG EDWIN SA...
CIVIL
STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
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PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
DEMOLITION PLAN

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 4 OF 24	

C-2

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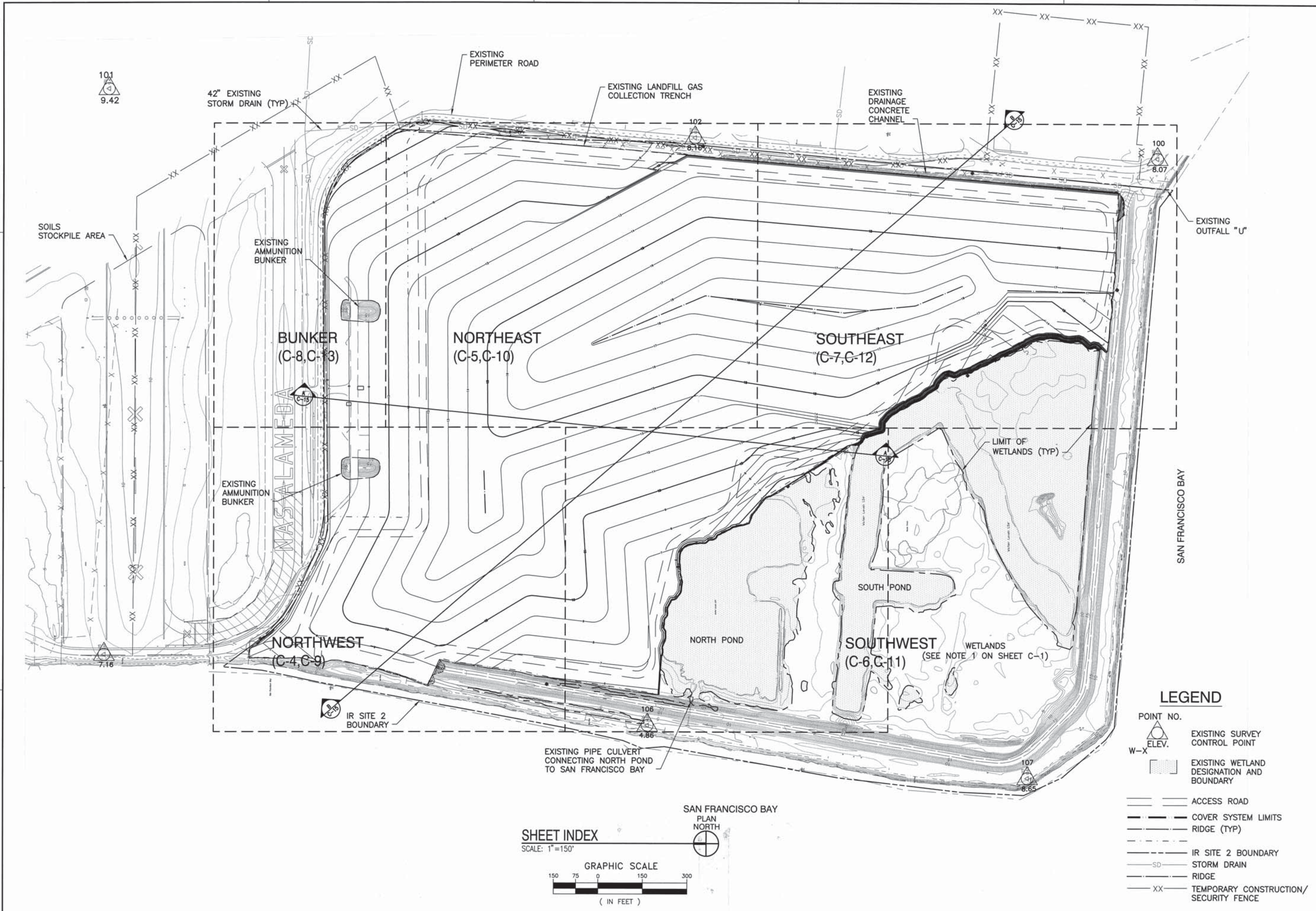

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TETRA TECH, INC.
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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SWANSON CIVIL STATE OF CALIFORNIA

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CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SHEET INDEX

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 5 OF 24	

C-3

DRAWFORM REVISION: OCTOBER 2011

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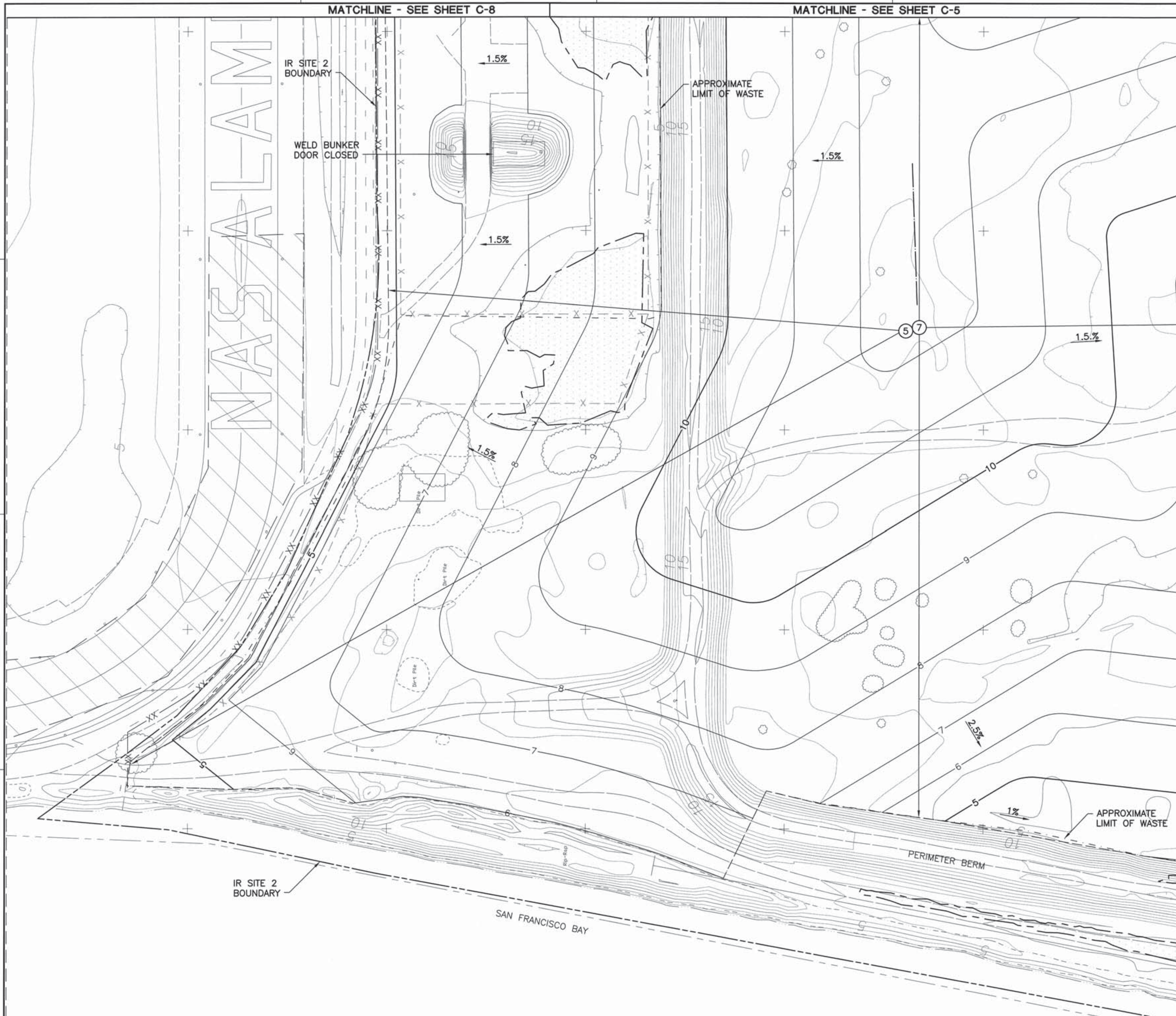

CONSTRUCTION NOTES

(5) CLEAR VEGETATION

(7) EXCAVATE/FILL TO CONTOURS SHOWN

LEGEND

— · —	WETLAND PRESERVE
—XX—	TEMPORARY CONSTRUCTION/ SECURITY FENCE
— · —	APPROXIMATE LIMIT OF WASTE
— —	IR SITE 2 BOUNDARY
- - -	TOP/GB OR TOE OF SLOPE
—829—	EXISTING CONTOUR
—829—	PROPOSED CONTOUR
— - —	CENTERLINE OF ROADWAY
— —	ROCK SEAWALL
— · —	LIMIT OF EXISTING RIP RAP
—SD—	EXISTING STORM DRAIN
——	RIDGE
	CAB
℄	CENTERLINE
(201.5)	EXISTING ELEVATION
⊕ 1	SURVEY CONTROL POINT
⊗	WATER VALVE
ø	DIAMETER
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING SOIL GAS MONITORING WELL
POINT NO. / ELEV.	EXISTING SURVEY CONTROL POINT
W-X	EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN S... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

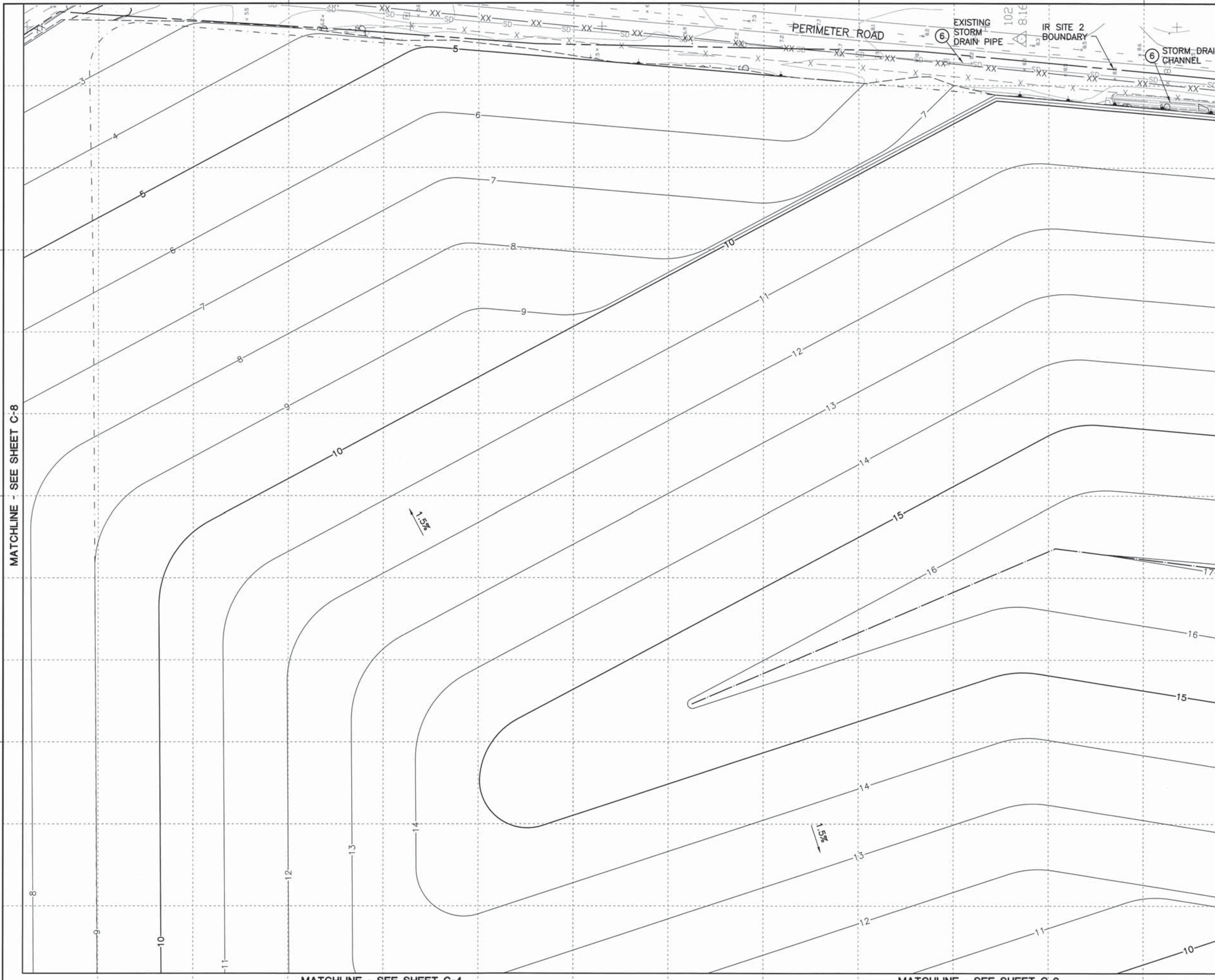
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SUBGRADE PLAN-NORTHWEST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	—
STA. PROJ. NO.	—
WORK ORDER NO.	—
CONSTR. CONTR. NO.	—
NAVFAC DRAWING NO.	
SHEET 6 OF 24	

C-4

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0045GRF.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 - 2:08pm



CONSTRUCTION NOTES

5. CLEAR VEGETATION
6. PROTECT IN PLACE
7. EXCAVATE/FILL TO CONTOURS SHOWN

LEGEND

- WETLAND PRESERVE
- XX — TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- 829 — EXISTING CONTOUR
- 829 — PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD — EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- 1 SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING SOIL GAS MONITORING WELL
- POINT NO. / ELEV. — EXISTING SURVEY CONTROL POINT
- W-X — EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

NAVFAC

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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SA... CIVIL STATE OF CALIFORNIA

DESG. G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SUBGRADE PLAN-NORTHEAST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 7 OF 24	

C-5

DRAWFORM REVISION: OCTOBER 2011

SYM | DESCRIPTION | DATE | APPR

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0050GRF.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 - 2:08pm

CONSTRUCTION NOTES

5. CLEAR VEGETATION
7. EXCAVATE OR FILL TO CONTOURS SHOWN

LEGEND

- WETLAND PRESERVE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- ⊕ 1 SURVEY CONTROL POINT
- ⊗ WATER VALVE
- ∅ DIAMETER
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING SOIL GAS MONITORING WELL
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W–X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM | DESCRIPTION | DATE | APPR

NAVFAC

TETRA TECH, INC.
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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALYER CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

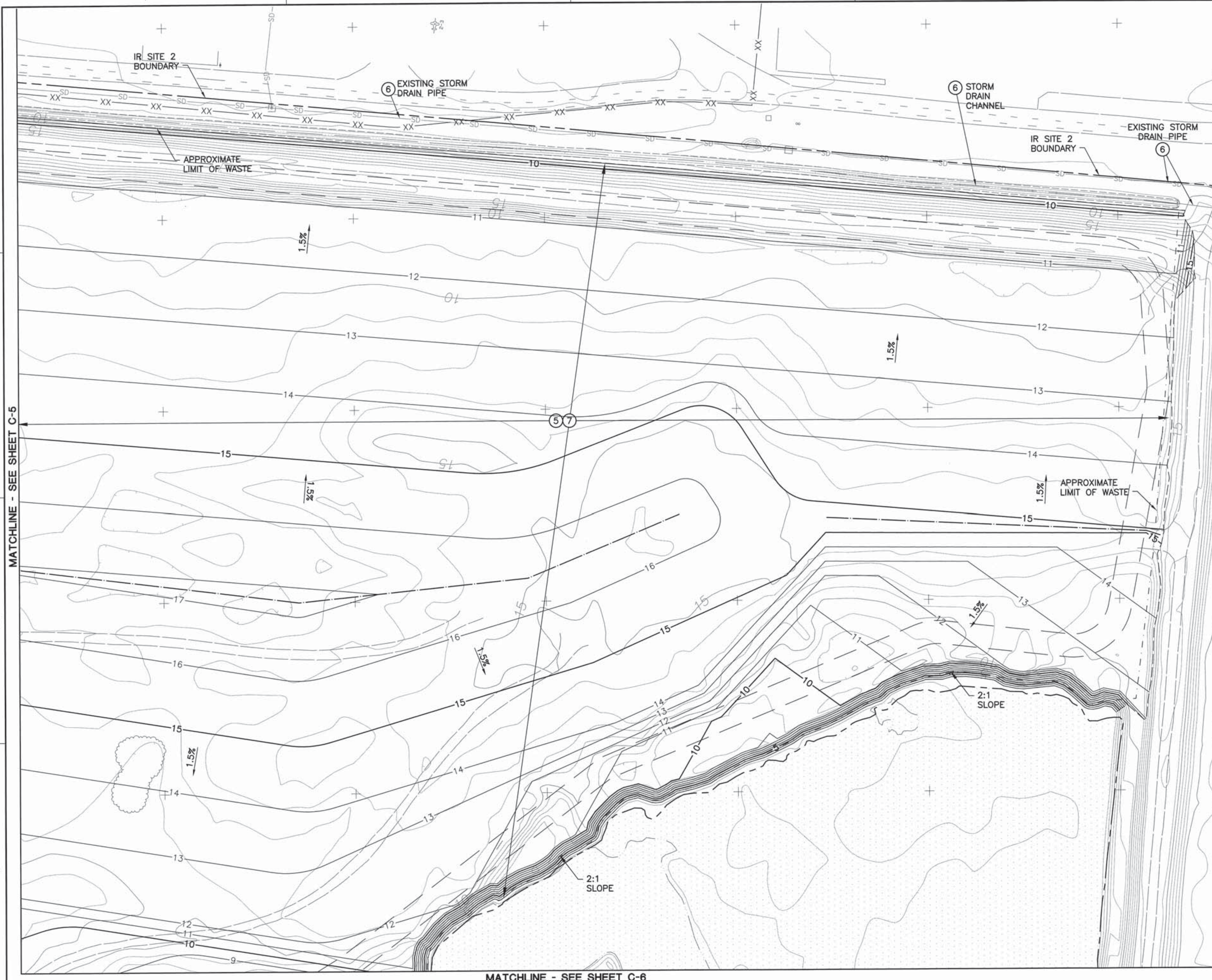
ALAMEDA POINT INSTALLATION RESTORATION SITE 2
SUBGRADE PLAN-SOUTHWEST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 8 OF 24	

C-6

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: C:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0046GRF.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 - 2:08pm



CONSTRUCTION NOTES

5. CLEAR VEGETATION
6. PROTECT IN PLACE
7. EXCAVATE/FILL TO CONTOURS SHOWN

LEGEND

- WETLAND PRESERVE
- TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- 1 SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING SOIL GAS MONITORING WELL
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W–X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAUL CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY SOUTHWEST DIVISION NAVAL FACILITIES ENGINEERING COMMAND ALAMEDA, CA

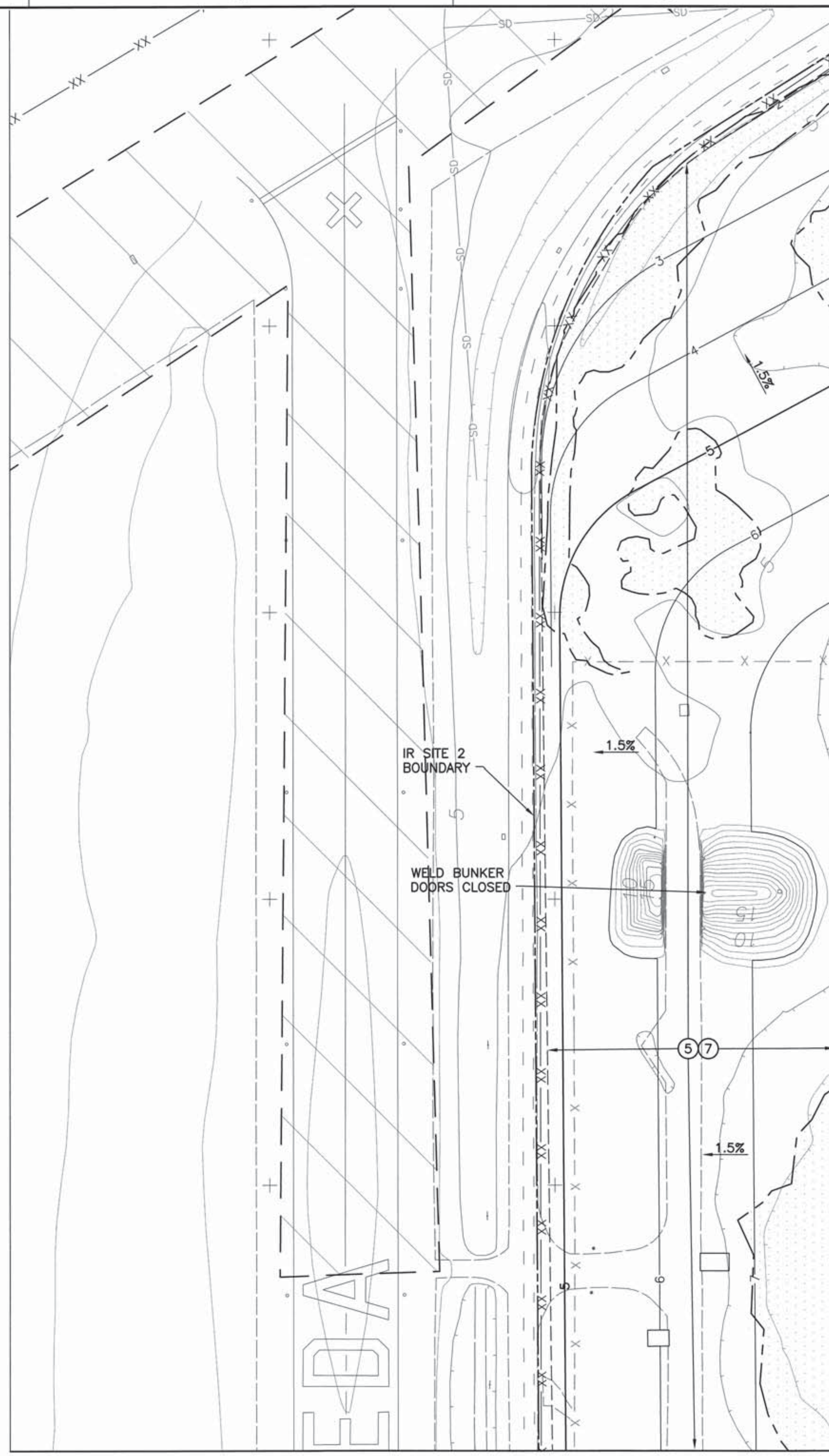
ALAMEDA POINT INSTALLATION RESTORATION SITE 2 SUBGRADE PLAN-SOUTHEAST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	—
STA. PROJ. NO.	—
WORK ORDER NO.	—
CONSTR. CONTR. NO.	—
NAVFAC DRAWING NO.	
SHEET 9 OF 24	

C-7

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0051GRF.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 - 2:08pm



MATCHLINE - SEE SHEET C-4

CONSTRUCTION NOTES

5. CLEAR VEGETATION
7. EXCAVATE/FILL TO CONTOURS SHOWN

LEGEND

Symbol	Description
	WETLAND PRESERVE
XX	TEMPORARY CONSTRUCTION/ SECURITY FENCE
	APPROXIMATE LIMIT OF WASTE
	IR SITE 2 BOUNDARY
	TOP/GB OR TOE OF SLOPE
829	EXISTING CONTOUR
829	PROPOSED CONTOUR
	CENTERLINE OF ROADWAY
	ROCK SEAWALL
	LIMIT OF EXISTING RIP RAP
SD	EXISTING STORM DRAIN
	CAB
℄	CENTERLINE
(201.5)	EXISTING ELEVATION
⌖ 1	SURVEY CONTROL POINT
⊗	WATER VALVE
Ø	DIAMETER
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING SOIL GAS MONITORING WELL
POINT NO. / ELEV.	EXISTING SURVEY CONTROL POINT
W-X	EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALLER CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SUBGRADE PLAN-BUNKER

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 10	OF 24

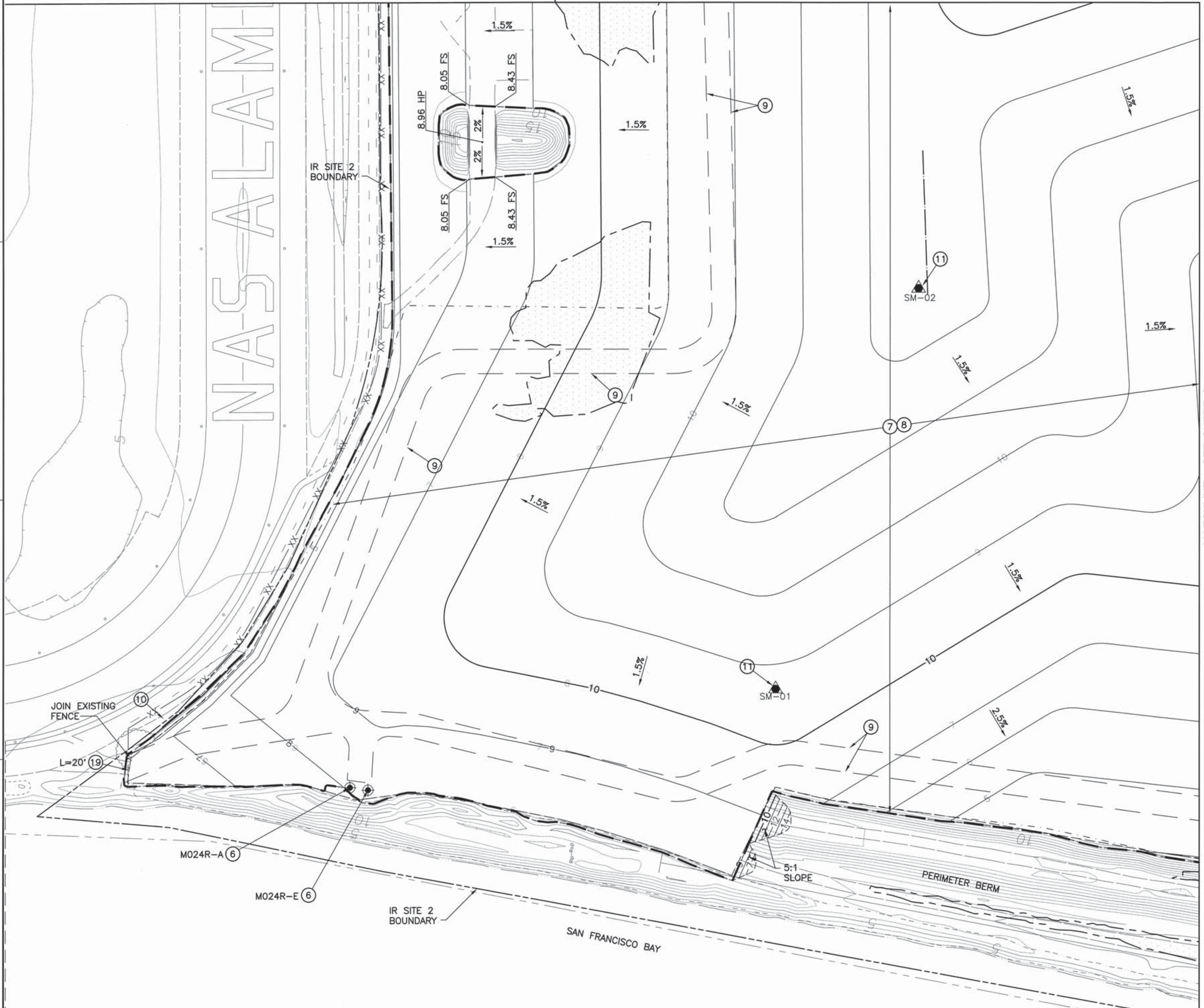
C-8

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0077ORF.dwg LAYOUT NAME: C-8 SUBGRADE PLAN-BUNKER PLOTTED: Tuesday, February 19, 2013 - 2:08pm

MATCHLINE - SEE SHEET C-13

MATCHLINE - SEE SHEET C-12



CONSTRUCTION NOTES

- (6) PROTECT IN PLACE
- (7) EXCAVATE OR FILL TO CONTOURS SHOWN
- (8) CONSTRUCT FINAL COVER PER 1/D-1
- (9) CONSTRUCT ACCESS ROAD PER 5/D-4
- (11) INSTALL SETTLEMENT MONUMENT PER 3/D-1
- (19) CONSTRUCT CHAIN LINK GATE PER 1/D-6

LEGEND

- WETLAND PRESERVE
- XX TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- 1 SURVEY CONTROL POINT
- WATER VALVE
- ø DIAMETER
- NEW GROUNDWATER MONITORING WELL
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W-X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 150 100

(IN FEET)

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALL CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT INSTALLATION RESTORATION SITE 2

FINAL GRADING AND COVER PLAN-NORTHWEST

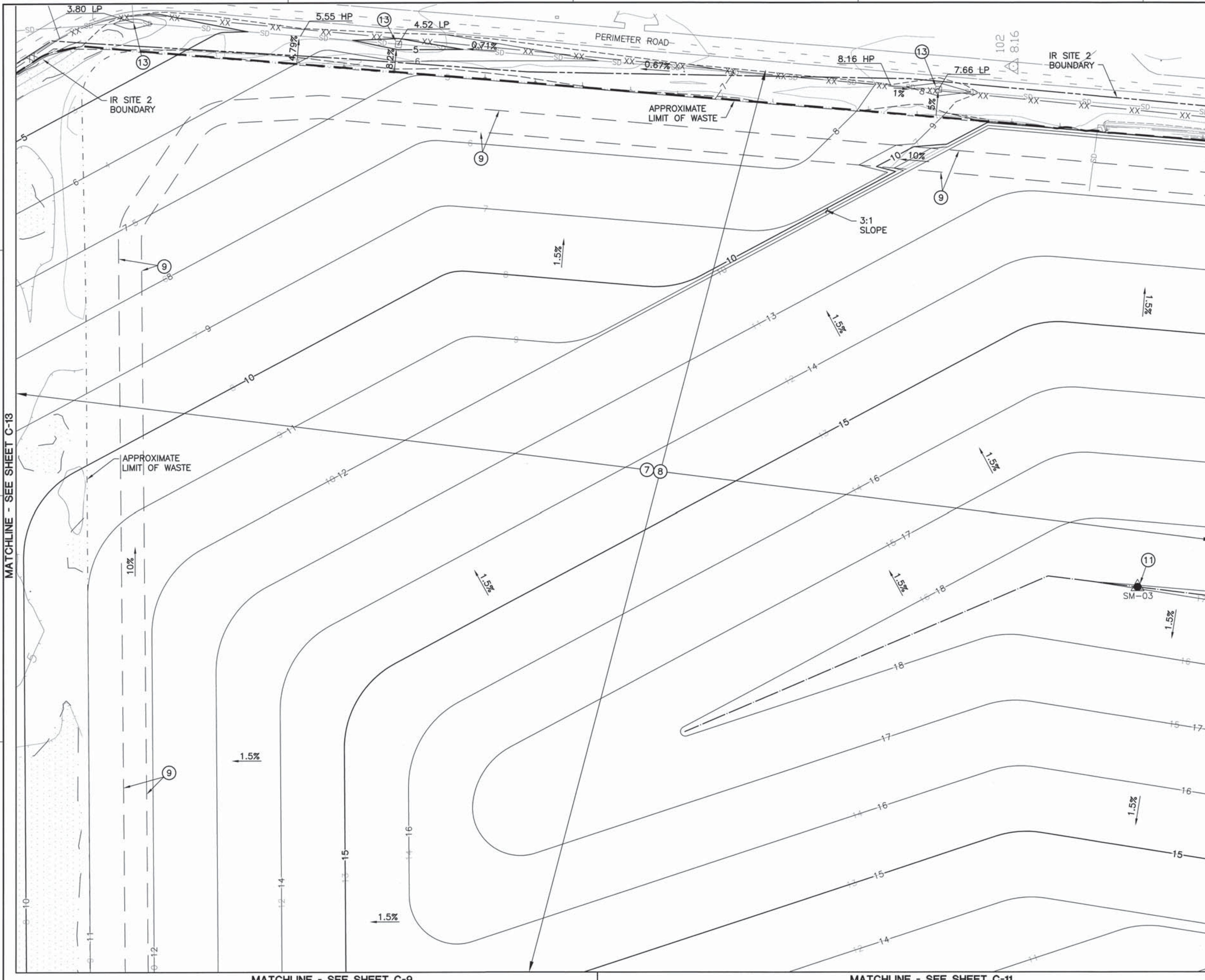
CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 11 OF 24	

C-9

DRAWFORM REVISION: OCTOBER 2011

SYM	DESCRIPTION	DATE	APPR

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0047GRF.dwg LAYOUT NAME: C-9 FINAL GRADING AND COVER PLAN-NORTHWEST PLOTTED: Wednesday, February 20, 2013 - 9:00am



CONSTRUCTION NOTES

7 EXCAVATE OR FILL TO CONTOURS SHOWN
8 CONSTRUCT FINAL COVER PER 1/D-1
9 CONSTRUCT ACCESS ROAD PER 5/D-4
11 INSTALL SETTLEMENT MONUMENT PER 3/D-1
13 CONVERT EXISTING MANHOLE TO DRAINAGE INLET PER 1/D-3

LEGEND

- WETLAND PRESERVE
- TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- HP HIGH POINT
- LP LOW POINT
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- NEW LANDFILL GAS MONITORING PROBE
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W-X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE
50 25 0 50 100
(IN FEET)

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALE CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

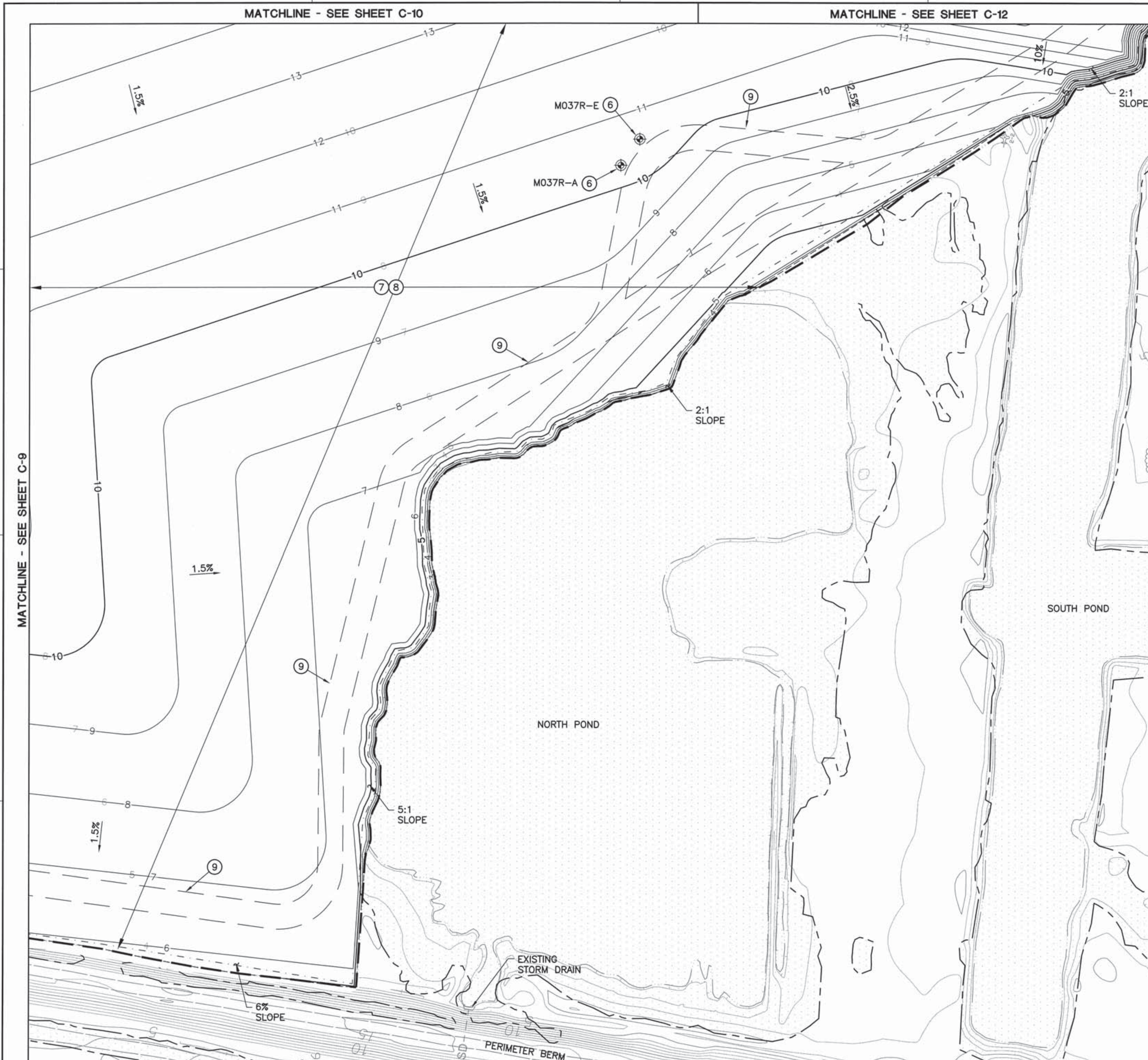
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-NORTHEAST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	–
SHEET 12 OF 24	

C-10

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-00520RF.dwg LAYOUT NAME: C-10 FINAL GRADING AND COVER PLAN-NORTHEAST PLOTTED: Tuesday, February 19, 2013 - 2:08pm



CONSTRUCTION NOTES

(6) PROTECT IN PLACE
(7) EXCAVATE OR FILL TO CONTOURS SHOWN
(8) CONSTRUCT FINAL COVER PER 1/D-1
(9) CONSTRUCT ACCESS ROAD PER 5/D-4
(10) INSTALL LANDFILL GAS MONITORING PROBE PER 1/D-2

LEGEND

- WETLAND PRESERVE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- ⊕ 1 SURVEY CONTROL POINT
- ⊗ WATER VALVE
- ∅ DIAMETER
- NEW LANDFILL GAS MONITORING PROBE
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W-X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER G EDWIN SAUL CIVIL STATE OF CALIFORNIA

SYM	DESCRIPTION	DATE	APPR

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION ALAMEDA, CA

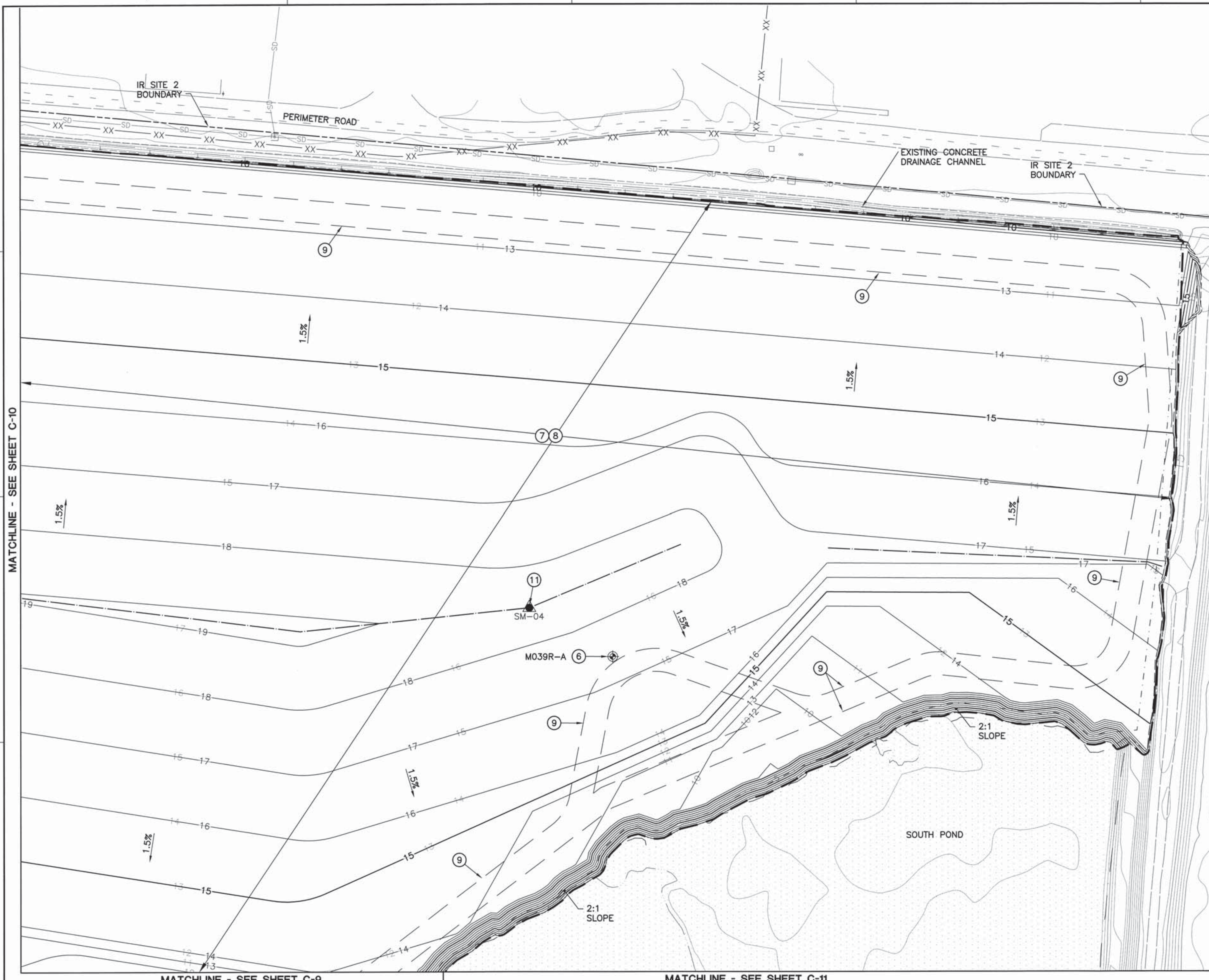
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-SOUTHWEST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 13 OF 24	

C-11

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0048GRF.dwg LAYOUT NAME: C-11 FINAL GRADING AND COVER PLAN-SOUTHWEST PLOTTED: Tuesday, February 19, 2013 - 2:08pm



CONSTRUCTION NOTES

6. PROTECT IN PLACE
7. EXCAVATE OR FILL TO CONTOURS SHOWN
8. CONSTRUCT FINAL COVER PER 1/D-1
9. CONSTRUCT ACCESS ROAD PER 5/D-4
10. INSTALL LANDFILL GAS MONITORING PROBE PER 1/D-2
11. INSTALL SETTLEMENT MONUMENT PER 3/D-1

LEGEND

- WETLAND PRESERVE
- XX — TEMPORARY CONSTRUCTION FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 — EXISTING CONTOUR
- 829 — PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD — EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- NEW LANDFILL GAS MONITORING PROBE
- POINT NO. / ELEV. — EXISTING SURVEY CONTROL POINT
- W-X — EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM | DESCRIPTION | DATE | APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAUNDER CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT INSTALLATION RESTORATION SITE 2

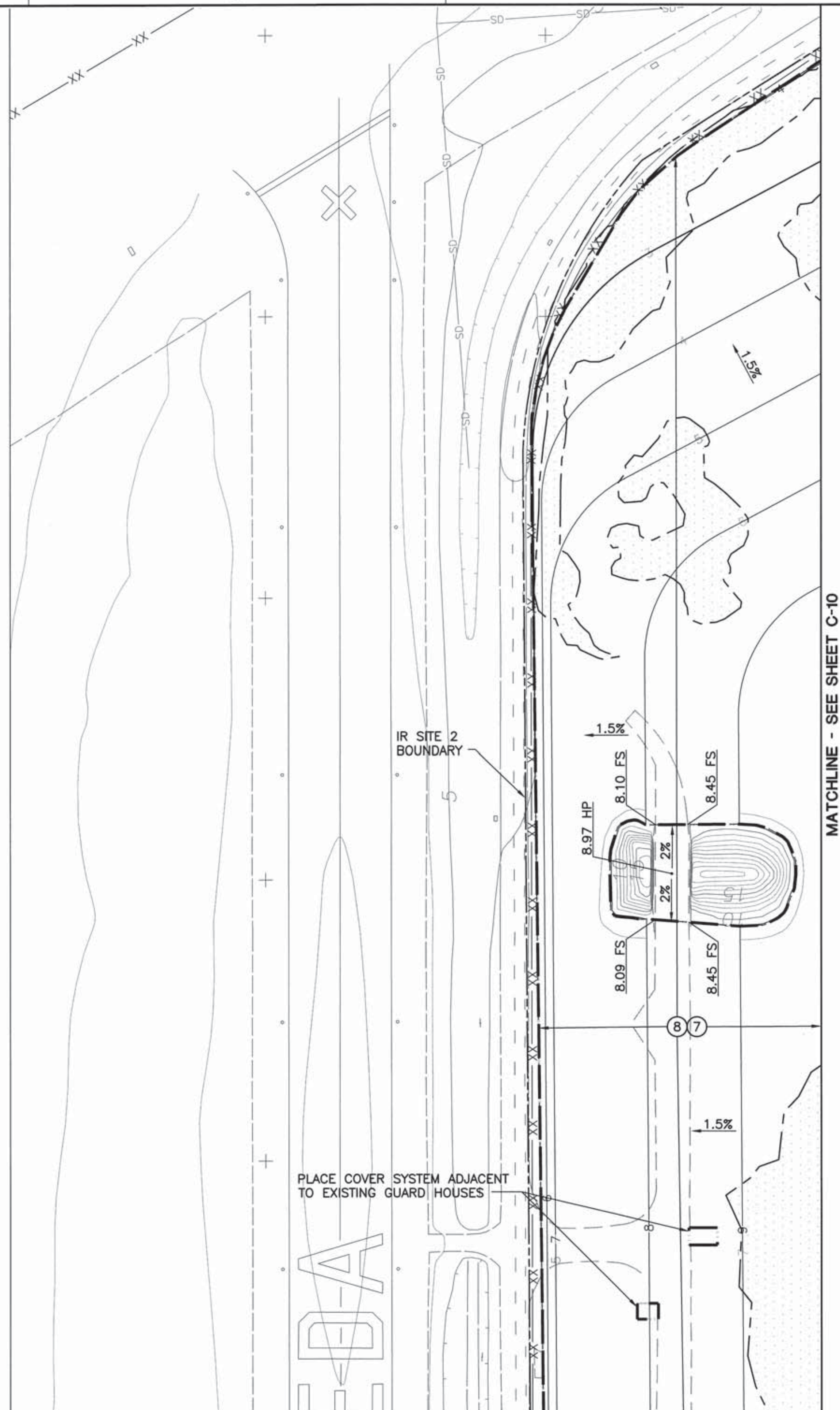
FINAL GRADING AND COVER PLAN-SOUTHEAST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	—
STA. PROJ. NO.	—
WORK ORDER NO.	—
CONSTR. CONTR. NO.	—
NAVFAC DRAWING NO.	
SHEET 14 OF 24	

C-12

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0053GRF.dwg LAYOUT NAME: C-12 FINAL GRADING AND COVER PLAN-SOUTHEAST PLOTTED: Tuesday, February 19, 2013 - 2:08pm



MATCHLINE - SEE SHEET C-9

CONSTRUCTION NOTES

7. EXCAVATE OR FILL TO CONTOURS SHOWN
8. CONSTRUCT FINAL COVER PER 1/D-1

LEGEND

- WETLAND PRESERVE
- XX — TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 — EXISTING CONTOUR
- 829 — PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD — EXISTING STORM DRAIN
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- 1 SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- NEW GROUNDWATER MONITORING WELL
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W–X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAL... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-BUNKER

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 15 OF 24	

C-13

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0078GRF.dwg LAYOUT NAME: C-13 FINAL GRADING AND COVER PLAN-BUNKER PLOTTED: Tuesday, February 19, 2013 - 2:09pm

EROSION CONTROL NOTES

1. CONTRACTOR SHALL COMPLY WITH PROVISIONS AND BEST MANAGEMENT PRACTICES INCLUDED IN THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED BY THE CONTRACTOR.
2. BEST MANAGEMENT PRACTICES (BMP) REFERENCE NUMBERS REFER TO CALIFORNIA STORMWATER BMP HANDBOOK–CONSTRUCTION BY THE CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA), DATED NOVEMBER, 2009.
3. ALL EROSION CONTROLS WILL BE INSTALLED AS NECESSARY PRIOR TO THE BEGINNING OF WORK AND BE MAINTAINED THROUGHOUT CONSTRUCTION IN ACCORDANCE WITH THE SWPPP.
4. CONTROL OFF SITE RUN–ON BY DIVERTING STORMWATER FLOWS AWAY FROM SITE TO EXISTING STORM DRAIN SEWERS AND DRAINAGE CHANNELS.
5. CONTROL SITE RUN–OFF FROM ACTIVE AREA USING FIBER ROLLS AND GRAVEL BAG BERMS AT DOWN GRADIENT AREAS.
6. ONLY ESSENTIAL VEHICLES SHOULD ENTER SOIL EXCAVATION AND FILL AREAS.
7. VEHICLES WILL ENTER AND LEAVE SITE ONLY THROUGH DESIGNATED LOCATIONS.
8. VEHICLES WILL BE INSPECTED FOR SOIL ON TIRES AT THE VEHICLE INSPECTION AREA. SOIL WILL BE BRUSHED CLEAN TO PREVENT TRACKING ONTO PUBLIC ROADS. RADIATION CONTROLS IN EFFECT, SEE RPP ATTACHMENTS 2 AND 3.
9. TRASH CONTAINERS WILL BE PROVIDED ON SITE, ALL TRASH WILL BE PLACED INTO APPROPRIATE WASTE CONTAINERS. THE SITE WILL BE KEPT CLEAR OF TRASH AND DEBRIS.

CONSTRUCTION NOTES

15 CONSTRUCT SILT FENCE PER 4/D-4
16 CONSTRUCT FIBER ROLLS PER 2/D-4
17 HYDRO SEED PER SPECIFICATIONS
20 CONSTRUCT TURF REINFORCEMENT MAT TERMINATION AT EDGE OF ACCESS ROAD PER 6/D-4
23 CONSTRUCT TURF REINFORCEMENT MAT PER 1/D-5

LEGEND:

HYDRO–SEED WITH TACKIFIER, SEED MIX PER SPECIFICATIONS

FILTER FABRIC AND GRAVEL BAG BERM INLET PROTECTION PER SE–10

–SF– SILT FENCE PER SE–1

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2–PLAN SET\PLAN SET\18–0015EC.dwg LAYOUT NAME: C–14 SEDIMENT AND EROSION CONTROL PLAN PLOTTED: Tuesday, February 19, 2013 – 2:09pm

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860–7777

REGISTERED PROFESSIONAL ENGINEER · GREG EDWIN ... · CIVIL · STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

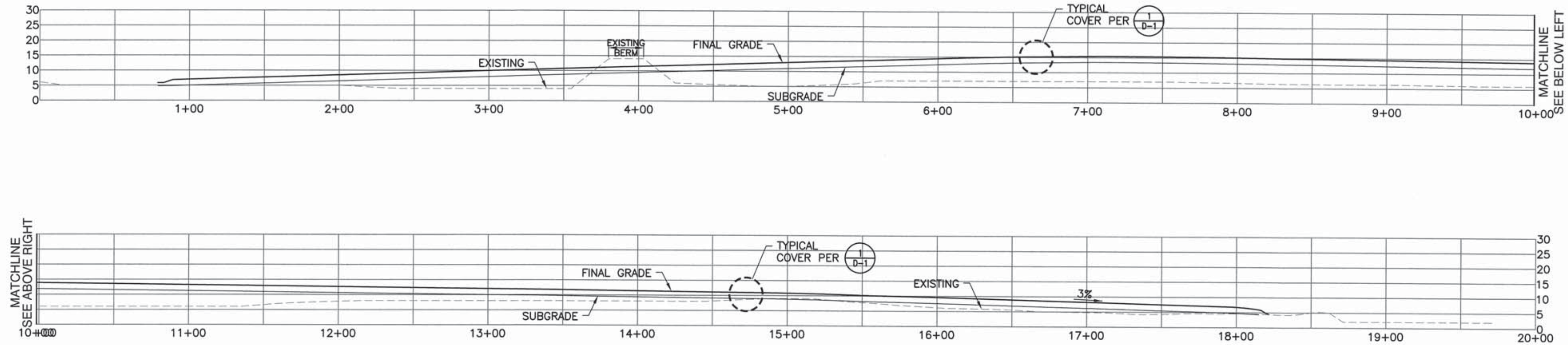
DEPARTMENT OF THE NAVY · NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION · ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SEDIMENT AND EROSION CONTROL PLAN

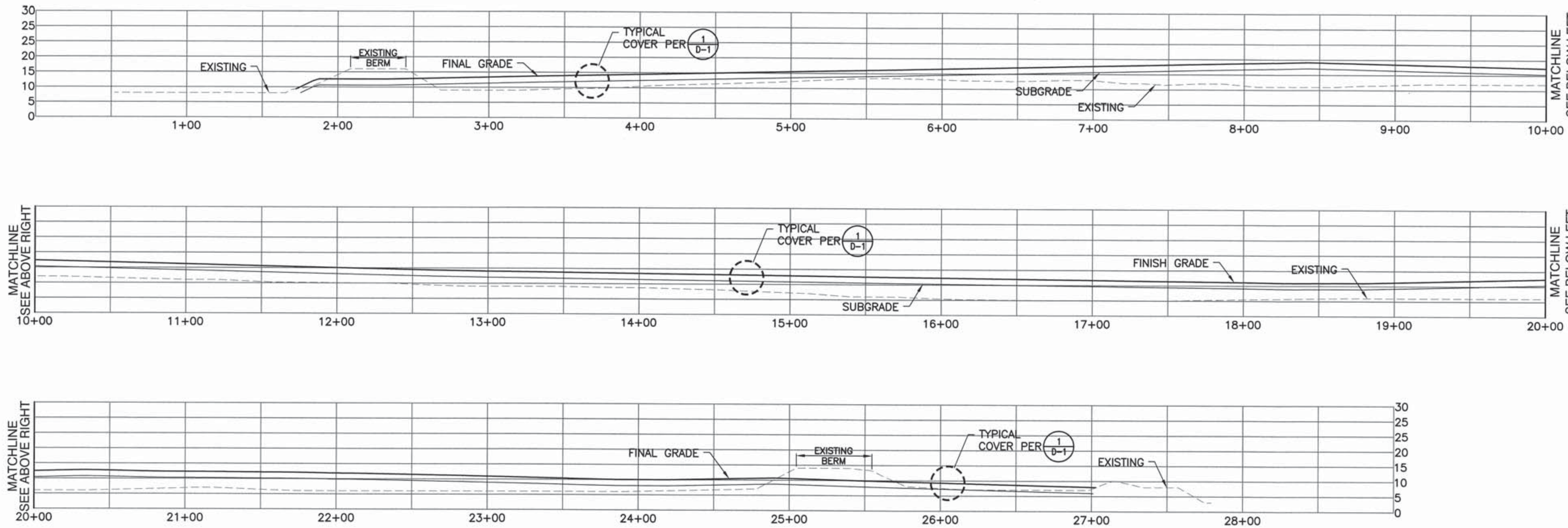
CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 16 OF 24	

C-14

DRAWFORM REVISION: OCTOBER 2011



SECTION A
H:1"=40' V:1"=20'
C-3



SECTION B
H:1"=40' V:1"=20'
C-3

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER
GREG EDWIN SA...
CIVIL
STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

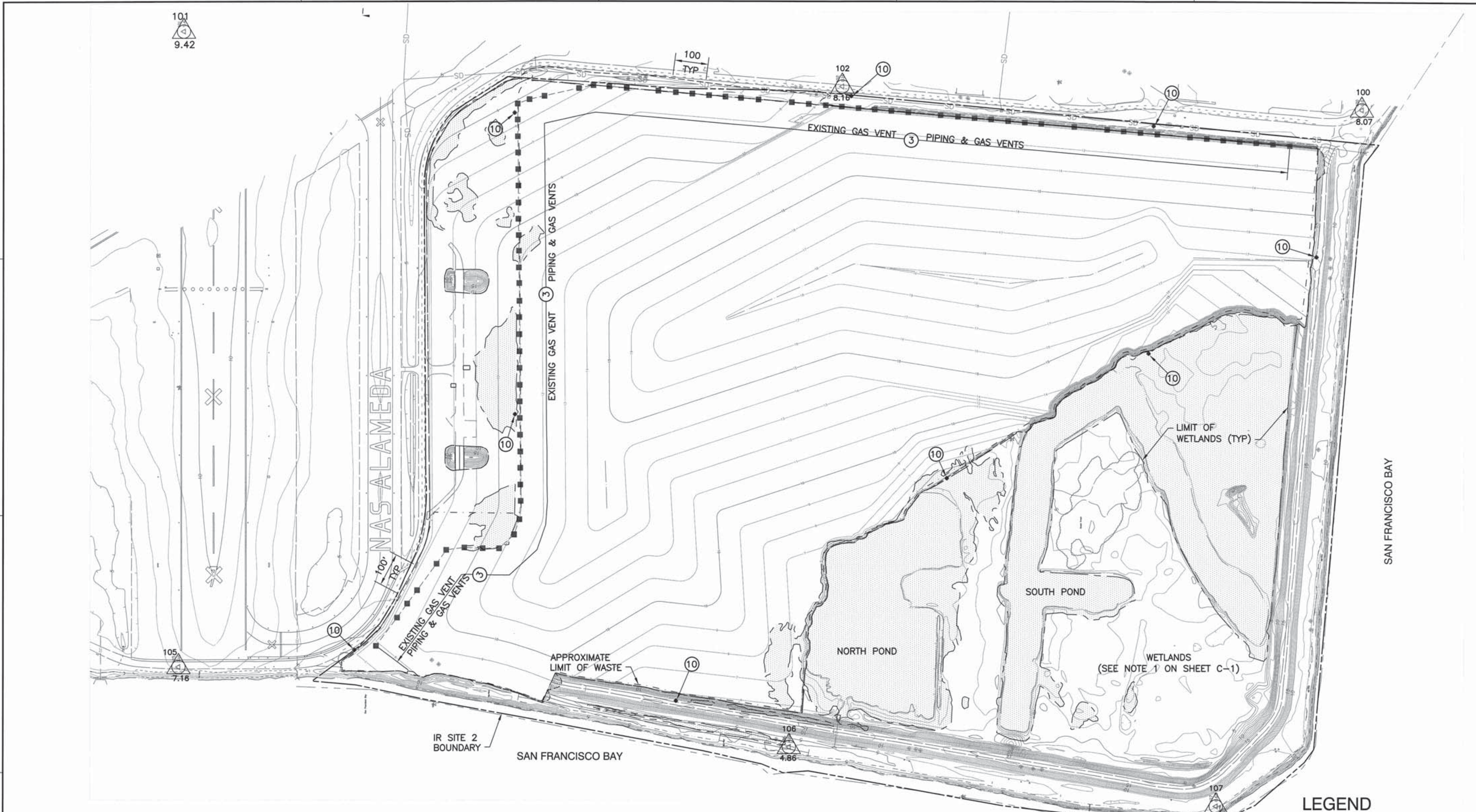
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SECTIONS

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 17 OF 24	

C-15

DRAWFORM REVISION: OCTOBER 2011

REV.DATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\33-0034SEC.dwg LAYOUT NAME: C-15 SECTIONS PLOTTED: Tuesday, February 19, 2013 - 2:09pm



CONSTRUCTION NOTES

(3) PROTECT GAS VENT IN PLACE, REPLACE AS NECESSARY PER 1/C-17

(10) INSTALL LANDFILL GAS MONITORING PROBE PER 1/D-2

LANDFILL GAS PASSIVE VENT SYSTEM

SCALE: 1"=150'

PLAN NORTH

GRAPHIC SCALE

150 75 0 150 300

(IN FEET)

LEGEND

POINT NO. / ELEV. — EXISTING SURVEY CONTROL POINT

W–X — EXISTING WETLAND DESIGNATION AND BOUNDARY

APPROXIMATE LIMIT OF REFUSE

IR SITE 2 BOUNDARY

SD — STORM DRAIN

RIDGE

REPLACED GAS VENT

EXISTING GAS VENT

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER — G. EDWIN — CIVIL — STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

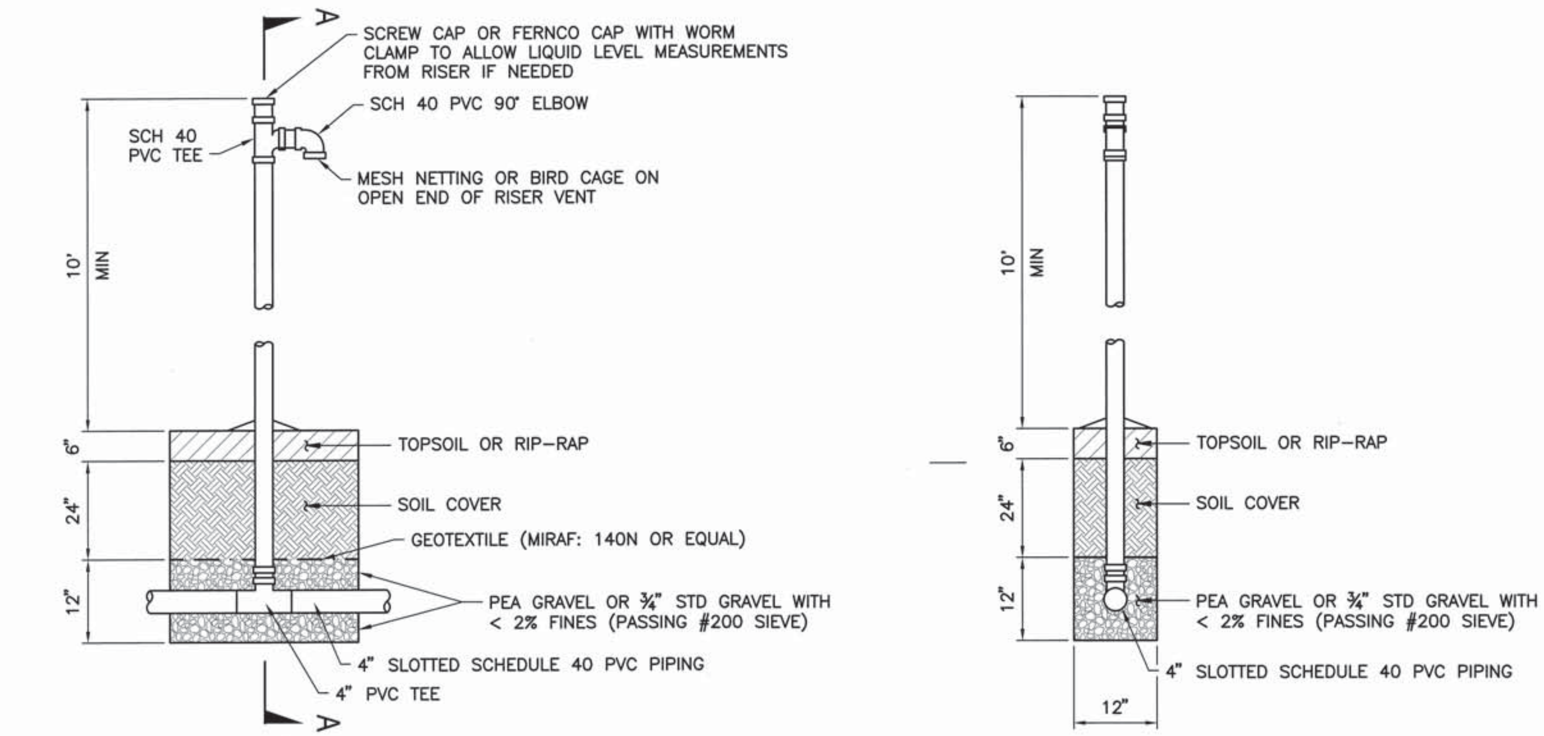
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
LANDFILL GAS PASSIVE VENT SYSTEM

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 16 OF 24	

C-16

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: Q:\dwg\ALAMEDA IR2\GAS\86-00420SP.dwg LAYOUT NAME: C-16 LANDFILL GAS PASSIVE VENT SYSTEM PLOTTED: Tuesday, February 19, 2013 - 2:09pm



SECTION A–A

NOTES IF RIP-RAP IS ENCOUNTERED:
1. REMOVE RIPRAP AS NEEDED FOR LGMT CONSTRUCTION
2. FOLD BACK OR REMOVE EXISTING GEOTEXTILE AS NEEDED.
3. INSTALL NEW GEOTEXTILE OVER NEW BACKFILL. PROVIDE LAP SEAM OVER EXISTING GEOTEXTILE.
4. REPLACE RIPRAP.

RISER VENT DETAIL (1)

NOT TO SCALE C-16

NOTES:
1. THE COLLECTION PIPE SHALL BE 4 INCH DIAMETER PERFORATED SCHEDULE 40 (ASTM D1785) POLYVINYL-CHLORIDE (PVC).
2. VERTICAL VENT PIPES SHALL BE SCHEDULE 40 PVC AND SHALL EXTEND A MINIMUM OF 10 FEET ABOVE THE GROUND SURFACE. THE TOP OF THE PIPE SHALL PROVIDE AN INVERTED "J" CONFIGURATION TO PREVENT PRECIPITATION AND ANIMAL ENTRY INTO THE PIPE.
3. GRAVEL USED FOR GAS COLLECTION SHALL HAVE A UNIFORM GRADATION WITH <5% PASSING THE #16 SIEVE TO MAXIMIZE PORE SPACE FOR GAS TRANSMISSION AND SHALL BE FREE OF FINES. TO PREVENT CLOGGING, THE GRAVEL MUST HAVE A D85 ≥ 0.375" OR BE PROTECTED BY GEOTEXTILE FILTER.
4. GROUND SURFACE IS TO BE RESTORED TO ORIGINAL GRADE AND RESTORED TO THE ORIGINAL CONDITION BY VEGETATING OR PLACING GEOTEXTILE AND RIPRAP. SURFACE SHALL BE SLOPED TO DRAIN AWAY FROM RISER PIPES.
5. COAT EXPOSED PVC WITH LATEX PAINT
6. GAS VENT TRENCH SHALL BE REPLACED IN KIND.
7. INSTALL ANTI-PERCH DEVICE ON TOP OF EACH GAS VENT. INSTALLATION METHOD TO BE APPROVED BY THE ENGINEER.

SYM	DESCRIPTION	DATE	APPR

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TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN S. CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

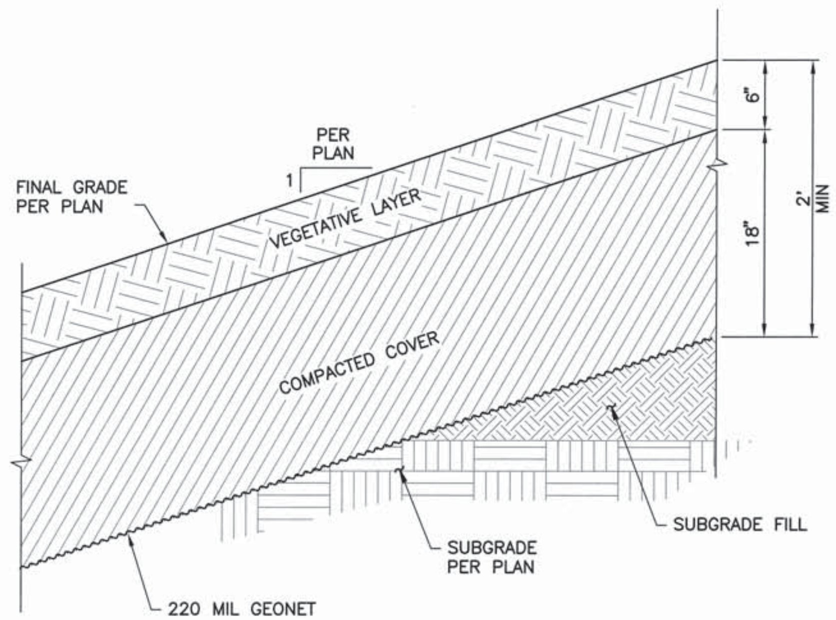
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
LANDFILL GAS DETAILS

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 19 OF 24	

C-17

DRAWFORM REVISION: OCTOBER 2011

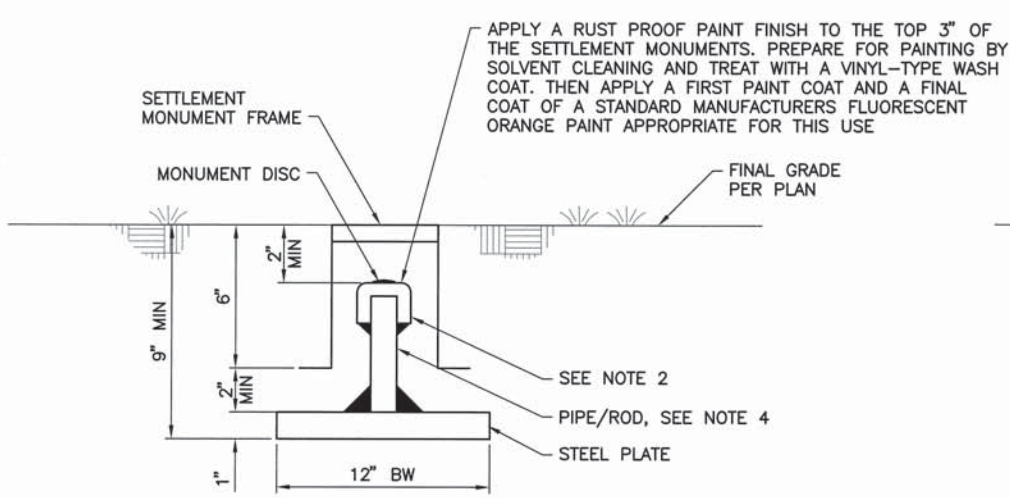
REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\GAS\85-0024GS0.dwg LAYOUT NAME: C-17 LANDFILL GAS DETAILS PLOTTED: Tuesday, February 19, 2013 – 2:09pm

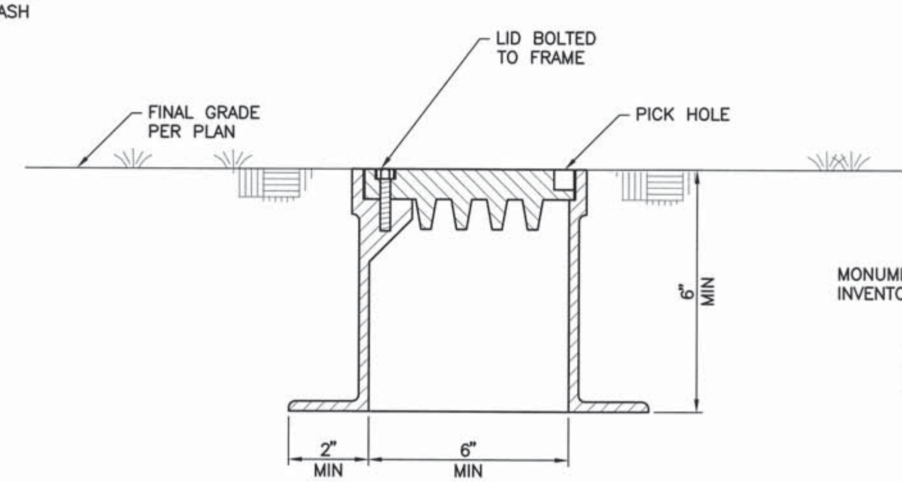


NOTE:
SUBGRADE FILL MAY BE COMPRISED OF EXISTING SOILS, COMPACTED FILL OR RANDOM FILL IN ACCORDANCE WITH SPECIFICATIONS.

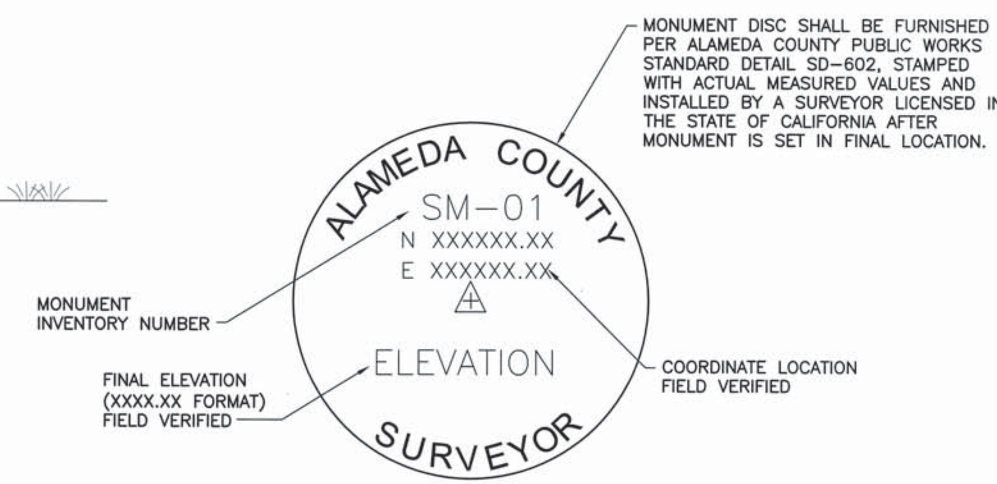
TYPICAL COVER DETAIL (1)
NOT TO SCALE C-9, C-10, C-11, C-12, C-13

\-
NOT TO SCALE \- (2)





SETTLEMENT MONUMENT FRAME



TYPICAL MONUMENT DISC – ENLARGED VIEW

NOTES:
1. MONUMENT SHALL BE MANUFACTURED WITH RUST-RESISTANT METALS.
2. CONTRACTOR SHALL RECORD FINAL COORDINATES AND ELEVATIONS OF SETTLEMENT MONUMENTS BOTH PRIOR TO INTRODUCTION OF FILL OVER MONUMENT BASE PLATE AND IMMEDIATELY AFTER TOPSOIL PLACEMENT. ALL SURVEYS SHALL BE PERFORMED BY A SURVEYOR LICENSED IN THE STATE OF CALIFORNIA.
3. THE CONTRACTOR SHALL PLACE A MONUMENT FRAME AND LID OVER EACH SETTLEMENT MONUMENT. THE MONUMENT FRAMES SHALL BE FLUSH WITH THE TOPSOIL. A PAINT FINISH SHALL BE APPLIED TO THE LID OF EACH MONUMENT FRAME AS SPECIFIED FOR SETTLEMENT MONUMENT DETAIL.
4. 6" STEEL PIPE OR ROD, DIAMETER SIZED AS NECESSARY.

SETTLEMENT MONUMENT FABRICATION DETAIL (3)
NOT TO SCALE C-9, C-10, C-12

SYM	DESCRIPTION	DATE	APPR

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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SA... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
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CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SITE DETAILS

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 20 OF 24	

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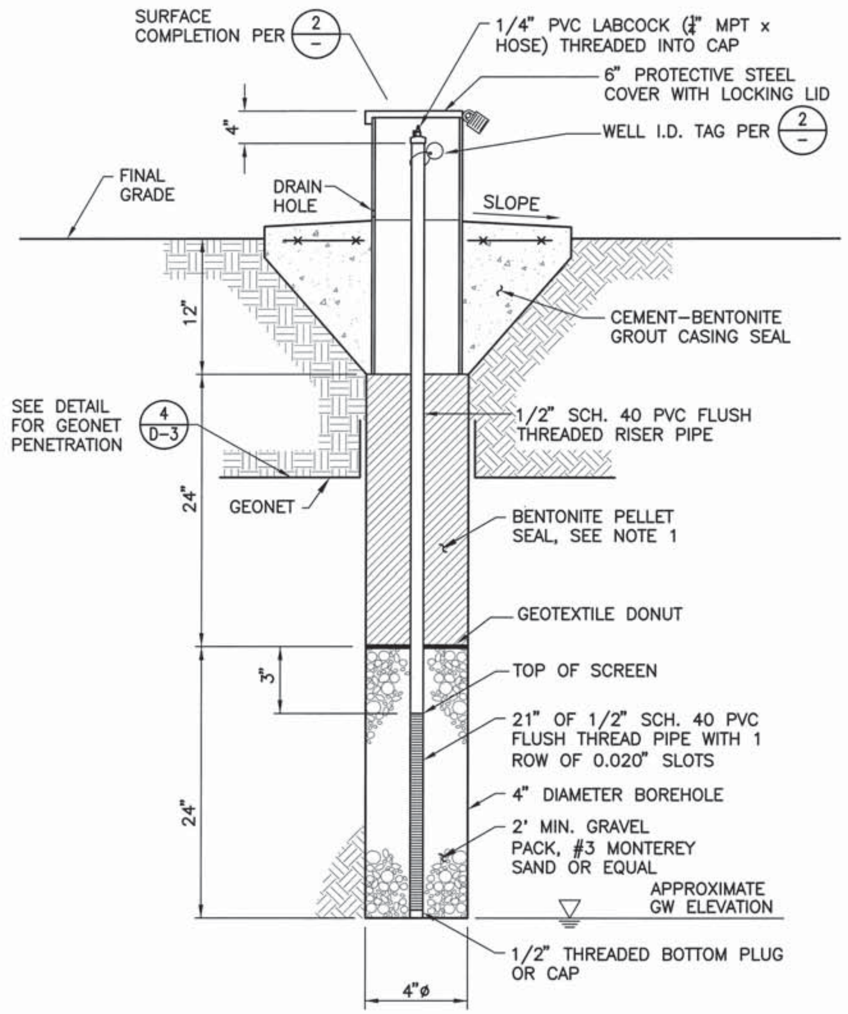
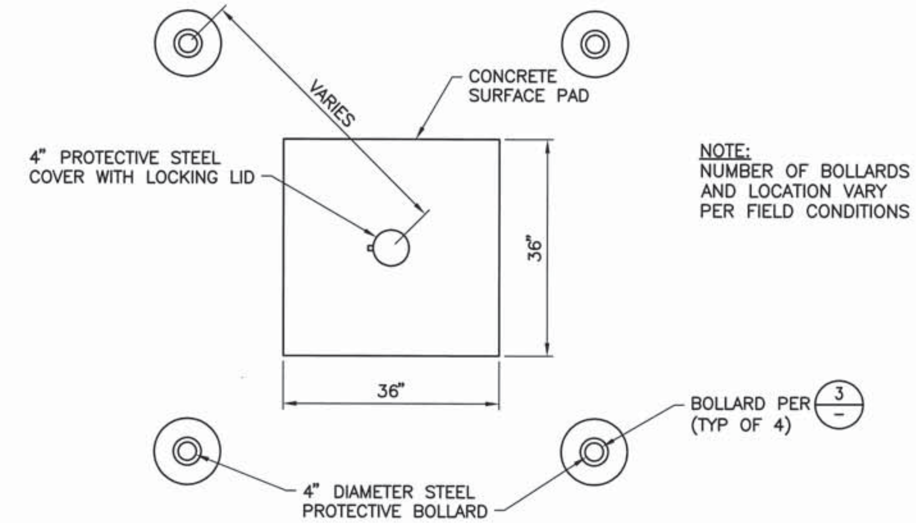
DRAWFORM REVISION: OCTOBER 2011



NOTES:

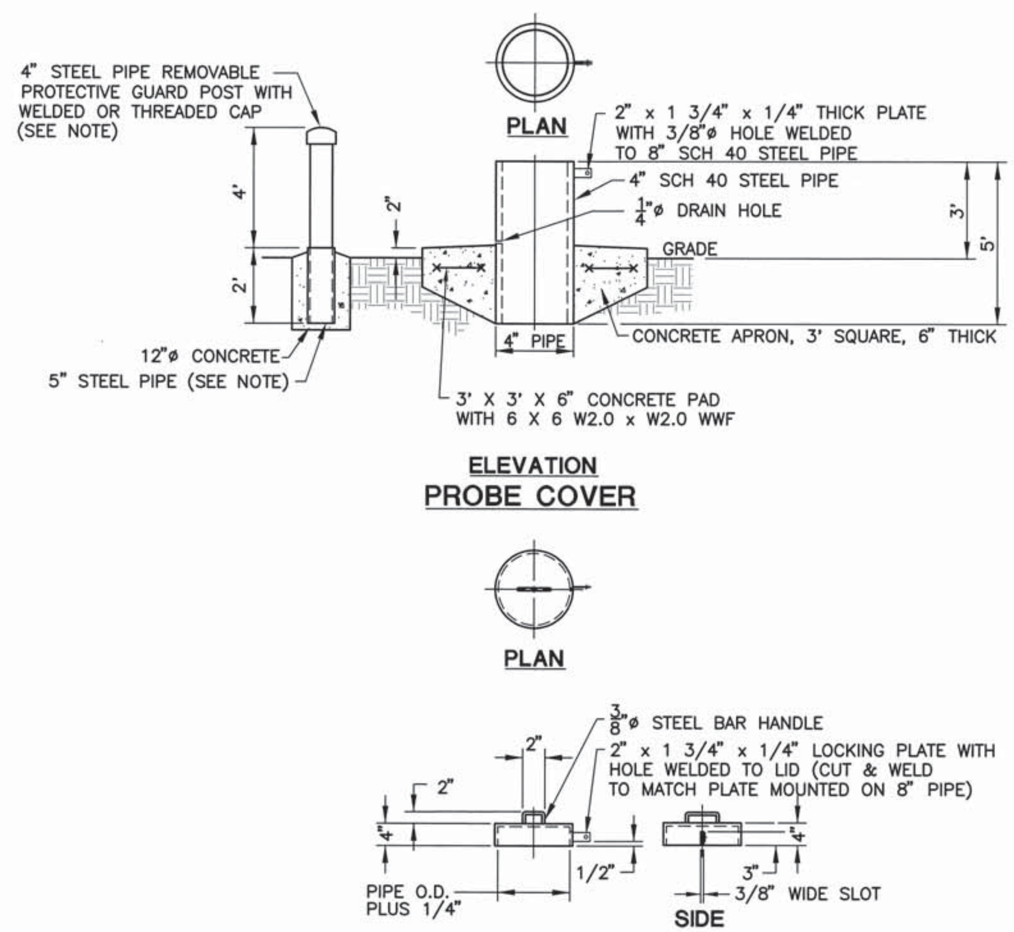
1. BENTONITE SEAL SHALL BE 24" MINIMUM THICKNESS. THIS SEAL SHALL BE 3/8" PELLETS TREMIED INTO PLACE IN 6" LIFTS. THE PELLETS SHALL BE HYDRATED IN PLACE BETWEEN LIFTS.

GAS MONITORING PROBE, ABOVE GRADE COMPLETION (1)
NOT TO SCALE C-9, C-10, C-11, C-12



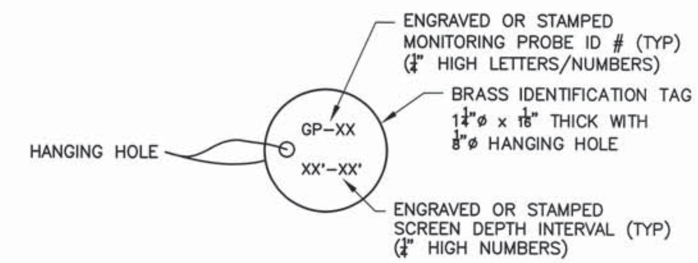
NOTE:
NUMBER OF BOLLARDS AND LOCATION VARY PER FIELD CONDITIONS

MONITORING PROBE SURFACE COMPLETION PLAN VIEW (2)
NOT TO SCALE D-2

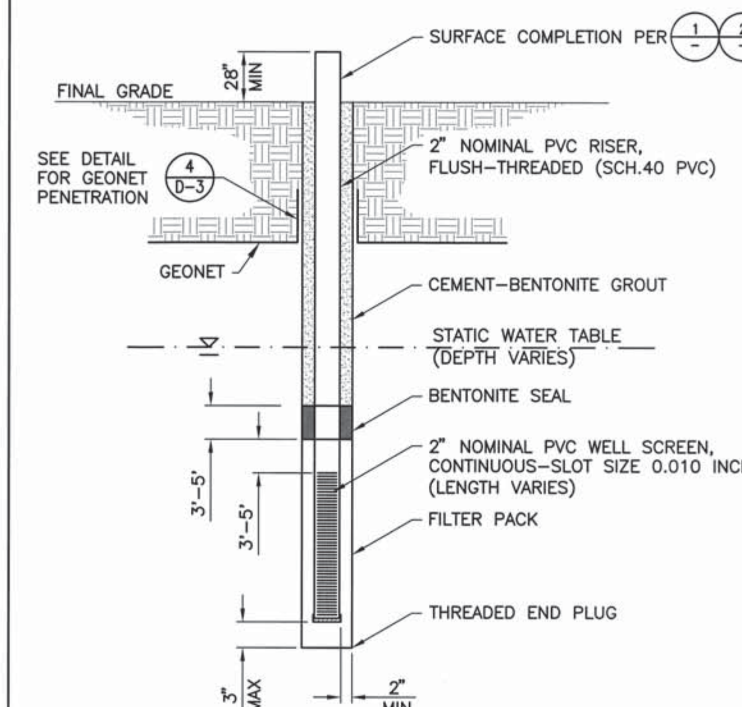


NOTE:
FOUR REMOVABLE PROTECTIVE GUARD POSTS AROUND EACH PROBE SHALL BE 4" x 6' LONG STEEL PIPE (TO BE PAINTED STANDARD GOLDEN YELLOW). EACH GUARD POST SHALL BE SET INTO A 5" x 2' LONG STEEL PIPE, SET IN CONCRETE AT A DEPTH OF 2' BELOW GROUND SURFACE.

PROBE COVER AND BOLLARD DETAIL (3)
NOT TO SCALE D-2



WELL I.D. TAG DETAIL (4)
NOT TO SCALE D-2



EXISTING GROUNDWATER MONITORING WELL CONSTRUCTION DETAIL (5)
NOT TO SCALE C-9

SYM	DESCRIPTION	DATE	APPR

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DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
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CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION ALAMEDA, CA

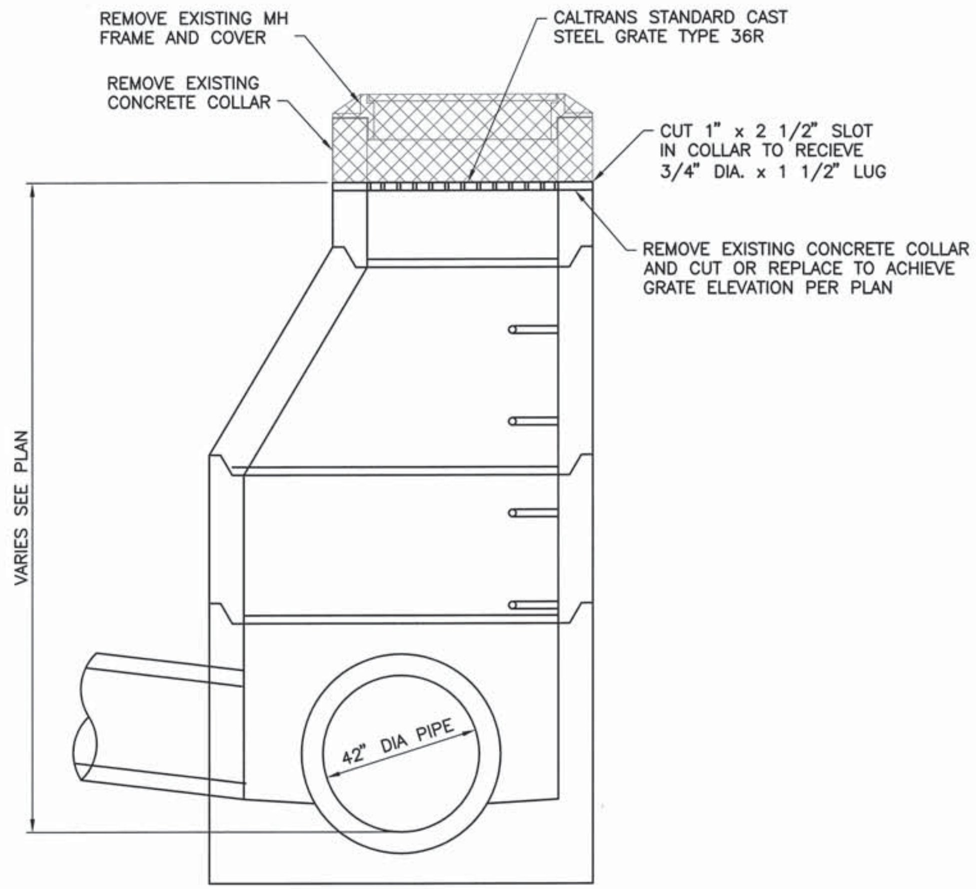
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SITE DETAILS

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 21 OF 24	

D-2

DRAWFORM REVISION: OCTOBER 2011

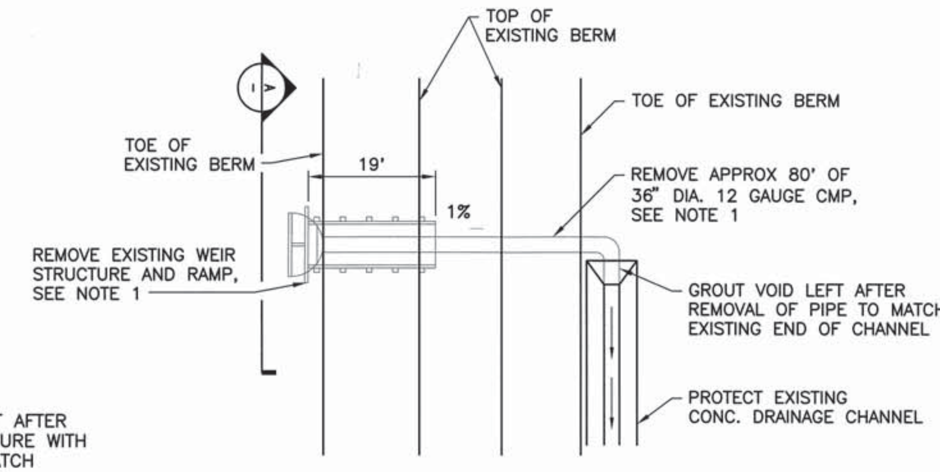
REV.DATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2–PLAN SET\PLAN SET\31–0071DTL.dwg LAYOUT NAME: 22X34 PLOTTED: Tuesday, February 19, 2013 – 2:09pm



ELEVATION

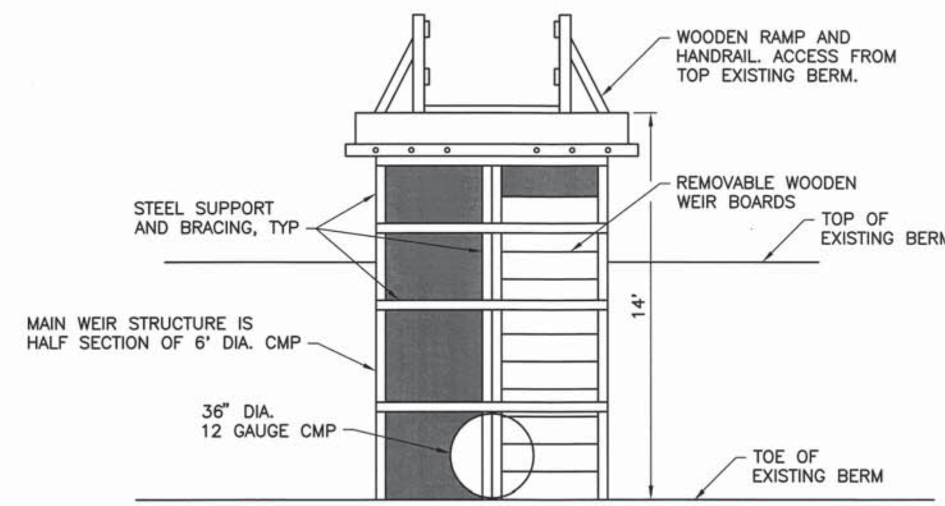
CONVERT EXISTING MANHOLE TO DRAINAGE INLET (1)

NOT TO SCALE C-10



NOTES:
1. BACKFILL VOIDS LEFT AFTER REMOVAL OF STRUCTURE WITH COMMON FILL TO MATCH SURROUNDING GRADE.

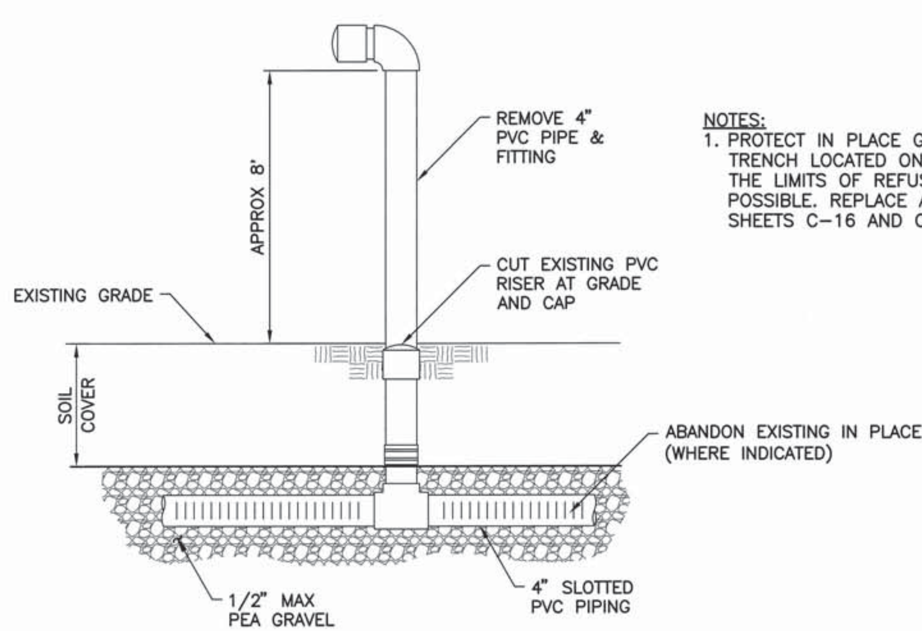
PLAN



SECTION A

EXISTING WIER STRUCTURE FOR REMOVAL (2)

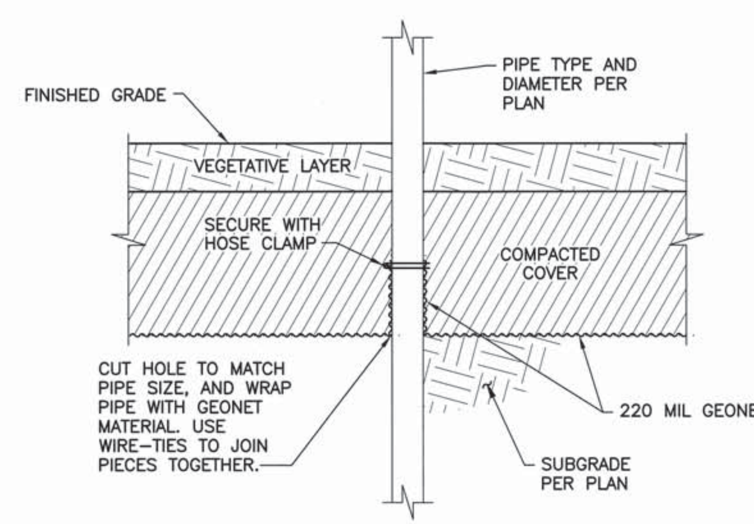
NOT TO SCALE C-2



NOTES:
1. PROTECT IN PLACE GAS VENT TRENCH LOCATED ON OR OUTSIDE THE LIMITS OF REFUSE WHERE POSSIBLE. REPLACE AS NEEDED PER SHEETS C-16 AND C-17.

EXISTING LANDFILL PERIMETER GAS VENT AND COLLECTION TRENCH (3)

NOT TO SCALE C-2



GEONET PENETRATION (4)

NOT TO SCALE -

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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALLEE CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
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CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SITE DETAILS

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO NO. –
STA. PROJ. NO. –
WORK ORDER NO. –
CONSTR. CONTR. NO. –
NAVFAC DRAWING NO.
SHEET 22 OF 24
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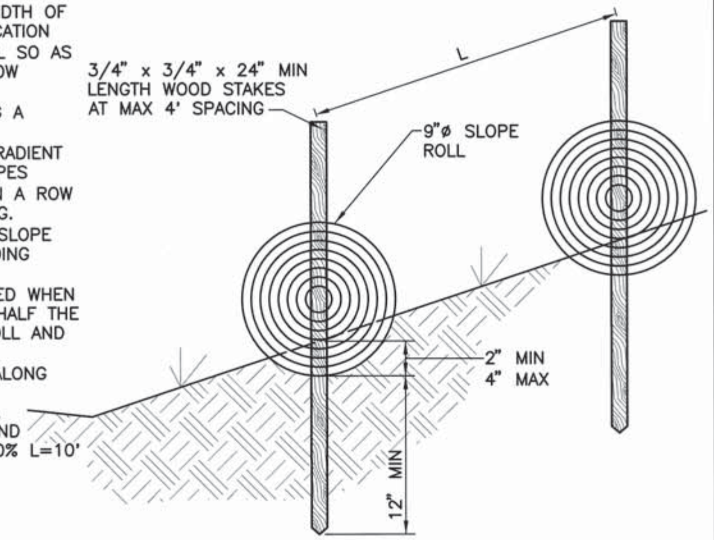
DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\31-00720TL.dwg LAYOUT NAME: 22X34 PLOTTED: Tuesday, February 19, 2013 - 2:09pm

STRAW ROLL NOTES:
1) A 3" DEEP TRENCH, THE WIDTH OF THE ROLL, DUG PER PLAN LOCATION SHALL "NEST" THE STRAW ROLL SO AS NOT TO ALLOW RUNOFF TO FLOW UNDER OR AROUND ROLL.
2) INSTALL SLOPE ROLL ALONG A LEVEL CONTOUR
3) INSTALL SLOPE ROLL UP GRADIENT AND NEAR TRANSITION OF SLOPES
4) INSTALL ADJACENT ROLLS IN A ROW BY OVERLAPPING, NOT ABUTTING.
5) TURN ENDS OF ROLLS UP SLOPE TO PREVENT RUNOFF FROM GOING AROUND THE ROLL
6) SEDIMENT IS TO BE REMOVED WHEN ACCUMULATION REACHES ONE HALF THE DISTANCE BETWEEN TOP OF ROLL AND ADJACENT GROUND SURFACE
7) DISTANCE L IS MEASURED ALONG FACE OF THE SLOPE.
FOR SLOPES 0 TO 25% L=20',
SLOPES 25% TO 50% L=15' AND
FOR SLOPES GREATER THAN 50% L=10'

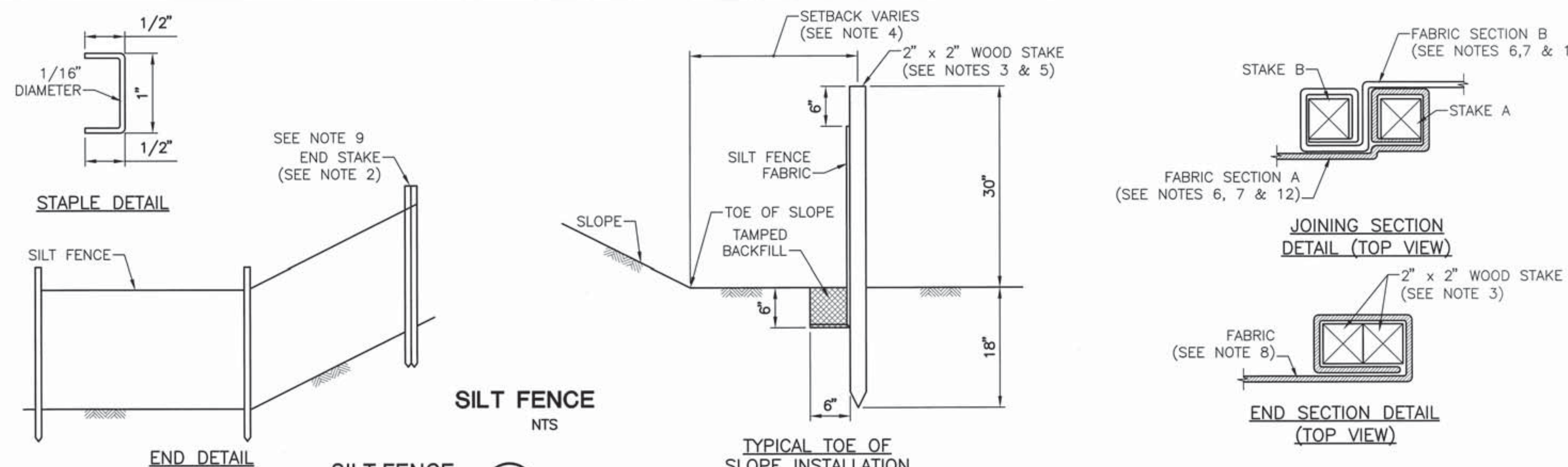


- NOT TO SCALE - 1

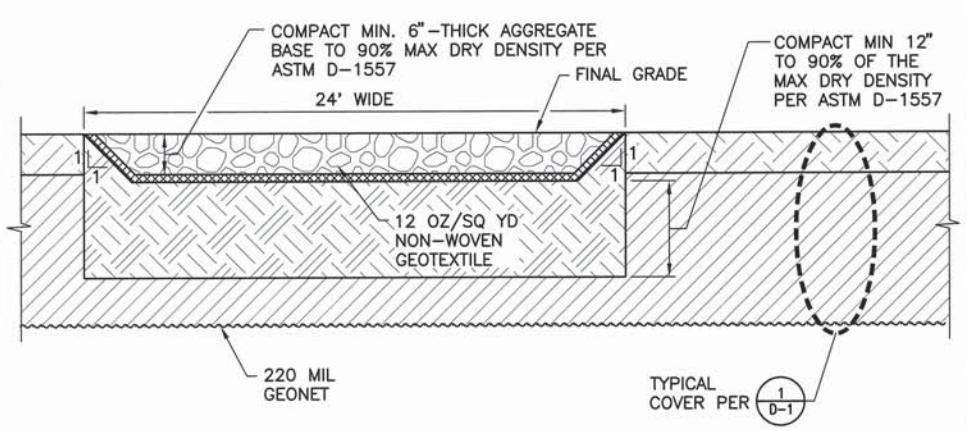
STRAW ROLL
NOT TO SCALE C-14 2

- NOT TO SCALE - 3

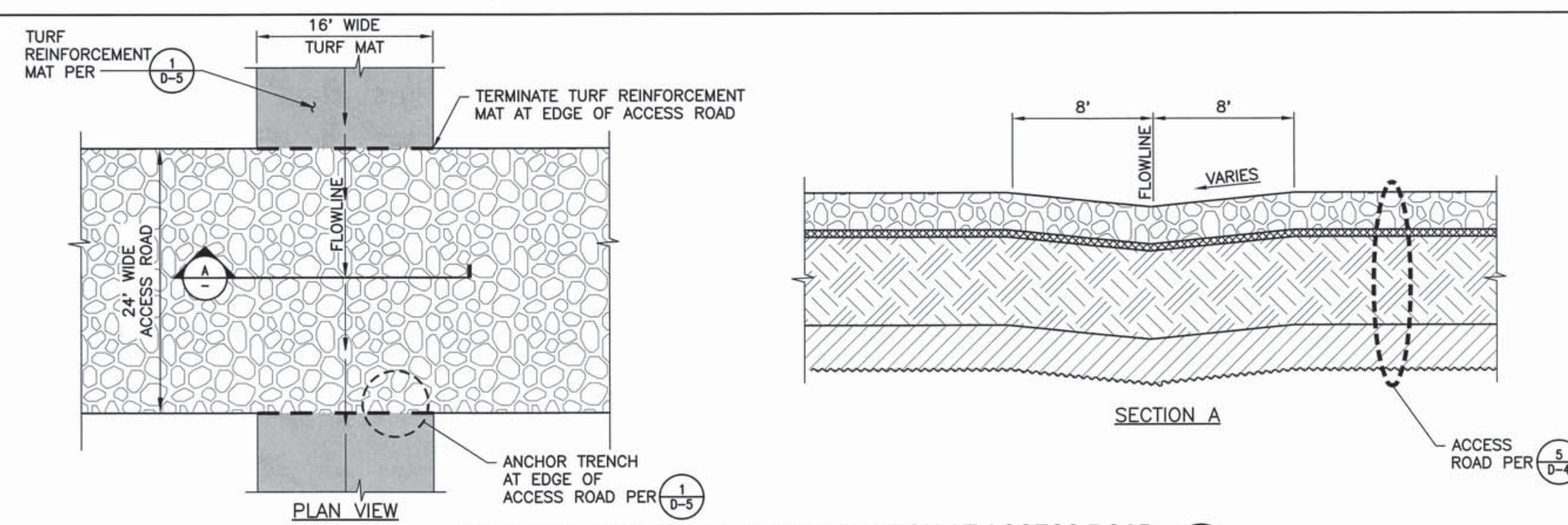
NOTES:
1. CONSTRUCT THE LENGTH OF EACH REACH SO THAT THE CHANGE IN BASE ELEVATION ALONG THE REACH DOES NOT EXCEED 1/3 THE HEIGHT OF THE LINEAR BARRIER, IN NO CASE SHALL THE REACH LENGTH EXCEED 500'.
2. THE LAST 8'-0" OF FENCE SHALL BE TURNED UP SLOPE.
3. STAKE DIMENSIONS ARE NOMINAL.
4. DIMENSIONS MAY VARY TO FIT FIELD CONDITION.
5. STAKES SHALL BE SPACED AT 8'-0" MAXIMUM AND SHALL BE POSITIONED ON DOWNSTREAM SIDE OF FENCE.
6. STAKES TO OVERLAP AND FENCE FABRIC TO FOLD AROUND EACH STAKE ONE FULL TURN. SECURE FABRIC TO STAKE WITH 4 STAPLES.
7. STAKES SHALL BE DRIVEN TIGHTLY TOGETHER TO PREVENT POTENTIAL FLOW-THROUGH OF SEDIMENT AT JOINT. THE TOPS OF THE STAKES SHALL BE SECURED WITH WIRE.
8. FOR END STAKE, FENCE FABRIC SHALL BE FOLDED AROUND TWO STAKES ONE FULL TURN AND SECURED WITH 4 STAPLES.
9. MINIMUM 4 STAPLES PER STAKE. DIMENSIONS SHOWN ARE TYPICAL.
10. CROSS BARRIERS SHALL BE A MINIMUM OF 1/3 AND A MAXIMUM OF 1/2 THE HEIGHT OF THE LINEAR BARRIER.
11. MAINTENANCE OPENINGS SHALL BE CONSTRUCTED IN A MANNER TO ENSURE SEDIMENT REMAINS BEHIND SILT FENCE.
12. JOINING SECTIONS SHALL NOT BE PLACED AT SUMP LOCATIONS.
13. GRAVELBAG ROWS AND LAYERS SHALL BE OFFSET TO ELIMINATE GAPS.



SILT FENCE
NOT TO SCALE C-14 4



AGGREGATE BASE ACCESS ROAD
NOT TO SCALE C-9, C-10, C-11, C-12 5



TURF REINFORCEMENT MAT TERMINATION AT ACCESS ROAD
NOT TO SCALE C-14 6

SYM	DESCRIPTION	DATE	APPR

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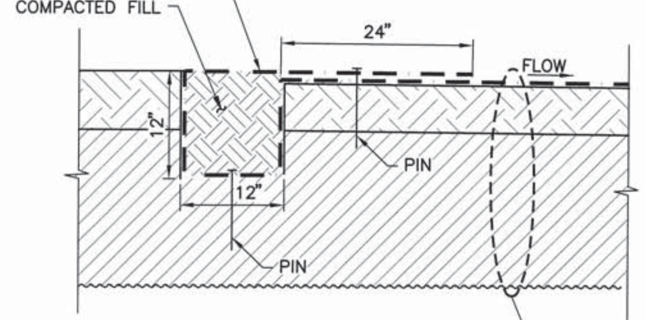
REVIEWED BY G.E.S.
PM/DM C.H.M.
CHIEF ENG C.H.M.

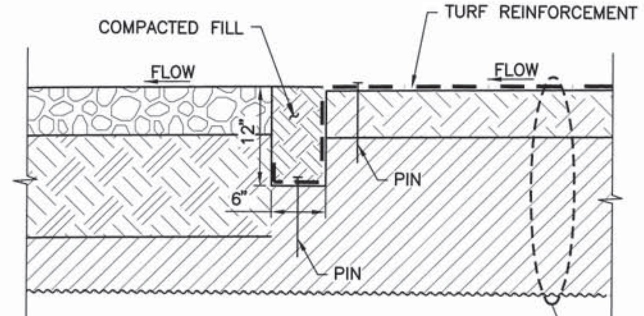
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SITE DETAILS

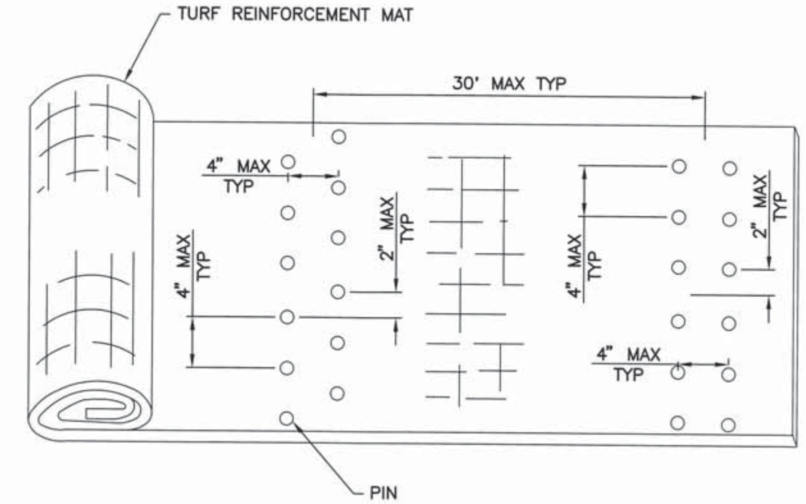
CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO NO. —
STA. PROJ. NO. —
WORK ORDER NO. —
CONSTR. CONTR. NO. —
NAVFAC DRAWING NO.
SHEET 23 OF 24
D-4
DRAWFORM REVISION: OCTOBER 2011



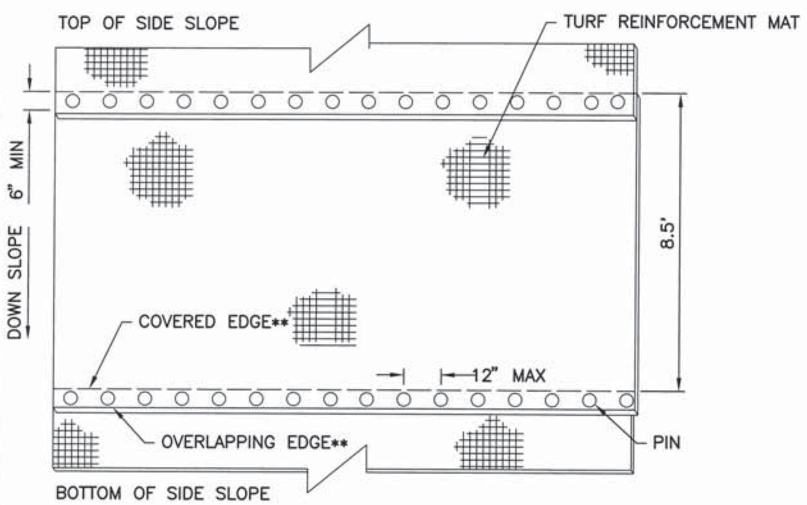
UPSTREAM ANCHOR TRENCH
NTS



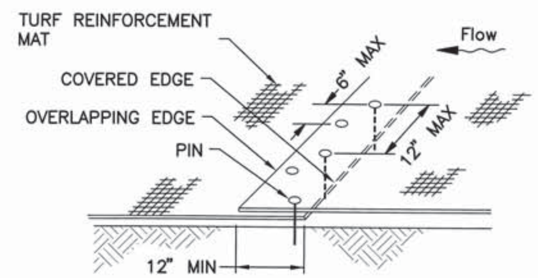
ANCHOR TRENCH AT EDGE OF ACCESS ROAD
NTS



SIMULATED CHECK SLOT
NTS

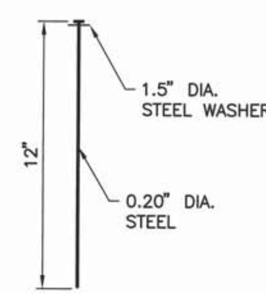


OVERLAP AT ROLL EDGE
NTS

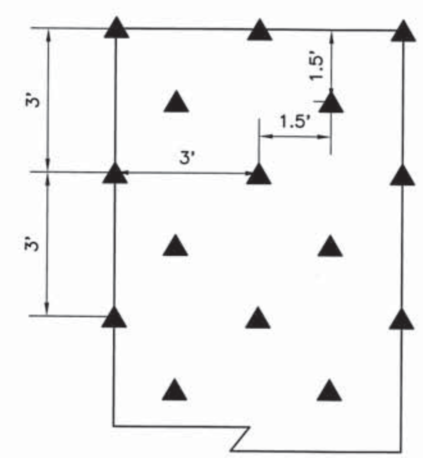


**NOTE: EDGE SHINGLE/OVERLAP PLACEMENT DEPENDS ON DOWN SLOPE DIRECTION (SHINGLE IN THE DIRECTION OF THE DOWN SLOPE)

OVERLAP AT ROLL END
NTS



PIN
NTS



2.5 PINS/yd~2
SWALE PIN PATTERN

PIN PATTERN
NTS

NOTE:
INSTALL AND HYDROSEED REINFORCED TURF MAT PER PROJECT SPECIFICATIONS.

TURF REINFORCEMENT MAT (1)
NOT TO SCALE C-11, C-12, C-13, C-14

SYM	DESCRIPTION	DATE	APPR

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1360 VALLEY VISTA DRIVE
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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN S... 60600 CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
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CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2

SITE DETAILS

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	—
STA. PROJ. NO.	—
WORK ORDER NO.	—
CONSTR. CONTR. NO.	—
NAVFAC DRAWING NO.	—
SHEET 24 OF 24	

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DRAWFORM REVISION: OCTOBER 2011

REV.DATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\31-00740TL.dwg LAYOUT NAME: 22X34 PLOTTED: Tuesday, February 19, 2013 - 2:09pm

DESIGN SPECIFICATIONS

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DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 – EXISTING CONDITIONS

DIVISION 31 – EARTHWORK

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILITIES

-- End of Project Table of Contents –

SECTION 00 01 15

LIST OF DRAWINGS
November 2011

PART 1 GENERAL

1.1 SUMMARY

This section lists the Drawings for the project pursuant to Contract.

1.2 CONTRACT DRAWINGS

Contract Drawings are as follows:

DRAWING NO.	SHEET NO.	TITLE
T-1	1	Title Sheet
G-1	2	Abbreviations, Symbols, and Legends
C-1	3	Site Plan
C-2	4	Demolition Plan
C-3	5	Sheet Index
C-4	6	Subgrade Plan-Northwest
C-5	7	Subgrade Plan-Northeast
C-6	8	Subgrade Plan-Southwest
C-7	9	Subgrade Plan-Southeast
C-8	10	Subgrade Plan-Bunker
C-9	11	Final Grading and Cover Plan-Northwest
C-10	12	Final Grading and Cover Plan-Northeast
C-11	13	Final Grading and Cover Plan-Southwest
C-12	14	Final Grading and Cover Plan-Southeast
C-13	15	Final Grading and Cover Plan-Bunker
C-14	16	Sediment and Erosion Control Plan
C-15	17	Sections
C-16	18	Landfill Gas Passive Vent System
C-17	19	Landfill Gas Details
D-1	20	Site Details
D-2	21	Site Details
D-3	22	Site Details
D-4	23	Site Details
D-5	24	Site Details
D-6	25	Site Details

1.3 SUPPLEMENTARY DRAWINGS

NOT USED.

-- End of Section --

SECTION 01 10 00

GENERAL PARAGRAPHS
November 2011

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following to the Remedial Project Manager/Resident Officer in Charge of Construction (RPM/ROICC) in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and the following:

SD-01 Preconstruction Submittals

After receipt of the Notice to Proceed, the Contractor shall submit to the RPM/ROICC the preconstruction submittals identified in the basic Contract and as defined herein. Commencement of site work shall not occur until all preconstruction submittals have been approved by the RPM/ROICC.

Remedial Action Work Plan (RAWP)
90% Remedial Design (including Geotechnical Report)
Radiological Work Plan
Radiological Protection Plan
Sampling and Analysis Plan
Accident Prevention Plan/Site Safety and Health Plan (APP/SSHP)
Quality Control Plan (QC)
Environmental Mitigation Plan
Wetlands Mitigation Plan
Stormwater Pollution Prevention Plan
Dust Control and Air Monitoring Plan
Spill Prevention, Control, and Countermeasure Plan
Waste Management Plan
Post-Closure Monitoring Plan
Land Use Controls Remedial Design
Waste Management Plan
Well Destruction Plan
Traffic Control Plan

SD-11 Closeout Submittals

As-Built Drawings
QC Testing Plan and Log
QC Test Results Summary Report
Rework Items List
Remedial Action Closure Report (RACP)

1.2 REMEDIAL ACTION WORK PLAN (RAWP)

The Contractor shall prepare a RAWP for all field activities to be conducted under this project. The RAWP shall include the following elements:

a. Construction Schedule: The schedule shall be a time-scaled logic diagram displaying project activities and shall identify Schedule Activity Numbers.

1.3 ENVIRONMENTAL PROTECTION PLAN

Submit as an attachment to the RAWP in accordance with the basic Contract. The RAWP will discuss the current environmental conditions of the site.

1.4 ACCIDENT PREVENTION PLAN/SITE SAFETY AND HEALTH PLAN (APP/SSHP)

The Contractor shall prepare an APP/SSHP that provides health and safety information for all aspects of construction associated with this project.

1.5 QUALITY CONTROL PLAN (QC)

The Contractor shall use skilled workers, an adequate number of which are thoroughly trained and have experience in the necessary crafts and who are familiar with the specified requirements and the methods needed for the proper performance of the work in each section of these Specifications.

1.6 RADIOLOGICAL WORK PLAN

Submit as an attachment to the RAWP in accordance with the basic Contract.

1.7 RADIOLOGICAL PROTECTION PLAN

Submit as an attachment to the RAWP in accordance with the basic Contract.

1.8 WETLANDS MITIGATION PLAN

Submit as an attachment to the RAWP in accordance with the basic Contract.

1.9 STORM WATER POLLUTION AND CONTROL PLAN

See requirements in Article 1.6 of Section 31 32 11 SOIL SURFACE AND EROSION CONTROL.

1.10 DUST CONTROL AND AIR MONITORING PLAN

Submit as an attachment to the RAWP in accordance with the basic Contract.

1.11 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

Submit Spill Prevention, Control, and Countermeasure Plan in compliance with 40 CFR 112 and as described at the following website: http://www.epa.gov/oem/content/spcc/spcc_qf.htm

1.12 RADIOLOGICAL PROTECTION PLAN

Submit as an attachment to the RAWP in accordance with the basic Contract.

1.13 POST-CLOSURE MONITORING PLAN

Submit in accordance with the basic Contract.

1.14 LAND USE CONTROLS REMEDIAL DESIGN

Submit in accordance with the basic Contract.

1.15 WASTE MANAGEMENT PLAN

Submit in accordance with the basic Contract.

1.16 SAMPLING AND ANALYSIS PLAN

Comprised of Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP), and in conformance with Southwest Division, Naval Facilities Engineering Command, Environmental Work Instructions (EWIs). The plan shall be submitted and approved by the Navy's Quality Assurance Officer (QAO).

1.17 BARRICADES

Erect and maintain temporary barricades to limit access to hazardous areas.

1.18 ADMINISTRATIVE AND CLOSE-OUT SUBMITTALS

1.18.1 Administrative Submittals

The following Administrative Submittals shall be made by the Contractor as specified in applicable sections of these Specifications and within the time frame outlined herein:

a. Submittals as required by each Section of these Specifications and which are not included in the RAWP shall be made prior to the respective item of work to begin or to be ordered from the supplier, whichever applies.

1.19.2 Closeout Submittals

a. As-Built Drawings and Record of Materials shall be submitted by the Contractor with the basic Contract.

b. Remedial Action Closure Report (RACR): At the conclusion of field activities, the Contractor shall prepare a RACR which shall summarize all field activities conducted. The RACR shall evaluate the data collected during the remedial action and shall draw a conclusion regarding whether the Contractor has achieved the objectives of the original design with approved deviations. This report shall include the following:

   (1) A narrative of construction activities describing the procedures implemented and any deviations from the procedures proposed in the RAWP.

   (2) A summary of all sampling and analyses conducted at the site and from borrow sources (i.e., the QC Test Log).

   (3) As-Built Drawings and design data (including final site survey results, survey of buried components, and cover system thickness verification.

   (4) Copies of all laboratory data generated during the remedial action (including geotechnical and chemical test results.)

1.20 PROJECT INFORMATION

In the case of conflict between the project Drawings and Specifications, the Specifications shall take precedence.

1.21 PROJECT SCHEDULE, PHASING, AND TIME CONSTRAINTS

1.21.1 Commencement, Prosecution, and Completion of Work

The Contractor shall submit to the RPM/ROICC all required preconstruction submittals as defined under paragraph entitled "SD-01 Preconstruction Submittals" above.

1.22 TRAFFIC CONTROL PLAN

At Contractor’s expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are be avoided. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 GENERAL

The PQAE will be allowed to assign certain functions to site quality control inspectors.

-- End of Section --

SECTION 01 11 00

SUMMARY OF WORK
November 2011

PART 1 GENERAL

1.1 SUMMARY

The Remedial Action involves site screening and removal of surficial radiological contamination, installation of a multilayer soil cover over the former landfill; implementation of engineering and institutional controls; wetland mitigation; construction monitoring; methane gas monitoring; air monitoring during activities that could produce dust from soil containing PCBs, pesticides, and other constituents of concern in addition to radiological control activities; and groundwater monitoring to confirm natural attenuation.

1.2 WORK COVERED

1.2.1 Project Description

The work includes furnishing all labor, materials, and equipment to perform the following:

a. Mobilization and setting up of environmental controls at the site;

b. Verifying the location and status of subsurface utilities that may be impacted by construction activities;

c. Providing site access roads and temporary safety fencing around the project;

d. Removal/destruction of groundwater monitoring wells located within the landfill cap footprint area, if required;

e. Protection or the removal/destruction of gas monitoring probes located within the landfill cap footprint area;

f. Removal of above-surface portions of gas venting system, if required;

g. Removal of an existing fence per Drawings and weir structure located on the eastern edge of landfill boundary;

h. Modification of existing storm drain manholes to inlet structures;

i. Clearing the designated work area;

j. Establishing erosion control measures that will remain in place throughout the duration of construction activities;

k. Site-wide surficial radiological screening;

l. Excavation, removal, and disposal of radiological contamination (as necessary);

m. Site grading and preparation of subgrade;

n. Installation of the multilayer soil cover system;

o. Installation of a geonet to serve as a biotic layer;

p. Installation of groundwater monitoring wells, if required;

q. Installation of landfill gas perimeter probes;

r. Construction of an access road;

s. Construction of perimeter storm water drainage controls;

t. Re-vegetation of the work area;

u. Establishing final erosion control measures;

v. Installation of a new permanent chainlink fence;

w. Managing and disposing of wastes generated during construction activities; and

x. Demobilization; including final site clean-up.

1.2.2 Location

The work shall be located at the Installation Restoration Site 2, Former Naval Air Station Alameda Point, Alameda, California, as shown in the Project Drawings.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 FACILITIES AND SERVICES

3.1.1 Availability of Utilities Services

a. The Contractor shall provide his own utilities.

b. The Contractor shall be responsible for supplying their own potable water and electricity.

c. The Contractor shall mobilize and maintain temporary sanitary facilities for the field crew; the Contractor shall remove the sanitary facilities from the site at the conclusion of construction activities.

3.1.2 Contractor’s Storage Area

Storage Size and Location: During the course of field activities, the Contractor shall be allowed to store equipment adjacent to the site in the location as shown on the plans. The Contractor shall be responsible for securing the storage area from unauthorized access.

3.2 RESTRICTIONS ON OPERATIONS

3.2.2 Security Requirements

The Contractor shall erect temporary security equipment consisting, at a minimum, of fencing, barriers, and signs to prevent unauthorized access to construction area. This equipment shall be erected prior to commencement of work at the site. Fencing and other barriers shall remain in place until construction activities are concluded; all temporary fencing shall be removed during demobilization.

3.3 ACTIONS REQUIRED OF THE CONTRACTOR

3.3.1 Location of Underground Facilities

The Contractor shall verify any type of underground obstruction indicated on the project plans or specified to be removed. There are no live utilities in the area but caution will be maintained during any excavation.

3.3.2 Permits and Approvals

The Contractor shall be responsible for obtaining all permits/permissions, approvals, and/or authorization as required.

3.3.3 Fugitive Dust

The Contractor shall monitor construction, and provide dust suppression and controls, in accordance with the work plans.

3.3.4 Not Used

3.3.5 Daily Site Cleanup

During site grading and subgrade preparation, no exposed waste (radiation impacted soils are not considered waste under this requirement) shall be left uncovered at the end of each day. The Contractor shall ensure that the construction site is secured at the end of each work day. All equipment and materials shall be stored in the Contractor's storage area or within the project construction area. No loose debris, trash, or project materials shall be present outside of the Contractor's storage or work areas at the end of each working day.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES
November 2011

PART 1 GENERAL

Units of weights and measures used on all submittals are to be the same as those used in the Contract Drawings.

Submittals will be reviewed to ensure completeness, accuracy, and Contract compliance. Submittal of a certification will be inspected and approved for conformance with the project Specifications or certification criteria. All items will be checked and approved by the Project Quality Control Manager (PQCM) or designated representative. Any submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review and approval prior to acceptance. Approved submittals will be stamped, signed or initialed, and dated. During the preparatory phase of the QC inspections, the PQCM or designated representative will ensure that all materials and equipment have been tested and approved. No field activities will be performed without the required approval of applicable submittals.

Required submittals will be provided to project personnel as determined by the distribution schedule. Each submittal will be assigned a unique document control number.

A transmittal form will accompany each submittal. Each transmittal will be identified with: Contract and Contract Task Order (CTO) number; name and address of the submitting organization; date of submittal; description of item being submitted, including reference to Specification Section (if applicable); and approval of submitting organization indicating conformance to the requirements. The PQCM will update the submittal register regularly (See Article 1.7 of this Section).

The submittal log will be updated to indicate status. Nonconforming submittals may be returned to the submitter for correction, resolution of comments, and resubmittal, if required (See subparagraph 1.8.3 of this Section). Revised submittals will be logged, reviewed, and processed in a manner identical to the initial submittal. Revisions to a submittal will be identified using an alphabetic suffix to the original submittal number, e.g., submittal 18 will be revised to 18(a).

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (Work) issuance of notice to proceed or commencing Work on site or the start of the next major phase of the construction on a multi-phase Contract.

Includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to start of construction work start of construction work Contract notice to proceed or next major phase of construction.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of Contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets Specification requirements. Must be dated after award of project Contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

SD-08 Manufacturer Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction Contract. For example, as-built Drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase Contract.

1.1.2 Approving Authority
Not used.

1.1.3 Work

As used in this section, on- and off-site construction required by Contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2 SUBMITTALS

Not Used

1.3 SUBMITTAL CLASSIFICATION

1.3.4 Designer of Record Approved/Conformance Review (DA/CR)

1.3.4.1 Deviations to the Accepted Design

The PQAE, PQCM, Landfill Engineer, Site Engineer, Construction Manager, and Project Manager concurrence are required for any proposed deviation from the accepted design which still complies with the Contract before the Contractor is authorized to proceed with material acquisition or installation. A Field Change Request must be approved by the aforementioned in addition to the RPM/ROICC. If necessary to facilitate the project schedule, the Contractor and the RPM/ROICC may discuss a submittal proposing a deviation prior to officially submitting it.

1.3.4.2 Substitutions

Not used.

1.3.5 Project Manager Approved

In addition to the above-stated requirements for proposed deviations to the accepted design, the Project Manager approval is required, if a Contract modification is required before the Contractor is authorized to proceed with material acquisition or installation for any proposed variation to the Contract (the solicitation and/or the accepted proposal), which constitutes a change to the Contract terms.

1.4 PREPARATION

1.4.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels to office of approving authority. Transmit submittals with transmittal form prescribed by RPM/ROICC and standard for project. On the transmittal form, identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled, "Identifying Submittals," of this section. Process transmittal forms to record actions regarding samples and installations.

1.4.2 Identifying Submittals

When submittals are provided by a subcontractor, the Prime Contractor is to prepare, review, and stamp with Contractor's approval all specified submittals.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction Contract number.

c. Date of the Drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the Specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.

h. Product identification and location in project.

1.4.3 Format for SD-02 Shop Drawings

Shop Drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare Drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.

Dimension Drawings, except diagrams and schematic Drawings; prepare Drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop Drawings as indicated on the Contract Drawings. Identify materials and products for work shown.

Include the nameplate data, size and capacity on Drawings. Also include applicable federal, military, industry and technical society publication references.

1.4.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.

Indicate, by prominent notation, each product which is being submitted; indicate Specification section number and paragraph number to which it pertains.

Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project, with information and format as required for submission of SD-07 Certificates.

Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, submit as specified for SD-07 Certificates.

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC); and submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the RPM/ROICC. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of construction effort.

Submit manufacturer's instructions prior to installation.

1.4.5 Format of SD-04 Samples

Not used.

1.4.6 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

1.4.7 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

Indicate by prominent notation, each report in the submittal. Indicate Specification number and paragraph number to which it pertains.

1.4.8 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

When submittal includes a document, which is to be used in project or become part of project record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.

1.5 QUANTITY OF SUBMITTALS

1.5.1 Number of Copies of SD-02 Shop Drawings

Submit one copy of submittals of shop Drawings requiring review and approval only by QC organization and two copies of shop Drawings requiring review and approval by RPM/ROICC.

1.5.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop Drawings.

1.6 VARIATIONS

Variations from Contract requirements require Designer of Record (DOR) approval.

1.7 SUBMITTAL REGISTER AND DATABASE

1.7.1 Use of Submittal Register

Submit submittal register as an electronic database, using submittals management program furnished to Contractor. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.8 SCHEDULING

Schedule and submit concurrently, submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent Drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.

b. Submittals called for by the Contract documents will be listed on the register. If a submittal is called for but does not pertain to the Contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the RPM/ROICC does not relieve the Contractor of supplying submittals required by the Contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

e. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC Project Manager approval and 20 working days for submittals for RPM/ROICC approval. Period of review for submittals with RPM/ROICC approval begins when RPM/ROICC receives submittal from QC organization.

f. Period of review for each resubmittal is the same as for initial.

1.8.1 Reviewing, Certifying, Approving Authority

The PQA or QC Project Manager is responsible for reviewing and certifying that submittals are in compliance with Contract requirements. Approving authority on submittals is the PQA or QC Project Manager unless otherwise specified for specific submittal.

1.8.2 Constraints

Not used.

1.8.3 QC Organization Responsibilities

a. Note date on which submittal was received from Contractor on each submittal.

b. Review each submittal; and check and coordinate each submittal with requirements of work and Contract documents.

c. Review submittals for conformance with project design concepts and compliance with Contract documents.

d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

(1) When QC Project Manager is approving authority, take appropriate action on submittal.

e. Ensure that material is clearly legible.

f. Each submittal transmittal letter must have a QC certifying statement or approving statement.

SECTION 02 41 00

DEMOLITION
November 2011

PART 1 GENERAL

1.1 REFERENCES

Not used.

1.2 PROJECT DESCRIPTION

This Section includes procedures for demolition work shown on the plans. See Section 02 41 10 for destruction of monitoring wells, probes, and boreholes.

1.2.1 Demolition/Deconstruction Plan

Not used.

1.2.2 General Requirements

Do not begin demolition or deconstruction until authorization is received from the RPM/ROICC during the preconstruction meeting. Rubbish and debris removed from the site shall be controlled by the RSOR.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place (i.e., existing gas trenches outside of the limits of waste) or to be reused. Repair or replace damaged items as approved by the RPM/ROICC. Coordinate the work of this section with all other work indicated. Existing gas trenches outside of the limits of waste that are damaged shall be installed, repaired, and/or replaced as shown on the Drawings and as described in Sections 31 00 00, 31 05 22, and 31 21 00.

1.3.1 Weather Protection

Not used.

1.3.2 Utility Service

Not used.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00, Submittal Procedures:

SD-01 Preconstruction Submittals

RAWP which discusses Existing Conditions

1.6 QUALITY ASSURANCE

1.6.1 Dust Control

Prevent the spread of dust and avoid the creation of a nuisance or hazard in the surrounding area. See Section 01 10 00, Article 1.9 and Section 01 11 00, subparagraph 3.3.3.

1.7 PROTECTION

See Article 1.3 of this Section.

1.8 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the Drawings and Specifications to determine the extent of the Work. Photographs sized 4 inch will be acceptable as a record of existing conditions.

PART 2 PRODUCTS

2.1 FILL MATERIAL

Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill, voids, depressions or excavations resulting from demolition or deconstruction of structures. Fill material shall be placed in conformance with Articles 3.11 TESTING and Article 3.16 FILLING AND BACKFILLING of Section 31 00 00 EARTHWORK.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE DEMOLISHED

Not used.

3.1.1 Landfill Gas Vents

Deconstruct existing landfill gas vents, as required. Remove and dispose of materials off-site.

3.1.2 Monitoring Well Destruction

Destruction of monitoring wells, if required, will be performed in accordance with Section 02 41 10 MONITORING WELL DESTRUCTION.

3.1.3 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units.

3.1.4 Weir Structure

Remove weir structure from within the limits of the landfill. Remove weir structure lateral pipe as shown in the project Drawings.

-- End of Section --

SECTION 02 41 10

MONITORING WELL DESTRUCTION
November 2011

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Change 1-2010; Change 3-2010; Errata 1-2010) Safety and Health Requirements Manual

1.2 SUBMITTALS

SD-01 Preconstruction Submittals

Water Well Contractor’s License

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 Monitoring Well Destruction

For destruction of groundwater monitoring wells, the Contractor must have a C-57 Water Well Contractor's License per Section 13750.5 of the California Water Code. California Water Code destruction standards are at the following website:
<http://www.water.ca.gov/groundwater/well_info_and_other/california_well_standards/wws/wws_combined_sec23.html#sec23>

Destruction must be done in compliance with the California Water Code and Alameda County Water District requirements in the County of Alameda Ordinance No. 73-68 entitled "An Ordinance to Regulate the Construction, Repair, Reconstruction, Destruction or Abandonment of Wells within the Boundaries of the County of Alameda; and Construction, Operation, or Destruction of Wells.”

Any well/probe decommissioned/destructed by the Contractor for any reason shall be decommissioned/destructed with regard to the requirements of the State of California, ASTM D 5299, and the requirements of Section 02 41 10 MONITORING WELL DESTRUCTION of these Specifications. Well/probe decommissioning/destruction includes pressure grouting of the well or probe. Maintain a well/probe decommissioning/destruction record as specified in paragraph Well/Probe Decommissioning/Destruction Records. Measure groundwater levels, if encountered before the decision is made for decommissioning/destruction, in all borings prior to backfilling. Include these water levels in the well/probe decommissioning/destruction records.

General requirements for destroying monitoring wells and exploration holes are contained in Section 23 of the Water Well Standards. Special considerations for monitoring wells and exploration holes are as follows:

(1) Preliminary Work. A monitoring well shall be investigated before it is destroyed to determine its condition and details of its construction. The well shall be sounded immediately before it is destroyed to make sure no obstructions exist that will interfere with filing and sealing.

Due to the radiological issues at the site, all boreholes and probes requiring abandonment/destruction may only be pressure grouted. No drilling is permitted in the landfill.

(2) Sealing Conditions. The following minimum requirements shall be followed when various conditions are encountered:

The monitoring well casing, and any other significant voids within the well, shall, at a minimum, be completely filled with sealing material, if the following conditions exist:

The monitoring well is located in an area of known or potential pollution or contamination, and,

Sealing material may have to be placed under pressure to ensure that the monitoring well is properly filled and sealed.

(3) Casing, filter pack, and annular seal materials shall be left in place during sealing operations based on site contamination. Sealing material may have to be applied under pressure to ensure its proper distribution.

a. Sealing and Fill Materials. Materials used for sealing exploratory borings and monitoring wells shall have low permeabilities so that the volume of water and possible pollutants and contaminants passing through them will be of minimal consequence. Sealing material shall be compatible with the chemical environment into which it is placed, and shall have mechanical properties consistent with present and future site uses.

Suitable sealing materials include neat cement, sand-cement, and bentonite, all of which are described in Section 9 of these standards. Bentonite shall not be used as a sealing material opposite zones of fractured rock, unless otherwise approved by the enforcing agency. Drilling mud or drill cuttings are not acceptable as any part of sealing material for well destruction. Concrete may be used as a sealing material at the approval of the enforcing agency.

Fill material, if any, shall meet the requirements of Section 23 of the Water Well Standards. Fill material shall be free of pollutants and contaminants and shall not be subject to decomposition or consolidation after placement. Drilling mud or cuttings with less than 50 percent moisture content are acceptable as random fill as defined in subparagraph 1.2.6 of Section 31 00 00.

3.1.1 Suggested Methods for Sealing the Annual Space and for Sealing-Off Strata

3.1.1.1 General

The use of the tremie or grout pipe for the introduction of the sealing material into the casing forcing material into annular space is preferred.

Gravity installation without a grout pipe or tremie should not be attempted when the sealing interval contains water or cannot be visually inspected (with the aid of a mirror or light). Where sealing material is to be introduced under water or the interval cannot be observed from the surface, methods involving positive placement (by a tremie or grout pipe, pumping or other application of pressure) must be used.

The sealing material must always be introduced at the bottom of the interval to be sealed. This prevents bridging (jamming) or segregation (separation of large aggregate from the mixture in sand-cement or concrete grouts) of the sealing material and eliminates gaps.

Sealing should be accomplished in one continuous operation. Where the sealing interval will exceed 100 feet in length, consideration must be given to the collapse strength of the casing. Further, because of the weight of such extensive seals, consideration must also be given to the installation of stronger retaining devices and to staging the placement of the seal (as, for example, the installation of a short segment of rapid-setting sealant in advance of the main body of sealing material; the former becomes a foundation to support the extensive seal).

3.1.1.2 Sealing Methods

The following methods can be used to seal the upper portion of the annular space. The first method is frequently used where short seals, under 20 feet deep, are placed in dry material.

Gravity Installation (Without Tremie). In this method sealing material is poured into the annular space without the use of a tremie or grout pipe. It cannot be used where the annular space contains water and is limited to intervals less than 30 feet deep. When used, visual observation (with the aid of a mirror or light) should be made during placement of the seal.

Continuous Injection. This method, called the Normal Displacement Method in the oil industry (which developed it), involves pumping grout through a tube or pipe centered in the casing. The grout is forced up into the annular space to the ground surface. The tube is detached and flushed. Because there is the possibility that coarse aggregate will jam the grout pipe, concrete cannot be used with this method.

-- End of Section –

SECTION 31 00 00

EARTHWORK
November 2011

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 289	(2007) Standard Test Methods for Potential Alkali Silica Reactivity of Aggregates (Chemical Method)
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 2216	(2010) Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	(2011) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(2009a) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 4318	(2010) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	(2008) Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
ASTM D 4792	(2007) Standard Test Method for pH of Soils
ASTM D 6913	(2004;r 2009) Standard Test Method for Particle Size Distribution (Gradation) of Soils Using Sieve Analysis
ASTM D 6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Materials Engineering and Testing Services - California Test Methods (California Test)

California Test 217 Method of Test for Sand Equivalent

California Test 229 Method of Test for Durability Index

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, for general soil types, abbreviated as percent laboratory maximum density.

1.2.2 Waste

Discarded materials including Portland cement concrete (PCC) and asphalt concrete (AC) rubble, equipment, municipal solid waste, green waste, and other miscellaneous waste materials that may be contained within a soil matrix.

1.2.3 Biotic Layer

This layer of the cover system provides a barrier against burrowing animals and protects the underlying material from burrowing animals. The biotic layer will consist of HDPE Geonet (See Section 31 05 20).

1.2.4 Satisfactory Materials

Satisfactory materials shall consist of soils identified in Section 2.2 Soil Materials.

1.2.5 Unsatisfactory Materials

Materials which do not comply with the requirements for the various soils listed below will be considered unsatisfactory. Soil will not be considered unsuitable based on moisture content.

1.2.6 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.2.5 Random Fill Material

Random fill material is composed of existing material onsite, from vegetative material from clearing, and borrow soil(See Section 31 11 00).

1.2.6 Select Random Fill

Select random fill is fill placed as the topmost 1 foot or less (when placed directly on the original subgrade) to form the subgrade of the 2-foot thick cover system.

1.2.7 Aggregate Base for Access Road

Aggregate base material is imported material to be placed as shown on the Drawings.

1.3 SYSTEM DESCRIPTION

It is the intent of the Drawings and these Specifications to provide for the construction of a 2-foot thick cover system which will approximate the line and grades indicated on the Drawings. The cover system includes construction of a fill layer composed of onsite or borrow soils which shall moisture conditioned, and compacted to form the foundation layer for soil cover. The topomost 1 foot, where possible, of this foundation layer will be composed by select random fill and overlain by a geonet biotic layer to form the subgrade of the 2-foot thick cover system. The biotic layer will be covered with an additional 24 inches of soil cover, consisting of an 18-inch thick layer of compacted fill and 6-inch thick layer of vegetative cover. The site will also have a gas vent system made of PVC pipe encased in a gravel trench lined with a 12-oz nonwoven geotextile as shown on the Drawings. Access roads composed of aggregate base with a 12-oz nonwoven geotextile separation layer will be above the soil cover.

When completed, the final landfill surface shall be graded such that no slope area within the landfill footprint exceeds a ratio of 2-foot horizontal to 1-foot vertical, nor shall any areas have a gradient less than 1 percent unless specifically designated or shown on the Drawings. Due to potential landfill settlement during construction, modifications of line and grades are anticipated to meet field conditions.

Modification of line and grades indicated on the Drawings, which conform to the design intent, may be recommended by the Contractor.

1.3 SUBMITTALS

SD-01 Preconstruction Submittal

Remedial Action Work Plan (RAWP), G

SD-06 Test Reports

Borrow Site Testing

Density tests

Aggregate Base Testing

SD-07 Certificates

Source Certification of Topsoil Properties

Source Certification of Vegetative Layer

Source Certification of Compacted Cover Fill

Source Certification of Select Random Fill

Source Certification of Random Fill

Source Certification of Aggregate Base Properties

Source Certification of Gravel for Gas Vent

Laboratory and field test results within 24 hours of the completion of the test. Borrow site testing results shall be obtained from the site prior to delivery of material. Copies of test reports within 5 days of completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

PART 2 PRODUCTS

2.1 WASTE

Materials which do not comply with the requirements for soil materials. Waste also includes man-made fills, trash, or refuse, as well as surficial debris collected during clearing.

2.2 SOIL MATERIALS

Soils, other than random fill material, shall be free of debris, roots, wood, scrap material, vegetation, refuse, visible organics, soft unsound particles, and deleterious, or objectionable materials.

In order to determine the properties of the borrow soil, samples shall be obtained from the potential borrow area for laboratory analysis prior to actual delivery. Samples may be obtained in several ways. No material shall be brought onsite until Borrow Site Testing results have been approved by the PQCM.

2.2.1 Compacted Cover Fill

Approved unclassified material shall be a soil or soil-rock mixture, free from clods or rock larger than 2 inches in greatest dimension, free from organic matter or other deleterious substances, and with the characteristics required to compact the soil to the density specified for the intended location. Compacted cover fill testing frequency and properties are in Table 1

.

2.2.1.1 Random Fill

Random fill shall be used below the 2-foot thick layer of compacted cover fill in the landfill area, , as fill beneath drainage control structures, and for bringing waste excavation areas to subgrade.

Random fill may contain onsite material including chipped vegetative material, concrete debris, and other construction related debris. Random fill shall meet the following requirements:

a. No particle shall exceed 12 inches in the greatest dimension.

b. Random fill testing frequency and properties are in Table 1.

2.2.1.2 Select Random Fill

Select random fill shall be placed as the topmost 1 foot or less (when placed directly on the original subgrade) of the random fill to form the subgrade of the 2-foot thick compacted cover fill.. Select random fill shall meet the following requirements:

a. No particle shall exceed 6 inches in the greatest dimension.

b. Random fill testing frequency and properties are in Table 1.

2.2.2 Vegetative Layer (6-Inch Thick)

The vegetative layer is the uppermost 6 inches of the 2-foot thick soil cover. Vegetative layer testing frequency and properties are in Table 1.

Samples of vegetative layer soils must be taken for laboratory testing to ensure conformance with Specifications for parameters such as grain size distribution, Atterberg limits, and compaction curve. Material shall be continuously visually inspected.

2.2.3 Vegetative Topsoil

Topsoil shall be placed above Turf Reinforcement Mat areas shown on the Drawings and as described in Section 31 32 11. Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7. . Vegetative topsoil properties and testing frequency are the same as for vegetative layer in Table 1.

2.3 AGGREGATE BASE FOR ACCESS ROAD

Aggregate shall be as specified in Section 26 of the 2010 Caltrans Standard Specifications, for Class 2 aggregate, 3/4-inch maximum gradation. The Contractor shall submit a source certification of the gradation and quality including Sand Equivalent (California Test 217), and Durability Index (California Test 229).

2.4 GRAVEL FOR GAS VENT

Gravel shall conform to properties in Table 2. Gravel shall be clean, hard, sound, durable, uniform in quality, and free of any detrimental quantity of soft, friable, thin, elongated or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.

Gravel shall be subrounded to rounded as described in ASTM D 2488.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Drainage

Provide for the collection and disposal of surface water encountered during construction.

3.1.1.1 Drainage

So that construction operations progress successfully, adequately drain the construction site during periods of construction to keep soil materials sufficiently dry. Grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, rework unsuitable material or area as specified herein. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained. The Stormwater Pollution Prevention Plan shall address the method and timing of localized controls.

3.1.2 Underground Utilities

Not used.

3.1.3 Machinery and Equipment

Not used.

3.2 SURFACE PREPARATION

3.2.1 Clearing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations within the limits of grading per Section 31 11 00 CLEARING.

3.3 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Rework soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted.

Refill with clean soil cover outside of the limits of waste. Refill with random fill within the limits of waste and compact to 85% minimum compaction. Where practicable without over-excavating below the existing grade, refill with 1-foot thick layer of select random fill below compacted cover fill and compact to 90% minimum compaction.

3.3.1 Monitoring

During excavation, emissions of VOCs, methane and other gases, fugitive dust, activities that could produce dust from soil containing PCBs, pesticides, and other constituents of concern, will be monitored. Proper personal protection equipment shall be used for protection of onsite workers in accordance with the approved Site Safety and Health Plan. Air quality monitoring shall be conducted in compliance with the Site Safety and Health Plan.

3.4 SUBGRADE PREPARATION

Subgrade shall consist of the existing ground surface with minimized cut areas. Surface preparation methods which break the surface including but not necessarily limited to over-excavating, scarifying, and disking shall be avoided.

Oversized material (greater than 12 inches) or other material that will prevent competent placement of soils on surfaces to receive fill or in excavated areas shall be removed and disposed in random fill or offsite.. Material shall not be placed on surfaces that are muddy.

Subgrade preparation shall be observed by a Geotechnical Engineer to observe whether any undesirable material is encountered in the construction area.

3.5 WASTE REMOVAL

The Contractor may encounter refuse during subgrade development at various designated areas of the project to establish revised slope gradients and/or to accommodate construction of various improvements. All refuse within the limits of proposed work shall be excavated and transported to an area established by the RSOR.

3.6 WASTE DEPTH VERIFICATION

Not used.

3.7 RECONSOLIDATION/SOIL RECOVERY/OPERATIONS PLAN

Not used.

3.7.1 Drainage

The Contractor shall provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction, grade the construction area to provide positive surface water runoff away from the construction activity or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. Drainage must be diverted away from exposed non-inert waste. Cover non-inert waste with a minimum of one foot thick cover soil to maintain separation from water and wastes. Surface water shall be controlled to avoid damage to adjoining wetlands or to finished work on the site.

3.8 GEONET AND GEOTEXTILE (GEOSYNTHETIC) SUBGRADE LAYER PREPARATION

The geosynthetic subgrade layer preparation shall consist of backfill and compaction of erosion gullies and rills, grading and placement of fill material to remove surface irregularities, placement and compaction of fill material to achieve the minimum subgrade layer thickness, and conditioning of the existing surface in preparation for receiving the cover material.

The geosynthetic subgrade shall be prepared to create a generally uniform surface, upon which the geosynthetics and protective layers can be constructed and its final thickness accurately verified. The Contractor's proposed sequencing and methods for achieving the design intent for development of the geosynthetic subgrade shall be outlined in the submitted Reconsolidation Areas/Operations Plan.

All earthwork shall conform to the following requirements, where applicable, unless otherwise noted in these Specifications:

A. Equipment used in the excavation, transport, stockpiling, processing, placement and compaction of all materials used in construction of the final cover system will be standard-of-practice grading machinery of known Specifications suitable for performing the required work in a timely and efficient manner.

B. All material considered by PQA or PCQM to be unsuitable for use in the construction of the final cover system components shall be removed. All materials incorporated as part of the compacted fill must be inspected and placement must be observed by PQA or PQCM.

C. All clearing, stripping, and site preparation for the Project shall be accomplished to the satisfaction of PQA or PCQM prior to placement of fill material.

D. Material deemed unlikely to meet the performance Specification and not disposed of during clearing of demolition shall be removed from the stockpiles, borrow and/or fill as directed by PQA or PCQM.

E. The existing cover surface to receive fill shall be prepared (cleared) to the satisfaction of the PQAE and the fill shall be placed, spread, mixed, watered, and compacted in accordance with the project Specifications.

F. The surface prepared to receive fill shall not be disturbed for existing landfill cover surface, and moisture conditioned to at least the optimum moisture content, mixed as required, and compacted to 90 percent minimum for subgrade fill surface as determined by ASTM D 6938. The compaction test shall be conducted at a frequency shown on Table 1. The prepared surface shall be firm and unyielding. Prior to fill placement, the ground surface to receive fill shall be inspected by the PQA or PCQM.

G. Irreducible rock or rock fragments in excess of three 6 inches in maximum dimension shall not be utilized for the Geosynthetic subgrade layer.

H. Suitable and sufficient processing and compaction equipment shall be on the job site to handle the amount of fill being stockpiled, processed, mixed and/or placed. If necessary, excavation or import equipment will be shut down temporarily in order to allow time for proper preparation and/or compaction of fills. Sufficient water supply apparatus will be provided with due consideration to the type of fill material, compaction characteristics, rate of placement, and time of year.

I. All materials incorporated as part of compacted fill must be inspected and placement must be observed by the PQA or PCQM.

J. Fill material shall be placed in thin horizontal lifts with a maximum uncompacted thickness not to exceed the limits shown on Table 1. Each layer shall be spread evenly and thoroughly mixed to obtain a near uniform condition in each layer. In areas of excess lift thickness, re-grading of the surface to the maximum lift thickness will be completed prior to construction of additional lifts.

K. The minimum compaction for select random fill in the final cover subgrade shall be 90 percent of the maximum dry density as determined by ASTM D 1557 and the specified moisture content is at least the optimum moisture content as determined by ASTM D 1557.

L. The cover soils shall contain sufficient fine-grained constituents such that gravel size and larger fragments do not cluster during construction.

M. At the beginning of each grading day the active fill pad will be inspected. Any previously placed soils which have moisture content below the specified minimum shall be thoroughly watered and processed in preparation for receiving additional fill. If necessary, additional moisture shall be added until the moisture content is within the limits required so as to assure an adequate bonding and compaction of all soil materials. Any previously compacted materials which are disturbed (aerated, bladed, etc.), to reduce or increase the moisture content must be recompacted to the project Specifications.

N. In the designated processing/stockpile areas, cover soils shall be processed to obtain a uniform soil condition and moisture conditioned (or dried) as necessary to at least the optimum moisture content as determined by ASTM D 1557.

O. Cover placement shall not exceed the capability of the processing operation necessary to meet the project Specifications.

P. Representative samples of fill material will be tested in the laboratory in order to determine the physical characteristics of the material. During processing and/or grading operations, no soils, or soil types, other than those previously analyzed may be used.

Q. Where tests by PQA or PCQM indicate that the moisture content or density of any layer of fill, or portion thereof, is below the Project requirements, the particular layer or portion thereof will be reworked until the required moisture/density has been attained. The moisture/density of the reworked fill will be verified by re-testing. No additional fill shall be placed over an area until the prior fill has been tested horizontally and vertically and meets the requirements of these Specifications.

R. Where work is interrupted by heavy rains, fill operations shall not be resumed until observations and field tests by PQA or PCQM indicate the moisture content and density of the in-place fills and/or materials intended for placement are within the limits previously specified. This requirement does not preclude the Contractor from disking or aerating excessively wet areas to enhance drying.

S. Throughout construction, all fill areas shall be graded to provide positive drainage to collection/transport features and to prevent ponding of water.

3.9 GEOSYNTHETIC MATERIAL SURFACE PREPARATION

3.9.1 General Requirements

Prior to placement of the geosynthetics (geonet and geotextile), the Contractor shall prepare the subgrade to provide a uniform surface, free of defects, or imperfections that may result in damage to the geosynthetic material.

The finished surface shall be free from abrupt breaks, sharp objects, or other foreign material that may inhibit placement of the geosynthetic material. All construction stakes, hubs, or other items used for grade control shall be removed and the void filled with processed material. The subgrade shall be unyielding, smooth, and uniform. The surface shall not be pebbly, or tracked and rutted by equipment. Pockets, holes, or discontinuities shall be repaired. No loose, coarse-grained material shall remain on the surface of the subgrade.

3.9.2 Subgrade Layer Tolerances

Not used.

3.10 COMPACTED SOIL COVER ABOVE GEOSYNTHETIC BIOTIC LAYER

Soil cover layer material shall be obtained from import borrow sources as approved by PQA or PQCM. Borrow materials shall be stockpiled outside the limits of waste.

Soil cover material shall be placed in a manner, and with appropriate equipment, such that damage does not occur to the underlying surface or materials. Soil shall be placed from the bottom of the slope upward. Equipment loading shall not exceed that recommended by the geosynthetic manufacturer. The uppermost six inches of the soil cover layer above the biotic layer shall be a vegetative layer material. The first lift above biotic layer shall be 10 to 12 inches in loose thickness. Subsequent lifts shall be as shown on Table 1.

The soil cover shall meet the compaction requirements shown on Table 1.

Topsoil placed above turf reinforcement mat shall be placed as specified and not compacted.

3.10.1 Soil Cover Layer Tolerances

Depth verification will be performed on an ongoing basis to verify that the minimum cover thickness is met. Areas found to be deficient in thickness by (greater than † 0.2 feet) will require regrading. Variances from a uniform plane shall not exceed † 0.20 feet vertical, measured in any direction for a horizontal distance of 20 feet. The thickness specified is a minimum; therefore a negative tolerance is not permitted.

3.11 TESTING

Perform off-site testing by a commercial testing laboratory. When test results indicate, as determined by PQA or PQCM, that compaction is not as specified, remove the material (uppermost 1 foot of the 2-foot thick soil cover above the biotic layer, vegetative layer, and fill areas in compacted subgrade), replace and recompact to meet Specification requirements. Perform tests on recompacted areas to determine conformance with Specification requirements.

3.11.1 Testing Frequency for Earthwork Materials

Table 1
Summary of Material Specification, CQA Testing and Frequency

Material (from bottom to top)	**Description**	**Material Specification**	**Testing**	**Testing Frequency**
Subgrade	Pre-existing, pre-construction grade in fill areas; cut grade in cut areas	• No material specification other than restriction on particles greater than 12 inches • The subgrade is formed by what is actually there	• No testing specified. Recompaction of the subgrade to practicable uniform compaction to the satisfaction of the CQA personnel (i.e., testing by probe penetration) • Note: Particles greater than 12 inches in largest dimension shall be removed and disposed.	
Random Fill	Variable thickness material to bring the grade to within 1 foot of the cover subgrade elevations. This layer may not exist in areas where engineered cover soil subgrade is located near the subgrade.	• Any USCS soil classification except PT, OH, and OL • Scattered debris (e.g., liner, refuse, etc.) is acceptable • Maximum particle size **12 inches**	• Manual visual procedure ASTM D2488	• Continuous inspection
		• Compact to 85% RC • Uncompacted lift thickness: 12 inches • Prevent nesting of sizes greater than 6 inches	• Maximum density and optimum moisture content (ASTM D1557)	• 1 test per week or when soil changes
			• RC per ASTM D6938 (nuke) to at least optimum moisture content	• At least 2 tests per 1,000CY or 3 tests per day
Select Random Fill	Zone of select material 1 foot thick, except in cut areas, to produce subgrade for placement of engineered cover	• Any USCS soil classification except PT, OH, and OL • No debris • Maximum particle size **6 inches**	• USCS Manual visual procedure ASTM D2488	• Continuous inspection
		• At least 90% RC • Uncompacted lift thickness: 6 to 8 inches	• Maximum density and optimum moisture content (ASTM D1557)	• 1 test per week or when soil changes
			• RC per ASTM D6938 (nuke) to at least optimum moisture content	• At least 2 tests per 1,000CY or 3 tests per day
Biotic barrier	Rodent barrier			
Compacted Cover Fill (engineered cover soil)	1.5 feet thick engineered cover material	• Any USCS soil classification except PT, OH, OL, CH, MH, GP, and GW • Maximum particle size **2 inches**	• USCS (ASTM D2487) • Atterberg Limits (ASTM D4318) • Sieve analysis (ASTM D6913)	• 1 test per 8,000 CY
			• USCS Manual visual procedure ASTM D2488	• Continuous inspection
		• At least 90% RC • First layer uncompacted thickness 10 to 12 inches; subsequent layers uncompacted lift thickness 6 to 8 inches	• Maximum density and optimum moisture content (ASTM D1557)	• 1 test per week or when soil changes
			• RC per ASTM D6938 (nuke) to at least optimum moisture content	• 4 tests per 1,000CY or 4 tests per day
Vegetative Layer and	6 inches of material supporting vegetative growth	• Any USCS soil classification except PT, OH, OL, CH, MH, SP, SW, GP and GW • Maximum particle size **1 inch**	• USCS (ASTM D2487) • Atterberg Limits (ASTM D4318) • Sieve analysis (ASTM D6913)	• 1 test per 8,000 CY
			• USCS Manual visual procedure ASTM D2488	• Continuous inspection

		• Compact to 85% RC • Uncompacted lift thickness: 6 to 8 inches	• Maximum density and optimum moisture content (ASTM D1557)	• 1 test per week or when soil changes
			• RC per ASTM D6938 to at least optimum moisture content	• 4 tests per 1,000CY or 4 tests per day
Vegetative Topsoil Layer	Soil placed above the turf reinforcement mat areas	• Any USCS soil classification except PT, OH, OL, CH, MH, SP, SW, GP and GW • Maximum particle size **1 inch** • pH 5.5 to 7	• USCS (ASTM D2487) • Atterberg Limits (ASTM D4318) • Sieve analysis (ASTM D6913) • pH (ASTM D4792)	• 1 test per 8,000 CY
		• No specified compaction required	• No specified compaction required	• No specified compaction required

After the first 5 consecutive passing laboratory tests, soils shall be weekly tested and certified by the borrow source to demonstrate compliance with the Specifications.

TABLE 2
GRAVEL FOR GAS VENT

Property	Frequency	Test Method
Particle Size (1)	1 per source	ASTM D 6913
Reactivity (2)	1 per source	ASTM C 289
Visual	Continuous	ASTM D 2488

(1) A certified sieve analysis shall be submitted. 100 percent shall pass 1/2-inch sieve, 90-100 percent shall pass 3/8-inch sieve, 30-60 percent shall pass a No. 4 sieve, and 0 to 10 percent shall pass a No. 8 sieve.
(2) Certified test results shall indicate non-reactive.

3.11.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change or change in material.

3.11.2.1 Aggregate Base Testing

Source shall certify aggregate base properties tested for conformance with properties specified in Section 26 of the 2010 Caltrans Standard Specifications (see subparagraph 2.2.4 of this section).

Test aggregate base in accordance with ASTM D 1557 for determination of maximum dry density and optimum moisture at a frequency of every 10,000 cubic yards or change in material type or source. Compact aggregate layer to at least 95 percent relative compaction. The finished surface must not vary more than 0.05 foot from the grade established by the Designer of Record.

3.11.2.2 Density Tests

Test in-place density in accordance with ASTM D 6938.

Perform ASTM D 1557 density test at the start of the job, and continue as specified in Table 1. Test each lift at randomly selected locations at the frequencies shown on Table 1.

3.12 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph DEVELOP GEOSYNTHETIC SUBGRADE LAYER PREPARATION. Finish ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials.

Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-establish grades to the required elevations and slopes.

Final surface grades will be track walked in preparation for hydroseeding. Exposed interim surfaces shall be track walked during construction as needed for erosion control.

3.13 PLACING VEGETATIVE TOPSOIL ABOVE EROSION CONTROL BLANKET

Spread topsoil evenly, as described in Specification Section 31 32 11, section 3.3.11.1, on areas covered with turf reinforcement mat as shown on plans. Obtain material required for topsoil from offsite areas. Topsoil shall be spread out using approved placement equipment. On slopes, topsoil shall be placed from the bottom of the slope upward. See Section 31 32 11 SOIL SURFACE EROSION CONTROL for placement in erosion control blanket areas shown on plans as "turf reinforcement mat."

3.13.1 Construction Tolerances

Finished surfaces shall be uniformly graded, meet the minimum and maximum grades, and shall be free from depressions, mounds, or windrows. The top surface of the select fill layer and topsoil layer may be no greater than the lines and grades shown on the Drawings. No minus tolerance will be permitted. Rigid grade stakes shall not be driven into the select fill layer to control placement.

3.13.2 Protection

3.13.2.1 Damage

Erosion rills or other damage that occurs shall be repaired and grades re-established. Repairs to the select fill layer or topsoil layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

3.13.2.2 Stockpiles

Storage or stockpiling of material on the completed surface of the select fill or topsoil layers will not be permitted.

3.14 ACCESS ROADS

Access roads shall be constructed above the final cover layer as shown on the Drawings.

3.15 DISPOSITION OF MATERIAL

Dispose of material not suitable for landfill cover system construction resulting from demolition operations with all applicable federal, state, and local regulations as contractually specified in the Waste Management Plan.

3.16 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain or with naturally high moisture content to a satisfactory moisture content. If moisture content is less than specified, water and thoroughly mix soil to maintain a satisfactory water content capable of obtaining the required compaction. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.16.1 Compacted Soil Placement

Provide for general site. Place in lifts and compact as shown on Table 1.

3.16.3 Aggregate Base Placement

Place in one 6 inch lift over access road and compact as specified.

3.16.4 Placement of Gravel for Gas Vent

Gravel for gas vent piping shall be placed to the dimensions and/or quantity indicated on the Drawings. Care shall be exercised so as not to contaminate the gravel during the placement operations.

The gravel shall be placed to a tolerance of minus 0.00 feet to plus 0.20 feet.

3.17 SETTLEMENT MONITORING MONUMENTS

Following completion of the vegetative topsoil cover, and prior to revegetation, settlement monitoring monuments shall be installed as shown on the project Drawings. Following installation of the monuments, the location and elevation shall be surveyed and noted on the as-built Drawings.

3.18 COMPACTION

Compaction shall be as shown on Table 1.

3.18.1 General Site

Compact underneath storm drainage facilities including earthen swales, V-ditches, trapezoidal channels, rip-rap structures, and other improvement areas as required for Compacted Cover Fill in Table 1 .

3.18.2 Compaction for Existing Subgrade

Where the existing surface is the subgrade for the 2-foot thick soil cover, the existing surface shall be compacted to the degree practicable and to the satisfaction of CQA personnel .

3.18.3 Compaction for Subgrade Fill

The subgrade for the 2-foot thick soil cover shall consist of select random fill, unless the existing surface is the subgrade for the soil cover as described above.

Select random fill shall be placed a minimum of 12-inches thick over random fill. Compact select random fill as shown on Table 1.

3.18.4 Cover Soil and Vegetative Layer

Compact cover soil and vegetative layer as shown on Table 1.

3.18.5 Aggregate Base

Compact minimum 6 inch thick aggregate base to 95 percent of the maximum dry density based on ASTM D 1557.

3.19 FINISH OPERATIONS

3.19.1 Grading

All areas, including filled sections and adjacent transition areas, shall be uniformly smooth graded. The completed surface shall be reasonably smooth, and free from irregular surface changes. Finish grades as indicated within one-tenth of one foot of the grades shown on the project Drawings. All areas shall be graded to drain. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

Final surface grades will be track walked in preparation for hydroseeding. Exposed interim surfaces shall be track walked during construction as needed for erosion control.

3.19.2 Protection of Surfaces

Protect newly backfilled and graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes. Localized changes to site grades from settlement shall be maintained by additional grading, placement of small quantities of fill, and clearing of drainage pathways (Draft Final Geotechnical Investigation Report Installation Restoration Site 2, October 2012).

See Article 3.3 of Section 31 05 20 for filling above geonet.

3.20 DISPOSITION OF SURPLUS MATERIAL

The Contractor shall remove from the project site and dispose, in accordance with the Waste Management Plan and Radiological Protection Plan, surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

-- End of Section --

SECTION 31 05 20

GEOSYNTHETIC (BIOTIC) LAYER
08/08

PART 1 GENERAL

1.1 SUMMARY

Geosynthetic HDPE geonet material will serve as a biotic layer to prevent small burrowing animals from penetrating the cover.

1.2 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 1238	(2010) Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D 1505	(2010) Standard Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D 1603	(2006) Standard Test Method for Carbon Black Content in Olefin Plastics
ASTM D 4218	(1996; R 2008) Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
ASTM D 4716	(2008) Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
ASTM D 5035	(2006; R 2008e1) Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5199	(2011) Standard Test Method for Measuring Nominal Thickness of Geosynthetics

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sampling and Testing

Manufacturer's quality control manual.

SD-06 Test Reports

Geosynthetic Biotic Layer

Manufacturer's quality control test results.

1.4 QUALITY ASSURANCE

Not used.

1.5 DELIVERY, STORAGE, AND HANDLING

Ensure the biotic layer material has not been damaged during shipping, storage, or handling. Any biotic layer material found to be damaged shall be repaired or replaced. Accept delivery of material only after the required submittals have been approved. Each roll shall be labeled with the manufacturer's name, product identification, lot number, roll number, and roll dimensions.

PART 2 PRODUCTS

2.1 GEOSYNTHETIC BIOTIC LAYER

The biotic layer shall be Skaps Transnet HDPE Geonet TN 220 or approved equal. The polymer used to manufacture the geonet shall be polyethylene which is clean and free of any foreign contaminants. Regrind material which consists of edge trimmings and other scraps may be used to manufacture the geonet; however, post-consumer recycled materials shall not be used. The geosynthetic biotic layer shall conform to the property requirements listed in Table 1. Where applicable, Table 1 property values represent minimum average roll values (MARV). .

TABLE 1 - GEOSYNTHETIC BIOTIC LAYER (GEONET) PROPERTIES

PROPERTY	TEST METHOD	TEST VALUE	MINIMUM MQC TESTING FREQUENCY
Thickness, range	ASTM D 5199	220±20 mil	100,000 SF
Polymer Density, minimum	ASTM D 1505	0.940 g/cc	100,000 SF
Carbon Black Content, range	ASTM D 1603 ASTM D 4218	2-3 percent	100,000 SF
Tensile Strength, minimum, Note 1	ASTM D 5035	45 lbs/in	100,000 SF
Melt Flow, maximum, Note 2	ASTM D 1238	1 g/cm^3	100,000 SF

Note 1: MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5 percent of all the test data.
Note 2: Condition 190/2.16.

2.2 SAMPLING AND TESTING

2.2.1 Manufacturing Quality Control Testing

Manufacturing quality control test methods and frequencies shall be in accordance with Table 1 unless otherwise approved.

2.2.2 Conformance Testing

Not used.

PART 3 EXECUTION

3.1 INSTALLATION

Install under continuous observation of a qualified geosynthetics CQC.

3.1.1 Surface Preparation

Prior to placement of the geosynthetic biotic layer, the subgrade shall be smooth and free of all materials which could damage the biotic layer.

3.1.2 Placement

The geosynthetic biotic layer shall not be damaged during placement. One (1) inch is the maximum rut depth allowed. On side slopes, geotextiles shall be anchored at the top and then unrolled in the direction of maximum slope, keeping the net flat against the subgrade to minimize wrinkles and folds.

After placement, the material shall be examined to ensure that no potentially harmful objects are present.

3.1.3 Seams and Overlaps

3.1.3.1 Geonet Side Seams

Overlap geonet side seams a minimum of 12 inches on surfaces flatter than 5 horizontal to 1 vertical.

On slopes 5 horizontal to 1 vertical or steeper, side seam fastener spacing shall be a maximum of 5 feet with overlapped geonet if required to maintain overlap.

Adjoining rolls across the roll width should be shingled down in the direction of the slope and joined together with cable ties spaced every foot along the roll width if required to maintain overlap.

3.1.3.2 Geonet End Seams

Overlap geonet end seams a minimum of 1 foot. End seam fastener spacing shall be a maximum of 1 foot on slopes 5 horizontal to 1 vertical or steeper if required to maintain overlap.

3.1.3.3 Geonet Fasteners

Tie geonet rolls together with plastic fasteners. The fasteners shall be a contrasting color from the geonet and attached geotextiles. Metallic fasteners will not be allowed.

3.2 REPAIRS

3.2.1 Geonet Damage

Prior to covering the deployed geonet, each roll shall be inspected for damage resulting from construction.

Any rips, tears or damaged areas on the deployed geonet shall be patched. The patch shall be secured to the original geonet by tying every 12 inches with the approved tying devices.

Make repairs by placing a patch of the geosynthetic biotic layer over the damaged area. Extend the patch a minimum of 1 foot beyond the edge of the damage. Use approved fasteners, if necessary, spaced every 6 inches around the patch, to hold the patch in place.

3.3 PROTECTION AND BACKFILLING

The geonet shall be continually inspected by the CQC during soil cover.

Soil cover shall be placed so that it does not shift the geonet from its intended position and underlying materials are not exposed or damaged. Place cover soil from the bottom of the slope upward (for slopes of 5 horizontal to 1 vertical or greater) and shall not be dropped directly onto the biotic layer from a height greater than 3 feet. No equipment shall be operated directly on the top surface of the geosynthetic biotic layer without permission from the PQAE. The initial loose soil lift thickness shall be 12 inches. Use equipment with ground pressures no greater than 7 psi to place the first lift of soil. Cover soil compaction and testing requirements are described in Section 31 00 00 EARTHWORK.

-- End of Section --

SECTION 31 05 22

GEOTEXTILES USED AS FILTERS

08/08

PART 1 GENERAL

1.1 SUMMARY

This Specification is for a 12 ounce per square yard (oz/sy) non-woven geotextile separation layer to line the aggregate base access road and newly installed gas vent trenches.

1.2 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4354	(1999; R 2009) Standard Practice for Sampling of Geosynthetics for Testing
ASTM D 4355	(2007) Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
ASTM D 4491	(1999a; R 2009) Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(2004; R 2009) Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(2008) Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(2004) Standard Test Method for Determining Apparent Opening Size of a Geotextile
ASTM D 4759	(2011) Standard Practice for Determining the Specification Conformance of Geosynthetics
ASTM D 4873	(2002; R 2009) Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM D 6241	(2004; R2009) Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

1.3 DEFINITIONS

a. Formulation: The mixture of a unique combination of ingredients identified by type, properties and quantity. For geotextiles, a formulation is defined as the exact percentages and types of resin(s), additives and/or carbon black.

b. Manufacturing Quality Control (MQC): A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and Contract Specifications [ref. EPA/600/R-93/182].

c. Minimum Average Roll Value (MARV): For geosynthetics, a manufacturing quality control tool used to allow manufacturers to establish published values such that the user/purchaser will have a 97.7% confidence that the property in question will meet published values. For normally distributed data, "MARV" is calculated as the typical value minus two (2) standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.

d. Minimum Value: The lowest sample value from documented manufacturing quality control test results for a defined population from one test method associated with one specific property.

e. Maximum Value: The highest sample value from documented manufacturing quality control test results for a defined population from one test method associated with one specific property.

f. Separation: The placement of a flexible porous geosynthetic between dissimilar materials so the integrity and functioning of both materials can remain intact or be improved. For separation of stone base courses overlying soil subgrades this primary function simultaneously prevents the stone from intruding down into the soil and the soil from pumping up into the stone.

1.4 SUBMITTALS

SD-03 Product Data

Manufacturing Quality Control Sampling and Testing

SD-07 Certificates

Geotextile

Prior to scheduled use, manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle geotextile in accordance with ASTM D 4873. No hooks, tongs, or other sharp instruments shall be used for handling geotextile.

1.5.1 Delivery

Notify the PQA a minimum of 24 hours prior to delivery and unloading of geotextile rolls packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, immediately rewrap rolls with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Label each roll with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.5.2 Storage

Geotextile labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer’s certificate.

Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage. Geotextile may be exposed for a maximum period of 15 days.

During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.

1.5.3 Handling

Handle and unload geotextile rolls with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Geotextile

Provide geotextile that is a non-woven matching or exceeding the minimum average roll values listed in TABLE 1.

TABLE 1
MINIMUM PHYSICAL REQUIREMENTS FOR SEPARATION GEOTEXTILE

PROPERTY (1)	UNITS	ACCEPTABLE VALUES	TEST METHOD
WEIGHT	OZ/SY	12	ASTM D 5261
GRAB STRENGTH	LBS	203	ASTM D 4632
CBR PUNCTURE	LBS	440	ASTM D 6241
TRAPEZOID TEAR	LBS	79	ASTM D 4533
APPARENT OPENING SIZE	INCHES	0.024	ASTM D 4751
PERMITTIVITY	SEC -1	0.02	ASTM D 4491
ULTRAVIOLET STABILITY (2)	PERCENT	50 AT 500 HRS	ASTM D 4355

(1) All values are minimum average roll values (MARV) except AOS which is a maximum average roll value (MaxARV) and UV stability which is a minimum average value.
(2) Evaluation to be on 50 mm strip tensile specimens after 500 hours exposure.

2.1.1.2 Geotextile Fiber

Fibers used in the manufacturing of the geotextile shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polamides. Add stabilizers and/or inhibitors to the base polymer, if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. Finish the edges of the geotextile to prevent the outer fiber from pulling away from the geotextile.

2.1.1.3 Workmanship and Appearance

The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning. General manufacturing procedures shall be performed in accordance with the manufacturer’s internal quality control guide and/or documents.

2.2 MANUFACTURING QUALITY CONTROL SAMPLING AND TESTING

The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the Specification. Documentation describing the quality control program shall be made available upon request. Perform manufacturing quality control sampling and testing in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D 4354, Procedure A. Acceptance of geotextile shall be in accordance with ASTM D 4759. Tests not meeting the specified requirements will result in the rejection of applicable rolls.

2.2.1 Certification

The Contractor shall provide to the CQA, a certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the geotextile.

The manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the Specification.

Documentation describing the quality control program shall be made available upon request.

The manufacturer's certificate shall state that the finished geotextile meets the requirements of the Specification as evaluated under the manufacturer's quality control program. A person having legal authority to bind the manufacturer shall attest to the certificate.

Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Subgrade materials and compaction requirements shall be in accordance with Section 31 00 00. Prepare surface, on which the geotextile will be placed, to a relatively smooth surface condition in accordance with the applicable portion of this Specification and shall be free from obstruction, sharp stones, debris, depressions, erosion feature, or vegetation. Remove any irregularities so as to ensure continuous, intimate contact of the geotextile with all the surface. Any loose material, soft or low density pockets of material, shall be removed; erosion features such as rills, gullies, etc., shall be graded out of the surface before geotextile placement.

3.2 INSTALLATION OF THE GEOTEXTILE

3.2.1 General

Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall also be free of tensile stresses, folds, and wrinkles. On slopes steeper than 10 horizontal on 1 vertical, lay the geotextile with the machine direction of the fabric parallel to the slope direction. Place the geotextile in the manner and at the locations shown. At the time of installation, reject the geotextile if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.2.1.1 Placement

Place the geotextile with the long dimension parallel to the centerline of trench and laid smooth and free of tension, stress, folds, wrinkles, or creases. Place the strips to provide a minimum width of 12 inches of overlap for each joint. Adjust the actual length of the geotextile used based on initial installation experience. Remove the temporary anchoring as the aggregate material (specified in Section 31 00 00) is placed to relieve high tensile stress which may occur during placement of material on the geotextile. Perform trimming in such a manner that the geotextile is not damaged in any way.

3.3 PROTECTION

Protect the geotextile at all times during construction from contamination by surface runoff; remove any geotextile so contaminated and replaced with uncontaminated geotextile. Replace any geotextile damaged during its installation or during placement of aggregate base. Protect the geotextile from damage prior to and during the placement of riprap or other materials. This may be accomplished by limiting the height of drop to less than 1 foot, by placing a cushioning layer of sand or gravel on top of the geotextile before placing the material, or other methods deemed necessary. Care should be taken to ensure that the utilized cushioning materials will not impede the flow of water. Before placement of aggregate base, demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

3.4 REPAIRS

Repair torn or damaged geotextile. Clogged areas of geotextile shall be removed. Perform repairs by placing a patch of the same type of geotextile over the damaged area. The patch shall extend a minimum of 12 inches beyond the edge of the damaged area. Patches shall be continuously fastened using approved methods. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Remove and replace geotextile rolls which cannot be repaired.

-- End of Section --

SECTION 31 11 00

CLEARING
November 2011

PART 1 GENERAL

1.1 SUMMARY OF WORK

Work includes:
a. Clear site vegetation to ground surface.
b. Remove designated trees to soil line.
c. Produce and stockpile onsite mulch derived from cleared vegetation and trees.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Protection shall be in accordance with the Environmental Protection Plan. Trees and vegetation to be left standing shall be protected from damage incidental to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Not used.

3.1.4 Species and Habitat

The Contractor is to implement substantive provisions of California Fish and Game Code 3511 and 2080. "Prior to any site clearing or excavation during the breeding season (March 1 through September 30), a TetraTech biologist will survey the area to determine the presence of migratory birds and to locate any active nests. The survey will be performed within 72 hours of the start of any ground-disturbance activities. If nests are found, the birds will be allowed to fledge before excavation. If this is not possible, the eggs/chicks will be taken to a licensed wildlife rehabilitator for captive rearing. The Navy will consult with the US Fish and Wildlife. Approval from the US Fish and Wildlife is not required before proceeding with CERCLA remedy" (August 2011, KCH, Intermediate Draft Remedial Design Report Installation Restoration Site 2, Page 5-2).

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing.

3.3 GRUBBING

Due to radiological concerns, activities that may expose radiological materials are prohibited.

3.4 MULCHING

Cleared vegetation shall be passed through a tub grinder or equivalent process. The resulting debris shall be a mulch that can be placed two feet below the final cover subgrade (See Section 31 00 00).

3.5 DISPOSAL OF MATERIALS

Remove from the project site and dispose, in accordance with the Waste Management Plan, Radiological Work Plan, and Radiological Protection Plan of timber, scrub, vegetation, and debris which cannot be utilized as mulch material. Burning will not be permitted.

-- End of Section --

SECTION 31 21 00

PIPING; OFF-GAS
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z400.1/Z129.1	(2004) Hazardous Industrial Chemicals - Material Safety Data Sheets - Preparation

ASTM INTERNATIONAL (ASTM)

ASTM D 1598	(2002; R 2009) Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
ASTM D 1784	(2008) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2241	(2009) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2467	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(2004; R 2009e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2672	(1996a; R 2009) Joints for IPS PVC Pipe Using Solvent Cement
ASTM D 3892	(1993; R 2009) Packaging/Packing of Plastics
ASTM D 3915	(2006) Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Pressure Applications
ASTM F 442/F 442M	(2009) Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)

ASTM F 656	(2010) Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25	(2008) Standard Marking System for Valves, Fittings, Flanges and Unions

1.2 SYSTEM DESCRIPTION

The off-gas piping system shall consist of buried PVC pipe, pipe supports, fittings, equipment and accessories.

1.4 SUBMITTALS

SD-03 Product Data

Material Safety Data Sheet

Material safety data sheet in conformance with ANSI Z400.1/Z129.1 for solvents, solvent cements, or glues used in pipe connections.

1.5 QUALITY ASSURANCE

1.5.1 Contractor Qualifications

Not used.

1.5.2 Single Source Supplier

Not used.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Packaging

Plastic pipe shall be packed, packaged and marked in accordance with ASTM D 3892.

1.6.3 Storage

Pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Piping bundles shall be stored on a prepared surface and should not be stacked more than two bundles high.

1.7 SEQUENCING AND SCHEDULING

Not used.

1.8 EXTRA MATERIALS

Not used.

1.9 MAINTENANCE SERVICE

Not used.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Provide materials and equipment that are new and unused.

2.1.1 Standard Products

Provide material and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Pipe, valves, fittings and appurtenances shall be supported by a service organization.

2.1.2 Identification

Each piece of pipe shall bear the ASTM designation and the ASTM markings required for that designation. Each valve shall be marked in accordance with MSS SP-25 to identify the manufacturer, size, pressure rating, body disc and seat material. Securely attach a tag with the manufacturer's name, catalog number and valve identification.

2.2 DESIGN STRENGTH

Pipe shall have an SDR value of 17.

2.3 STEEL PIPE

Not used.

2.4 COPPER TUBING

Not used.

2.5 POLYVINYL CHLORIDE (PVC) PIPING

Design and fabrication of below grade components of the off-gas piping system shall be in accordance with ASTM D 2513 except as modified herein.

2.5.1 PVC Pipe

Pipe shall be in accordance with ASTM F 442/F 442M, ASTM D 2241, SDR 17. Materials shall conform to ASTM D 3915, ASTM D 1784, Type IV, Grade 1, rigid (23447-B). The maximum eccentricity of the inside and outside circumferences of the pipe walls shall be 12 percent. Pipe shall be provided which does not fail, balloon, burst, or weep as defined in ASTM D 1598.

2.5.2 PVC Joints

Joints shall be pressure rated solvent cemented bell joints in accordance with ASTM D 2672 except where flanged or threaded fittings are required at expansion joints, valves, flowmeter, equipment connections or otherwise shown. Flanges shall be joined to pipe by solvent cementing. Primer shall conform to ASTM F 656. Solvent cement shall conform to ASTM D 2564.

2.5.3 PVC Fittings

Fittings shall be in accordance with ASTM D 2467.

2.6 HIGH DENSITY POLYETHYLENE (HDPE) PIPING

Not used.

2.7 REINFORCED EPOXY RESIN PIPING

Not used.

2.8 DUCT SYSTEMS

Not used.

2.9 FLANGED CONNECTIONS

Not used.

2.10 EQUIPMENT AND APPURTENANCES

Not used.

2.11 FACTORY TESTS

Not used.

PART 3 EXECUTION

3.1 EXAMINATION

Not used.

3.2 MANUFACTURER'S REPRESENTATIVE

Not used.

3.3 CONDENSATE CONTROL

Not Used

3.4 PRESSURE REGULATOR AND METER INSTALLATION

3.4.1 Vents

Locate discharge stacks, vents, or outlet ports as shown on Drawings.

3.5 INSTALLING PIPE UNDERGROUND

Installation shall conform to the lines, grades, details, and notes shown on the Drawings, and as referenced in these Specifications.

3.5.1 Excavation

Excavation of the existing subgrade for the gas vent shall be performed prior to placement of the gravel. The Contractor shall survey the location of the gas vent to ensure that the gravel bedding is as reflected on the Drawings.

Placement of the gravel material will not be allowed until the survey information has been submitted to the CQC.

3.5.2 Pipe Installation

Pipe shall be placed on a 2-inch thick bedding layer composed of approved gravel with the slots positioned as indicated on the Drawings.

All pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer. The pipe shall lay free on the base with no induced strain. Where there is evidence of induced pipe strain, the Contractor shall be required to eliminate the strain. The Contractor shall also remove and replace any fitting which induces a torque or strain to the pipe.

All pipe shall be cut, in a manner so as to ensure square ends. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.

Installation of fittings and joints shall conform to manufacturer's recommendations.

Slotted pipe may be joined with compatible couplings secured with round head self-tapping screws, flexible band seal couplings. Joints for solid riser pipe shall be joined as recommended by the manufacturer. All caps shall be solvent welded unless otherwise indicated on the Drawings.

The pipe shall not be concealed until a final record survey has been completed and the CQC has approved the pipe installation.

Pipe and fittings shall be held firmly in position and protected from damage while drainage gravel or backfill is being placed. All pipe and fittings shall be clean upon installation and kept so during the progress of the work.

Any pipe that becomes either partially or fully clogged and/or damaged before final acceptance shall be cleaned/repaired to the satisfaction of the PQA and/or replaced.

3.5.3 Magnetic Tape

Not used.

3.5.4 Pipe Coatings

Not used.

3.6 INSTALLING PIPE ABOVEGROUND

Existing above-ground vent risers will be left in place, if possible; otherwise they will be replaced using same alignment following cover construction. Anti-perch devices will be installed on all risers.

3.7 JOINTING PIPE

Not used.

3.8 CONNECTIONS

Not used.

3.9 PRESSURE AND LEAKAGE TESTS

Not used.

-- End of Section --

SECTION 31 32 11

SOIL SURFACE EROSION CONTROL
April 2011

PART 1 GENERAL

1.1 MEASUREMENT AND PAYMENT

NOT USED.

1.2 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 2844	(2007) Resistance R-Value and Expansion Pressure of Compacted Soils
ASTM D 3776/D 3776M	(2009a) Standard Test Method for Mass Per Unit Area (Weight) of Fabric
ASTM D 3787	(2007) Bursting Strength of Textiles - Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D 3884	(2009) Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
ASTM D 4354	(1999; R 2009) Sampling of Geosynthetics for Testing
ASTM D 4355	(2007) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D 4439	Standard Terminology for Geotextiles
ASTM D 4491	(1999a; R 2009) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(2004; R 2009) Trapezoid Tearing Strength of Geotextiles
ASTM D 4595	(2009) Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(2008) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(2004) Determining Apparent Opening Size of a Geotextile

ASTM D 4759	(2002; R 2007) Determining the Specification Conformance of Geosynthetics
ASTM D 4833	(2007) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4972	(2001; R 2007) pH of Soils
ASTM D 4873	(2002; R 2009) Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM D 5034	(2009) Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM D 5035	(2006; R 2008e1) Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5268	(2007) Topsoil Used for Landscaping Purposes
ASTM D 570	(1998; R 2005) Standard Test Method for Water Absorption of Plastics
ASTM D 5852	(2000; R 2007) Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
ASTM D 6461	(1999; R 2007e2) Standard Specification for Silt Fence Materials
ASTM D 6462	(2003; R 2008) Standard Practice for Silt Fence Installation
ASTM D 6475	Standard Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets
ASTM D 648	(2007) Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM D 6524	(2006) Standard Test Method for Measuring the Resiliency of Turf Reinforcement Mats
ASTM D 6525	(2006)Standard Test Method for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products
ASTM D 6566	(2006) Standard Test Method for Measuring Mass per Unit Area of Turf Reinforcement Mats
ASTM D 6567	(2006) Standard Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM)

ASTM D 6575	(2006)Test Method for Determining Stiffness of Geosynthetics Used as Turf Reinforcement Mats (TRMs)
ASTM D 6629	(2001; R 2007) Selection of Methods for Estimating Soil Loss by Erosion
ASTM D 6818	Standard Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats
ASTM D 977	(2005) Emulsified Asphalt

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(1940; R 1988; R 1998) Federal Seed Act

1.3 SYSTEM DESCRIPTION

The work consists of furnishing and installing soil surface erosion control materials, including fine grading, blanketing, stapling, mulching and miscellaneous related work, within project limits and in areas outside the project limits where the soil surface is disturbed from work under this Contract at the designated locations. This work includes all necessary materials, labor, supervision and equipment for installation of a complete system. Coordinate this section with the requirements of Section 31 00 00 EARTHWORK.

1.3.1 Definitions

a. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.

b. Typical Roll Value: Property value calculated from average or mean obtained from test data.

c. Rolled Erosion Control Product (RECP) - A temporary degradable or long-term non-degradable material manufactured or fabricated into rolls designed to reduce soil erosion and assist in the growth, establishment and protection of vegetation.

d. Turf Reinforcement Mat (TRM) - A long-term, non-degradable RECP composed of UV-stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three-dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature natural vegetation. TRMs provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix.

1.4 SUBMITTALS

Approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Erosion Control Blanket

Hydroseed

Hydromulch

Fiber Rolls

Silt Fence

SD-07 Certificates

Seed Mixes
State certification and approval for seed.

Erosion Control Blanket Certification

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

For items listed in this section:

a. Certification of origin including the name, address and telephone number of manufacturer.

1.5 REGULATORY REQUIREMENTS

According to page 21 of the Record of Decision (ROD), "CERCLA §121(d)(1) and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations with are collectively referred to as ARARs, unless such ARARs are waiver under 121(d)(4) of §CERCLA."

1.5.1 State ARARs for State and Regional Water Quality Control Boards

Water Quality Control Plan for the San Francisco Bay Basin Chapters 2 and 3 (California Water Code 13240), except for municipal beneficial use designation, describes water quality objectives including narrative and numerical standards, and incorporates statewide water quality control plans and policies. The beneficial uses for the East Bay subbasin are agricultural supply, industrial service supply and industrial process supply. These also apply to the shallow groundwater system at Alameda Point. The narrative standard requiring that all waters be maintained free of toxic substances in concentrations that are lethal to or that produce other harmful responses in aquatic organisms, and that there shall be no acute toxicity or chronic toxicity in ambient waters is an ARAR for groundwater.

The Navy accepts the substantive provisions of 13241, 13243, 13262(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, Water Quality Orders, waste discharge requirements, and promulgated policies of the Basin Plan for the San Francisco Bay Region.

SWRCB Resolution 88-63 (Sources of Drinking Water Policy) designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids exceed 3,000 milligrams per liter, and it is not reasonably expected by the Water Board to supply a public water system.

The project has been designed to minimize/eliminate any potential impact on local wetlands areas. The substantive provisions of the following are accepted as ARARs for implementing California Toxics Rule and National Toxics Rule and for point source discharge of groundwater to surface water that may be necessary: Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Inland Surface Waters Plan) (SWRCB 2000a), Sections 1.3 and 1.4.

1.5.2 Federal ARARs for Clean Water Act

The substantive numeric standards in the California Toxics Rule (40 CFR 131.38) and National Toxics Rule (40 CFR 131.36(b)) are ARARs for surface water and will be met in the surface water offshore of IR Site 2R, at the interface of the groundwater and the Bay.

1.5.3 State ARARs for California Endangered Species Act, California Fish and Game Code

Substantive provisions of California Fish and Game Code 5650(a), (b), and (f) are relevant and appropriate. Any removal action taking place in an area that may impact waters of the state will be conducted in such a way as to ensure that materials dug up will not be released into the waters of the state. Action must be taken if toxic materials are placed where they can enter waters of the state.

Within the San Francisco Bay Coastal Zone (activities affecting the San Francisco Bay and 100 feet landward of the shoreline) construction will be conducted to reduce fill and disposal of dredged material in the San Francisco Bay, maintain marches and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay. Construction shall be conducted in accordance with the substantive provisions of the Coastal Zone Management Act and San Francisco Bay Plan (an approved state management program).

1.5.4 Dewatering

Substantive provisions of Title 33 of the United States Code, Chapter 26, Section 1311(b)(2) and Clean Water Act 301(b) are applicable for point source discharges of groundwater to surface water in San Francisco Bay associated with any dewatering activities. Effluent limitations are to meet Best Conventional Pollution Control Technology and Best Available Technology standards to the extent economically feasible.

1.6 INTERIM EROSION AND STORM WATER CONTROL

The Contractor will be responsible for selecting and implementing temporary erosion and stormwater controls during construction in compliance with the State Water Resources Control Board adopted Order No. 2009-0009-DWQ (Waste

Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activities and Land Disturbance Activities) and the project Storm Water Pollution Control Plan .

These Specifications address permanent erosion and stormwater controls to be left in place upon completion. It is the intent of these Specifications that at the conclusion of the Contract, the site will be protected with newly installed erosion control improvements. However, interim erosion control features installed during the latter phases of the project may be considered and compensated as final, at the discretion of the Engineer, if the components are deemed to be in suitable and undamaged condition.

1.6.1 Federal ARARs for Erosion Control

The final cover shall be constructed to promote drainage and minimize erosion or abrasion of the cover (22 CCR 66264.310(a)(3)).

Collection and holding facilities associated with precipitation and drainage control systems shall be emptied immediately or otherwise managed to maintain system design capacity (27 CCR 20365(c) and (d), 21090(c)(4) and 21150).

1.6.2 Federal ARARs for Storm Water

The Contractor is to meet general requirements for a storm water management plan and implementation of best management practices per 40 CFR 122.44(k)(2) and (4). Substantive provisions are applicable for the excavation of waste during removal of radiological hot spots prior to placing the multilayer soil cover and for ground-disturbing activities.

1.6.3 Federal ARARs for Dredged Material

Discharge of dredged or fill material into wetlands is prohibited without a permit (33 United States Code 1344). In the event that dredged material needs to be discharged to waters of the United States, discharges of dredged material to waters of the United States including adjacent wetlands shall be done in compliance with substantive provisions of the following: 33 CFR 320.4, 40 CFR 230.10, 230.11, 230.20-230.25, 230.31, 230.32, 230.41, 230.42 and 230.53.

1.6.4 ARARs for Storage

The Contractor may need to temporarily store waste. Storage shall be done in compliance with ARARs.

Keep incompatible materials separate for storage of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere. Separate incompatible materials stored near each other by a dike or other barrier (22 CCR 66264.177). At closure, remove all hazardous waste and residues from the containment system and decontaminate or removal all containers and liners (22 CCR 666264.178). The substantive provisions are ARARs for handling small amounts of waste generated during construction (for example, the construction of new groundwater monitoring wells or other investigation derived waste). The requirements are applicable if waste is determined to be RCRA hazardous or non-RCRA, state-regulated hazardous waste. These requirements are relevant and appropriate for solid waste that is designated or nonhazardous solid waste.

Inspect container storage weekly for deterioration (22 CCR 66264.174).

Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system (22 CCR 66264.175(a) and (b)).

On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with 22 CCR 262.171-178 or in tanks, on drip pads, inside building, and is labeled and dated.

Containers of RCRA hazardous waste must be maintained in good condition, compatible with hazardous waste to be stored, and closed during storage, except to add or remove waste (22 CCR 66264.171, 66264.172, 66264.173).

1.7 QUALITY ASSURANCE

1.7.1 Installer's Qualification

Not Used

1.7.2 Substitutions

Not Used

1.7.3 Sustainable Design Requirements

NOT USED.

1.7.4 Erosion Control Blanket Turf Reinforcement Mat

a. Acceptance shall be based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.

b. Quality Assurance Sampling and Testing will be waived for ISO 9001:2000 Certified Manufacturing Facilities. Documentation of ISO 9001:2000 Certification shall be provided upon request.

1.8 DELIVERY, STORAGE, AND HANDLING

Store materials in designated areas and as recommended by the manufacturer for protection from the elements, direct exposure, and damage. Do not drop containers from trucks. Material shall be free of defects that would void required performance or warranty. Deliver geosynthetic binders and synthetic soil binders in the manufacturer's original sealed containers and store in a secure area.

a. Furnish erosion control blankets in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Label erosion control blanket and geotextile fabric rolls to provide identification sufficient for inventory and quality control purposes.

1.8.1 Rolled Erosion Control Product (RECP)

a. RECP labeling, shipment and storage shall follow ASTM D 4873.

b. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

c. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

d. Each RECP roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

e. The protective wrapping shall be maintained during periods of shipment and storage.

f. During storage, RECP rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the RECP.

PART 2 PRODUCTS

2.1 RECYCLED PLASTIC

NOT USED.

2.2 BINDERS

2.2.1 Synthetic Soil Binders

Calcium chloride, or other standard manufacturer's spray on adhesives designed for dust suppression.

2.2.2 Geosynthetic Binders

NOT USED.

2.3 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.3.1 Straw

Not Used

2.3.2 Hay

NOT USED.

2.3.3 Wood Cellulose Fiber

Wood cellulose fiber shall be 100 percent recycled material and shall not contain any growth or germination-inhibiting factors and shall be dyed with non-toxic, biodegradable dye of an appropriate color to facilitate placement during application. Composition on air-dry weight basis: a minimum 9 to a maximum 15 percent moisture, and between a minimum 4.5 to a maximum 6.0 pH. Wood cellulose fiber shall not contain environmentally hazardous levels of heavy metals.

2.3.4 Paper Fiber

Paper fiber shall comply with 2010 Caltrans Standard Specifications Section 21-1.02E.

2.3.5 Shredded Bark

Not used.

2.3.6 Wood By-Products

Not used.

2.3.7 Coir

Not used.

2.3.8 Asphalt Adhesive

Not used.

2.3.9 Mulch Control Netting and Filter Fabric

Not used.

2.3.10 Hydraulic Mulch

Hydraulic mulch shall have the following mixture characteristics:

CHARACTERISTIC (typical)	VALUE
Conwed 1000 Wood Fiber	2,000 lbs/acre
Ecology Controls M-Binder/Tack	100 lbs/acre
Biosol Forte 7-2-1 Organic fertilizer	800 lbs/acre
AM-120 Mycorrhizal inoculum	60 lbs/acre
Tri-C Soluble Humate	1/lb/acre

2.3.11 Tackifier

Ecology Controls M-Binder/Tack

2.3.12 Dye

Dye shall be a water-activated, green color. Pre-package dye in water dissolvable packets in the hydraulic mulch.

2.4 GEOTEXTILE FABRICS

Not used.

2.5 EROSION CONTROL BLANKETS

2.5.1 Erosion Control Blankets Type I

Not used.

2.5.2 Erosion Control Blankets Type II

Not used.

2.5.3 Erosion Control Blankets Type III

Not used.

2.5.4 Erosion Control Blankets Type IV

Not used.

2.5.5 Erosion Control Blankets Type V

Not used.

2.5.6 Erosion Control Blankets Type VI

Not used.

2.5.7 Erosion Control Blankets Type VII

Not used.

2.5.8 Erosion Control Blankets Type VIII

Not used.

2.5.9 Erosion Control Blankets Type IX

Not used.

2.5.10 Erosion Control Blankets - Turf Reinforcement Mat (TRM)

1. Three-dimensional, lofty woven polypropylene geosynthetic specially designed for erosion control applications on steep slopes and vegetated waterways.

2. Matrix composed of monofilament yarns woven into uniform configuration of resilient pyramid-like projections.

3. Material to exhibit very high interlock and reinforcement capacity with both soil and root systems and demonstrate high tensile modulus.

4. Minimum Average Roll Values:

Property	Test Method	Value	Units
Thickness	ASTM D 6525	0.25	in
Resiliency	ASTM D 6524	70	percent
Mass Per Unit Area	ASTM D 6566	7.5	oz/sq yd
Tensile Strength	ASTM D 6818	2000 x 1800	lb/ft
Tensile Elongation	ASTM D 6818	50	max percent
Tensile Strength	ASTM D 4595	259.2	lbs/ft
Light Penetration (% Passing)	ASTM D 6567	50 (max)	percent
Moisture Absorption	ASTM D 570	0.01 (max)	percent
UV Resistance(1)	ASTM D 4355	90 at 3,000 hours	percent

NOTE 1: Photodegradable life a minimum of 36 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 1:1 gradient.

5. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geosynthetic, at frequency exceeding ASTM D 4354, with following minimum acceptable testing frequency:

Property	Test Frequency (sq yd)
Mass Per Unit Area	1/24,000
Tensile Strength	1/24,000
Tensile Elongation	1/24,000
Light Penetration (% Passing)	1/24,000

2.5.11 Erosion Control Blankets Type XI (Re-vegetation Mat)

Not used.

2.5.12 Seed

2.5.12.1 Classification

Provide State-certified seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weed seed content, and inert material. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on site in the presence of PQA.

2.5.12.2 Planting Dates

Apply seed between September 1 to March 1.

2.5.12.2.1 Seed Purity

Not used.

2.5.12.2.2 Seed Mixture by Weight

Botanical Name	Common Name	Seeding Rate (PLS lbs/ac)	Source
Bromus carinatus	California “Bay Area” Brome	8	Alameda County
Elymus glaucus "Bay Area"	”Bay Area” Blue Wildrye	6	Alameda County
Hordeum brachyantherum-	Meadow Barley	6	Contra Costa County
Eschscholzia californica-	California Poppy	1.5	Monterey County
Clarkia purpurea-	Wine Cup Clarkia	0.75	Northern Cal Native
Achillea millefolium-	White Yarrow	0.5	Santa Clara County
Eriogonum parvifolium	Sea Cliff Buckwheat	0.75	San Mateo County
Artemisia douglasiana	Mugwort	0.50	Santa Clara County
Euthamia occidentalis	Western Golden Rod	0.10	Santa Clara County
Acmispon glaber-	Lotus/Deerweed	4.0	Santa Clara County
Mimulus aurantiacus	Sticky Monkey Flower	0.15	Santa Clara County
Mimulus guttatus	Seepspring Monkey Flower	0.05	Cental California Coast
Grindelia stricta	Coastal Gumweed	1.0	Alameda County
Sisyrinchium bellum	Blue Eyed Grass	1.5	San Mateo County

2.5.13 Staking

Not used.

2.5.14 Staples

Not used.

2.5.15 Erosion Control Blanket Metal Pin Ground Anchors

Metal pins shall be steel, with a minimum diameter of 0.2 inches and 12 inches in length. Metal pins installed in the anchor trenches in the creek shall be 36 inches in length. Pins shall be installed with a 1.5 inch steel washer as shown on plans.

2.6 SYNTHETIC GRID AND SHEET SYSTEMS

Not used.

2.7 ARTICULATING CELLULAR CONCRETE BLOCK SYSTEMS

Not used.

2.8 FERTILIZER

2.9.1 Hydroseeding Fertilizer

Hydroseeding fertilizer shall be Biosol Forte 7-2-1 (slow-release) per subparagraph 2.3.10 in Section 31 32 11.

2.9 WATER

Unless otherwise directed, water is the responsibility of the Contractor per subparagraph 01 11 00(b) of Section 01 11 00. . The source of water shall be approved by PQA.

2.10 FIBER ROLLS

Fiber rolls material shall meet Caltrans Standard Specification Section 21-1.02P – Fiber Rolls.

2.11 SILT FENCE

Silt fence fabric shall meet standards in ASTM D 6461.

2.12 GRAVEL BAGS

Gravel bags shall meet Caltrans Standard Specification Section 13-5.02G – Gravel Filled Bags.

PART 3 EXECUTION

3.1 WEATHER CONDITIONS

Perform erosion control operations under favorable weather conditions; when excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped as directed. When special conditions warrant a variance to earthwork operations, submit a revised construction schedule for approval. Do not apply erosion control materials in adverse weather conditions which could affect their performance.

3.1.1 Finished Grade

Verify that finished grades are as indicated on the Drawings; complete finish grading and compaction in accordance with Section 31 00 00 EARTHWORK, prior to the commencement of the work. Verify and mark the location of underground utilities and facilities in the area of the work. Repair damage to underground utilities and facilities.

3.1.2 Placement of Erosion Control Blankets

Before placing the erosion control blankets, ensure the subgrade has been graded smooth; has no depressed, void areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter. Vehicles will not be permitted directly on the blankets.

a. Grade and compact areas to be treated with RECP and compacted as indicated or as directed by Engineer.

b. Remove large rocks, soil clods, vegetation, and other sharp objects that could keep RECP from intimate contact with subgrade.

c. Prepare seedbed by loosening 50 to 75 mm (2 to 3 in) of soil above final grade.

d. Select and apply seed, topsoil, and hydromulch in accordance with to scarified surface prior to installation of RECP. The topsoil Specification is in Section 31 00 00 Earthwork.

e. Construct an anchor trench as shown on Drawing sheet D-2.

f. Anchor trenches will be 24 inches deep along creeks with 36-inch length metal pin anchors inside the trench. Anchor trenches at the toe of the slope outside of creek areas shall be 12 inches deep with 12-inch length metal pins as shown on plans.

3.1.3 Synthetic Grid

Not used.

3.1.4 Concrete Cellular Block

Not used.

3.1.5 Soil Conditioner Application Rates

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site.

3.1.6 Fertilizer Application Rates

Hydroseeding fertilizer shall be applied at rates stated in subparagraph 2.3.10 in Section 31 32 11.

3.2 SITE PREPARATION

Provide soil preparation (including soil conditioners as required), fertilizing, seeding, and surface topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.2.1 Soil Test

See Section 31 00 00 Earthwork.

3.2.2 Layout

Erosion control material locations may be adjusted to meet field conditions. When soil tests result in unacceptable particle sizes, a shop Drawing shall be submitted indicating the corrective measures.

3.2.3 Protecting Existing Vegetation

Not used.

3.2.4 Obstructions Below Ground

When obstructions below ground affect the work, submit shop Drawings showing proposed adjustments to placement of erosion control material for approval.

3.3 INSTALLATION

3.3.1 Synthetic Binders

Not used.

3.3.2 Seeding

3.3.2.1 Seed Application Seasons and Conditions

Immediately before seeding, restore soil to proper grade. Do not seed when ground is muddy frozen, snow covered, or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above seeding dates or conditions, submit a written request to PQA stating the special conditions and proposed variance.

3.3.2.2 Seed Application Method

Seeding method shall be hydroseeding or broadcasting, as shown on plans. The application rate shall be single step

3.3.2.2.1 Hydroseeding

First, mix water and fiber. Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. Fiber shall be added at 2,000 pounds, dry weight, per acre. Then add and mix seed, binder, inoculants, fertilizer, and remainder of mulch to produce a homogeneous slurry. Seed shall be mixed to ensure broadcasting at the rate shown in Section 2.5.12.2.2. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

3.3.2.2.2 Broadcast Seed and Mulch Application

Not Used

3.3.2.2.3 Broadcast and Drop Seeding

Not Used

3.3.3 Mulch Installation

Not Used

3.3.4 Mulch Control Netting

NOT USED.

3.3.5 Mechanical Anchor

NOT USED.

3.3.6 Asphalt Adhesive Tackifier

NOT USED.

3.3.7 Non-Asphaltic Tackifier

NOT USED.

3.3.8 Asphalt Adhesive Coated Mulch

NOT USED.

3.3.9 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Apply wood cellulose fiber, paper fiber, or recycled paper as part of the hydraulic mulch operation.

3.3.10 Hydraulic Mulch Application

3.3.10.1 Unseeded Area

NOT USED.

3.3.10.2 Seeded Area

For hydraulic seeded areas, apply mulch at the rate per manufacturer recommendation with the seed and fertilizer, and at the rate per manufacturer recommendation in a second application of mulch only.

3.3.11 Erosion Control Blankets

3.3.11.1 In Areas of Concentrated Surface Water Flow Labeled as Turf Reinforcement Mat on Plans.

a. Install RECP at elevation and alignment indicated on plans.

b. Secure into trench with anchoring devices, backfill, and compact with specified soil or as directed by Engineer.

c. Unroll RECPs downslope, overlapping adjacent rolls minimum 75 mm (3 in). Lay material loosely, maintaining direct contact with soil.

d. Secure RECP to slope with one ground anchoring device (metal pin) per square yard.

e. Alternate installation methods must be approved by Engineer prior to execution.

f. Where applicable soil fill and seed the RECP:

1. Spread and lightly rake 12 to 20 mm (0.5 to 0.8 in) of protective layer soil into RECP to completely fill its thickness. See Section 31 00 00 Earthwork for protective layer soil Specification.

2. When using lightweight power equipment to fill RECP, avoid sharp turns. Do not drive tracked or heavy equipment over RECP.

3. Smooth out soil by barely exposing top portion of RECP. Do not place excessive soil above material.

4. Broadcast additional seed or mulch above soil-filled mat and water.

3.3.12 Synthetic Sheet System

NOT USED

3.3.12.1 Sheet System Revegetation

NOT USED.

3.3.12.2 Sheet System Grids

NOT USED.

3.3.12.3 Sheet System Seeding

NOT USED.

3.3.12.4 Grid System Grids

NOT USED.

3.3.13 Grids

3.3.13.1 Grid System Revegetation

NOT USED.

3.3.13.2 Synthetic Grids

NOT USED.

3.3.13.3 Grid System Seeding

NOT USED.

3.3.14 Articulating Cellular Concrete Block System Installation

NOT USED.

3.3.14.1 Concrete Grout

NOT USED.

3.3.14.2 Toe Protection

NOT USED.

3.3.14.3 Backfilling Cellular Block System

NOT USED.

3.3.14.4 Block System Revegetation

NOT USED.

3.3.14.5 Seeding, Fertilizing, Mulching

Install seed, topsoil, and hydromulch above erosion control blanket areas.

3.3.14.5.1 Sediment Fencing

Install posts at the spacing indicated on Drawings and at an angle between 2 degrees and 20 degrees towards the potential silt load area. Sediment fence height shall be approximately 16 inches. Do not attach filter fabric to existing trees. Secure filter fabric to the post and wire fabric using staples, tie wire, or hog rings. Imbed the filter fabric into the ground as indicated on Drawings. Splice filter fabric at support pole using a 6 inches overlap and securely seal.

3.4 FIBER ROLLS

Fiber rolls material shall be installed to meet the 2010 Caltrans Standard Specification Section 21-1.02P – Fiber Rolls.

3.5 SILT FENCE

Silt fence shall be installed to meet ASTM D 6462.

3.6 GRAVEL BAGS

Gravel bags shall be installed as shown on the plans and to meet the 2010 Caltrans Standard Specification Section 13-10.03C – Temporary Gravel Bag Berms.

3.7 CLEAN-UP

Dispose of excess material, debris, and waste materials offsite at an approved landfill or recycling center. Clear adjacent paved areas.

Immediately upon completion of the installation in an area, protect the area against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.8 WATERING SEED

Start watering immediately after installing erosion control blanket type XI (revegetation mat). Apply water to supplement rainfall at a sufficient rate to ensure moist soil conditions to a minimum 1 inch depth. Prevent run-off and puddling. Do no drive watering trucks over turf areas, unless otherwise directed. Prevent watering of other adjacent areas or plant material.

-- End of Section --

SECTION 32 31 13

CHAIN LINK FENCES AND GATES
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fence Assembly

Location of Gate, Corner, End, and Pull Posts

Gate Assembly

Gate Hardware and Accessories

SD-03 Product Data

Zinc Coating

Fabric

Stretcher Bars

Concrete

1.3 ASSEMBLY AND INSTALLATION INSTRUCTIONS

Submit manufacturer's erection/installation Drawings and instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.5 QUALITY ASSURANCE

1.5.1 Required Report Data

Submit reports listing chain-link fencing and accessories regarding weight in ounces for zinc coating and chemical composition and thickness of aluminum alloy coating.

1.5.2 Certificates of Compliance

Not Used

PART 2 PRODUCTS

2.1 GENERAL

Provide fencing materials conforming to the requirements of Section 80-3.02 of the 2010 Caltrans Standard Specifications.

Submit manufacturer's data indicating percentage of recycled material content in protective fence materials, including chain link fence, fabric, and gates to verify affirmative procurement compliance.

PART 3 EXECUTION

3.1 GENERAL

Ensure final grading and established elevations are complete prior to commencing fence installation.

Install chain link fence in conformance with Section 80-3.03 of the 2010 Caltrans Standard Specifications.

3.15 TOLERANCES

Provide posts that are straight and plumb within a vertical tolerance of 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

3.16 SITE PREPARATION

3.16.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing. Establish a graded, compacted fence line prior to fencing installation.

3.17 FENCE INSTALLATION

Install fence on prepared surfaces to line and grade indicated. [Secure fastening and hinge hardware in place to fence framework by peening or welding. Allow for proper operation of components. Coat peened or welded areas with a repair coating matching original coating.] Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

3.18 ACCESSORIES INSTALLATION

3.18.2 Padlocks

Provide padlocks for gate openings and provide chains that are securely attached to gate or gate posts. Provide padlocks keyed alike, and provide two keys for each padlock.

3.19 GROUNDING

Not Used - if site conditions warrant grounding of fence consult engineer.

3.20 SECURITY

Install new security fencing, remove existing security fencing, and perform related work to provide continuous security for facility. Schedule and fully coordinate work with Contracting Officer and cognizant Security Officer.

3.21 CLEANUP

Remove waste fencing materials and other debris from the work site.

-- End of Section --

SECTION 33 24 13

MONITORING PROBES
08/08

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

Provide groundwater monitoring wells and landfill gas monitoring probes, including drilling, casing, screen, gravel packing, grouting, development, monitoring device, and incidental-related work complete and ready for operation.

1.2 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 150	(2009) Standard Specification for Portland Cement
ASTM D 1785	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2488	(2009a) Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 5092	(2004e1) Design and Installation of Ground Water Monitoring Wells in Aquifers

FORESTRY SUPPLIERS INC. (FSUP)

FSUP 77341	(1999) Munsell (R) Soil Color Charts

GEOLOGICAL SOCIETY OF AMERICA (GeoSA)

GSA RCC00100R	(1980) Rock Color Chart

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Change 1-2010; Change 3-2010; Errata 1-2010) Safety and Health Requirements Manual

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600-4-89-034	(1990) Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells

1.3 SYSTEM DESCRIPTION

1.3.1 Groundwater Monitoring Wells

Not used.

1.3.2 Landfill Gas Monitoring Probes

Construct each monitoring probe to yield chemically representative landfill gas samples of the screened interval for chemical analysis. The screened interval is that portion of a monitoring probe which is directly open to the landfill waste by way of openings in the probe screen and indirectly open to the landfill waste by way of the gravel pack (or other permeable material) extending continuously below and/or above the screen.

1.4 INSTALLATION PLAN

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Proposed method of drilling

SD-02 Shop Drawings

Installation Diagrams

As-built installation diagram for each monitoring well and probe installed, prepared by the geologist/engineer present during well/probe installation operations, within 10 working days of the completion of the well installation procedure.

Survey Maps and Notes

Survey maps and notes, including a tabulated list of all monitoring wells, probes, and monuments, copies of all field books, maps showing the locations, and elevations of all monitoring wells and probes, and all computation sheets within 10 working days after completion of the survey.

SD-03 Product Data

Well seal materials

Borehole Logs

Original borehole logs, within 10 working days after completion of the boring and well installation procedures.

Installation Diagrams

Installation diagram for each monitoring well and probe within 10 working days of the completion of the installation.

Project Photographs

Photographs taken before, during, and after completion of the work, of each well/probe installation.

Monitoring Wells and Probes

Catalog data for monitoring well/probe screens (to include the screen slot size), casing, riser pipe, filter pack material, bentonite, cement, centralizers, surface protective covers, locking caps, airline oil filters for pneumatic drilling, dedicated sampling equipment, and chemical specifications on drill lubricants and tracers, if used. Include any information, written or otherwise, supplied by the manufacturers or suppliers of the above listed items.

Qualifications

Personnel qualification documentation. Probe driller qualifications, including the driller’s license number and health and safety certifications.

Permits

A copy of all permits, licenses, or other requirements necessary for execution of the work.

Documentation and Quality Control Reports

Reports for well/probe construction and development.

SD-06 Test Reports

Decontamination and drilling water analytical test results.

Filter Pack

Filter pack material test results; sieve and Chemical Analysis.

Drilling Fluid Additive

Manufacturer's data, if available, including analytical test results of the additive, if not a part of the manufacturer's data.

SD-11 Closeout Submittals

Disposal certificates

1.6 PERFORMANCE REQUIREMENTS

Perform work in conformance with the approved EM 385-1-1 and OSHA requirements. Each system, including equipment, materials, installation, and performance, shall be in accordance with local, State, and Federal regulations, ASTM D 5092, and EPA 600-4-89-034 except as modified herein. Requirements shall be ASTM C 150, Type I or II for all cement. Identify and secure monitoring wells and probes to avoid unauthorized access and tampering.

1.7 QUALITY ASSURANCE

1.7.1 Notification

Notify the RPM/ROICC 15 days prior to drilling.

1.7.2 Qualifications

Provide an onsite geologist/engineer with at least 3 years experience in hazardous waste projects, soil and rock logging, and monitoring well/probe installation, registered in the state of California, responsible for all geophysical and borehole logging, drilling, well/probe installation, developing and testing activities. Provide a driller licensed in the state of California, according to the state requirements. Perform and provide geophysical log interpretation done by a qualified log analyst, demonstrating competence through background, training, and experience when so called upon.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver materials in an undamaged condition. Unload and store with minimal handling. Store materials in onsite enclosures or under protective coverings. Store plastic piping, jointing materials, and rubber gaskets under cover, out of direct sunlight. Store materials off the ground. Keep insides of pipes and fittings free of dirt and debris by taping or sealing off open pipe ends. Replace defective or damaged materials with new materials.

PART 2 PRODUCTS

2.1 PROBE ASSEMBLY

Landfill gas monitoring probes shall consist of the following:

a. Solid Pipe, Couplings, End Caps, and Fittings: PVC schedule 80 (ASTM D 1785), square flush-threaded ½-inch diameter, 8 threads per inch (TPI).

b. Screen Pipe: PVC schedule 80 (ASTM D 1785), square flush-threaded, ½-inch diameter, 8 TPI machine-slotted, 0.020-inch slots.

c. Labcock Valves: 1/4-inch PVC (mpt x hose barb), screw-on with tapered hose barbs. Hose Barb Cap: a snugly fitted cap; to keep dirt out.

d. Probe Identification Tags: 1-1/4-inch diameter by 1/16-inch thick brass tags, stamped with the 1/2-inch high letters/numbers indicating probe’s name and depth of the probe.

2.1.1 Gravel Pack and Sealing Materials

a. Sand: Screen sand shall consist of commercially produced, clean, graded, #3 Monterey Sand, or equivalent, as approved by the Engineer/Geologist.

b. Bentonite Seal: Bentonite seals shall be Enviroplug #16 and hydrated in the field in accordance with manufacturer Specifications or requirements, or equivalent, as approved by the Engineer/Geologist.

2.1.2 Surface Completion Assembly

a. Probe Apron: Probe Apron shall be 3-foot square by 6-inch thick, slope-to-drain. Concrete for the well apron shall be commercially available pre-mixed bagged concrete, or may be hand mixed. Hand mixing shall conform to 90-1.02(G) of the 2010 Caltrans Standard Specifications.

b. Cover: Probe covers shall be 8 inches in diameter and schedule 40 steel pipe and shall have a steel lid fabricated with a locking devise in accordance with the details on the Drawings.

c. Guard Posts: Each probe shall be protected by four (4) guard posts, and shall be schedule 40 steel pipe with a welded on threaded pipe cap. Concrete for the bollards shall be commercially available pre-mixed bagged concrete, or may be hand mixed as described in subparagraph 2.1.2(a) of this Section. The guard posts shall be primed and painted protective standard golden yellow after installation.

d. Lock to match key for existing system (i.e. one key for all probes).

2.9 PROTECTIVE POSTS

Provide and place four 3-inch diameter, schedule 40 carbon steel, protective bollards around each monitoring well/probe, and as indicated.

PART 3 EXECUTION

3.1 PROTECTION OF EXISTING CONDITIONS

Maintain all existing survey monuments and monitoring wells/probes, and protect them from damage from equipment and vehicular traffic. Immediately report and repair any items damaged by the Contractor. Re-install monitoring wells/probes requiring replacement due to Contractor negligence according to these Specifications. Protect wells/probes scheduled for destruction from damage so that destruction may be performed according to these Specifications.

3.2 PREPARATION

3.2.1 Decontamination

a. Prior to drilling, steam-clean drilling equipment with clean water to prevent potential cross contamination.

3.3 PROBE INSTALLATION

Install in accordance with applicable standards and recommendations. In general, the procedure shall be as follows:

3.3.1 Drilling

a. Actual boring depths will depend on conditions encountered during drilling.

c. Containerize and dispose of cuttings off-site at a designated location as specifically directed by the Engineer/Geologist. The Contractor shall pay for all costs associated with transporting and disposal of waste generated during the project.

If obstructions are encountered during borehole advancement, continue drilling until obvious that further efforts to advance the borehole are impractical. The Engineer/Geologist will then determine which of the following courses of action should be followed:

a. If, during the drilling of a borehole, contact with an obstruction is made such that the probe cannot be completed to the full depth as called for on the Drawings, the Engineer/Geologist shall be consulted as to whether the borehole has advanced to a sufficient depth. If, in the opinion of the Engineer/Geologist, the borehole has reached a sufficient depth, the Contractor shall be required to complete the probe, and the Contractor shall be compensated based on the depth (lineal feet) actually reached.

b. If, during the drilling of a borehole, the probe cannot be completed to the full depth as called for on the Drawings, the Engineer/Geologist shall be consulted as to whether the borehole has advanced to a sufficient depth. If, in the opinion of the Engineer/Geologist, the borehole has not reached a sufficient depth to function as an effective probe due to the fault of the driller, the Contractor shall destruct this borehole by backfilling it with soil. The backfill material shall be placed in the borehole in three-foot lifts and tamped by the drill rig auger bucket. The Contractor shall not be compensated for this work.

3.3.2 Probe Installation

In general, the probe installation procedures shall be as follows:

a. Drill borehole so as to install the nested probes in a plumb and true line.

b. Install probes beginning with the deepest probe assembly first, followed by the next deepest probe assembly, until all probes have been properly installed.

c. Attach brass identification tag to each probe with Stainless Steel wire. Tags shall indicate probe name, and depth to ground surface to the bottom of the probe screen.

d. Pour #3 Monterey sand gradually and carefully into annular space to prevent bridging. Pour to the level above the top of the screened pipe, as determined by volume measurements and sounding with a weighted tape. Casing or tremmie shall be used to place the #3 sand. Casing or tremmie shall be withdrawn at the same rate that the #3 sand is placed. Sound frequently so that placement is accurate to within 0.2 foot.

e. Pour bentonite (Enviroplug #16, or approved equal), gradually to the appropriate level above the top of the #3 sand, as determined by volume measurements and sounding with a weighted tape. Casing or a tremmie shall be used, and shall be withdrawn slowly at the same rate the bentonite seal is placed. Add sufficient water for the bentonite seal to hydrate, in accordance with the manufacturer's recommendations, prior to placement of the remaining materials.

f. Attach probe top to top of solid pipe and seal with Labcock.

g. Install protective well monument and lid, in accordance with the details on the Drawings.

3.4 SURVEYS

Establish coordinates and elevations for each monitoring well/probe/test hole. Determine horizontal coordinates to the closest 0.1 foot and referenced to the State Plane Coordinate System. Obtain a ground elevation to the closest 0.01 foot at each well/probe. The highest point on the top of the riser pipe serves as a measurement point; reference this elevation and survey to the nearest 0.01 foot using the National Geodetic Vertical Datum of 1988. Plot the location, identification, coordinates, and elevations of the wells, probes, and monuments on maps with a scale large enough to show their location with reference to other structures.

3.5 WELL/PROBE DECOMMISSIONING/DESTRUCTION

Due to the radiological contamination at the site the well/probe destruction shall only be accomplished by a pressure grouting method Maintain a well/probe decommissioning/destruction record as specified in paragraph Well/Probe Decommissioning/Destruction Records. Measure groundwater levels, if encountered before the decision is made for decommissioning/destruction, in all borings prior to backfilling. Include these water levels in the well/probe decommissioning/destruction records. No well/probe may be decommissioned/destructed without the final approval of the RAWP.

3.6 ACCEPTANCE

It is the responsibility of the Landfill Engineer to ensure that the well/probes are properly designed and installed. It is the responsibility of TtEC, to construct, install, develop, and test all monitoring wells and probes according to the requirements of this Specification so that they are suitable for the intended purpose.

3.7 SITE CLEANUP

After completion of the work, remove tools, appliances, surplus materials, temporary drainage, rubbish, and debris incidental to work. Backfill excavation and vehicular ruts and dress to conform with the existing landscape or terrain. Utilities, structures, roads, fences, or any other pre-existing item which must be repaired or replaced due to the Contractor's negligence are the Contractor's responsibility; accomplish repair or replacement prior to completion of this Contract.

3.8 DOCUMENTATION AND QUALITY CONTROL REPORTS

Monitoring well construction, alteration, and destruction reports shall be completed on forms provided by the California Department of Water Resources. Other types of forms may be used for submission to the Department with the prior approval of the Department. The completed forms shall be submitted to the Department in accordance with relevant provisions of Sections 13750 through 13754 (Division 7, Chapter 10, Article 3) of the California Water Code.

Establish and maintain documentation and quality control reports for well/probe construction and development to record the desired information and to assure compliance with Contract requirements, including, but not limited to, the following:

3.8.1 Borehole Logs

Prepare and complete a borehole log for each boring drilled, prepared by the geologist present onsite during all drilling and installation activities. Provide the log at an appropriate scale. Keep copies current and complete of all logs in the field and make available at all times for inspection by the RPM/ROICC. Include, as a minimum, the following:

a. Name of the project and site.

b. Boring/well/probe identification number.

c. Location of boring (coordinates, if available).

d. Make and manufacturer's model designation of drilling equipment and name of drilling firm.

e. Date boring was drilled.

f. Reference data for all depth measurements.

g. Name of driller and name and signature of geologist/engineer preparing log.

h. Nominal hole diameter and depth at which hole diameter changes.

i. Total depth of boring.

j. Method of drilling, including sampling methods and sample depths, including those attempted with no recovery. Indication of penetration resistance such as drive hammer blows given in blows per 6 inches of driven sample tubes. Include in information hammer weight and drop distance. Record information such as rod size, bit type, pump type, etc. Also include a description of any temporary casing used, drill fluids and fluid additives used, if any, including brand name and amount used, along with the reason for and start (by depth) of its use, and, if measured, mud viscosities and weight.

k. Depth of each change of stratum. If location of strata change is approximate, it shall be so stated.

l. Description of the material of which each stratum is composed, in accordance with ASTM D 2488, and/or standard rock nomenclature, as necessary. Include in soil parameters for logging , but do not limit to, classification, depositional environment and formation, if known, Unified Soil Classification Symbol, secondary components and estimated percentages, color (using FSUP 77341 or GSA RCC00100R), plasticity, consistency (cohesive soil), density (non-cohesive soil), moisture content, structure and orientation, and grain angularity.

m. Include in rock core parameters for logging , but do not be limit to, rock type, formation, modifier denoting variety (shaly, calcareous, siliceous, etc.), color (using GSA RCC00100R), hardness, degree of cementation, texture, crystalline structure and orientation, degree of weathering, solution or void conditions, primary and secondary permeability, and lost core.

n. . Duly note and record the results of visual observation of the material encountered, and any unusual odor detected.

o. Depth of any observed fractures, weathered zones, or any abnormalities encountered.

p. Depth and estimated percent of drill fluid loss or lost circulation. Measures taken to regain drill water circulation. Significant color changes in the drilling fluid return.

q. Depth to water and date measured before, during, and after each drilling shift, and prior to well/probe installation. Provide and maintain at each well/probe under construction a portable water level measuring device of sufficient length to measure the water level to 165 foot depth. Make the device onsite at all times and provide graduated measuring wire in 0.01 foot. Take water level measurements to the nearest 0.01 foot.

3.8.2 Well/Probe Decommissioning/Destruction Records

Include in decommissioning/destruction records, as a minimum, the following:

a. Project name.

b. Well/probe or test hole number.

c. Well/probe/boring location, depth and diameter.

d. Date of decommissioning/destruction.

e. Method of decommissioning/destruction.

f. All materials used in the decommissioning/destruction procedure and the interval in which test materials were placed.

g. Casing, and or other items left in hole by depth, description, and composition.

h. Description and total quantity of grout used initially.

i. Description and daily quantities of grout used to compensate for settlement.

j. Water or mud level (specify) prior to grouting and date measured.

k. The reason for decommissioning/destruction of the monitoring well/probe/test hole.

3.8.3 Project Photographs

Before, during, and after completion of work, take a minimum of one view of each well/probe installation. Provide color prints with an information box, showing (typewritten) the following information:

Project No.	Contract No.
Contractor/Photographer:	
Photograph No.	Date/Time:
Description:	
Direction of View:	

3.8.4 Survey Maps and Notes

Prepare and submit a tabulated list of all monitoring wells, probes, and monuments, copies of all field books, maps showing the locations and elevations of all monitoring wells and probes, and all computation sheets, consisting of the designated number of the well, probe, or monument, the X and Y coordinates, and all the required elevations.

-- End of Section --

SECTION 33 40 00

STORM DRAINAGE UTILITIES
02/10

PART 1 GENERAL

1.1 SUMMARY

This section sets forth the requirements for permanent drainage improvements indicated on the Drawings including the drainage channel transition.

The Contractor shall refer to Section 31 00 00 EARTHWORK, regarding design intent for development of final cover grades and gradients, and the potential for modification of grades and alignment of civil and drainage improvements.

In general drainage improvements shall include construction of Portland Cement Concrete (PCC), conversion of manholes to storm drain inlets and installing turf reinforcement mat lined channels (See Section 31 32 11).

1.2 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 615/615M	(2009b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C 39	(2011a) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	(2012) Standard Specification for Ready Mixed Concrete

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Joint sealants

Submit manufacturer's product data, indicating VOC content. Manufacturer's catalog data for the following items must include printed instructions for admixtures, bonding agents, epoxy-resin adhesive binders, waterstops, and liquid chemical floor hardeners.

SD-06 Test Reports

Compressive Strength Testing per mix design

SD-07 Certificates

Curing Compound

Provide certificates for concrete that are in accordance with the paragraph entitled, "Classification and Quality of Concrete," of this section. Provide certificates that contain project name and number, date, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer, brand name of manufactured materials, material name, values as specified for each material, and test results.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the PQAE. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.4.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT CONCRETE

A. PCC shall conform to the requirements of Section 90 of the 2010 Caltrans Standard Specifications. Contractor shall submit PCC mix design.

2.1.1 Drainage Channel Transition

Not used.

2.1.2 Trapezoidal Channels

Not used.

2.1.3 Portland Cement Material

All cement to be used or furnished shall be:

a) Type II portland cement, or Type V portland cement.
The Contractor shall furnish a Certificate of Compliance signed by the manufacturer identifying the cement and confirming compliance.

Whenever suitable facilities are available for handling and weighing bulk cement, they shall be used.

Otherwise, cement shall be delivered in original unopened sacks marked with brand, type, and weight.

Cement shall be stored in such a manner as to permit ready access for inspection and sampling and suitably protected against contamination and moisture. Should any cement show evidence of contamination or be otherwise unsuitable, the Engineer may reject it and require that it be removed from the site.

All portland cement used in concrete for any individual structure shall be of the same brand and type unless otherwise approved by the Engineer.

2.1.4 Aggregate

Aggregate shall be of such character that it will be possible to produce workable concrete within the limits of slump and water content.
Methods of handling materials resulting in segregation, degradation, or the combining of materials which results in failure to meet Specifications shall not be permitted. The free moisture content of sand shall not exceed 8 percent at the time of batching.

Aggregates shall be nonreactive when tested in accordance with ASTM C 289 and evaluated in accordance with Appendix X-1 of ASTM C 33. Aggregates found to be potentially reactive may be used only upon written approval.

2.1.4.1 Combined Aggregate Grading

Combined aggregate grading shall conform to Section 90-1.02(C)(4)(d) of the 2010 Caltrans Standard Specifications for 1/2-inch max.

2.1.5 Admixtures

Admixtures shall conform to Section 90-1.02(E) of the 2010 Caltrans Standard Specifications.

2.1.6 Water

Water shall conform to Section 90-1.02(D) of the 2010 Caltrans Standard Specifications.

2.1.7 Concrete Consistency

Concrete shall conform to Section 90-.02(G) of the 2010 Caltrans Standard Specifications.

2.2 REINFORCING STEEL

Not used.

2.3 STEEL GRATE

The steel grate above the drainage inlets shall be Steel Grate Type 36R. Steel grate material shall conform to requirements in Section 75-1.02(B) of the 2010 Caltrans Standard Specifications.

2.4 CURING COMPOUND

2.4.1 Membrane Curing Compound

Curing compounds for concrete improvements shall conform to the requirements of 90-1.03 of the 2010 Caltrans Standard Specifications and shall be clear or translucent with fugitive dye, or white pigmented.

The Contractor shall submit a Certificate of Compliance for the proposed curing compound to be used.

2.5 SHOTCRETE

Shotcrete can be used for small quantities (less than 2 cubic yards) and shall conform to Section 53-1 of the 2010 Caltrans Standard Specifications.

PART 3 EXECUTION

3.1 PORTLAND CEMENT CONCRETE (PCC)

The Contractor shall place and finish concrete to the lines and grades indicated on the Drawings. Reinforcement and PCC shall be placed in accordance with the applicable portions of Sections 52, and 51, and 90 of the 2010 Caltrans Standard Specifications, as indicated on the Drawings.

All Concrete shall be cured in accordance with the applicable portions of Section 90 of the 2010 Caltrans Standard Specifications.

3.1.1 Test for Portland Cement Concrete

Each Portland cement concrete mix design used shall be tested in accordance with ASTM C 39 for Compressive Strength. If prior testing is available, it may be submitted with the mix design.

3.2 JOINT SEALANTS

Joints sealants shall be constructed in accordance with the requirements of Section 40-1.02(I) of the 2010 Caltrans Standard Specifications.

3.3 SHOTCRETE

Shotcrete shall be constructed in conformance with Section 53-1.03 of the 2010 Caltrans Standard Specifications.

-- End of Section --

FINAL GEOTECHNICAL REPORT

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 1

FINAL
GEOTECHNICAL REPORT
INSTALLATION RESTORATION SITE 2
April 22, 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by

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TETRA TECH

Project No. BAS 11-63E
April 22, 2013

Mr. Jacques Lord
U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West

Subject: **GEOTECHNICAL RECOMMENDATIONS
INSTALLATION RESTORATION SITE 2
Alameda Point
Alameda, California**

Dear Mr. Lord,

Presented herein is Tetra Tech's geotechnical recommendations for the remediation of Installation Restoration (IR) Site 2 at the former Naval Air Station Alameda, currently referred to as Alameda Point. The Department of Navy prepared a Record of Decision (ROD) in August 2010 documenting the selected remedy for the site which includes installing a multilayer soil cover over the former landfill to isolate buried refuse and prevent animal burrowing.

Previous geotechnical investigations of the site have reported the following geotechnical hazards for the IR Site 2:

- Strong earthquake ground shaking;
- Stability of perimeter slopes;
- Liquefaction and lateral spreading of loose hydraulic fills; and
- Settlement resulting from surcharging of soft Young Bay Mud.

The purpose of this report is to provide geotechnical recommendations for the remediation of the IR Site 2. Although the information about the subsurface conditions is taken from previous investigations of the site, this report is intended to be a stand-alone document to serve as a sole geotechnical engineering document submitted in support of the 100% Remedial Design (RD). This report replaces the previously submitted draft report dated May 4, 2012 as it includes additional analyses of seismically induced deformations of the perimeter slopes to evaluate the potential for the loss of refuse confinement integrity and displacement of refuse into the San Francisco Bay and/or breach of bay waters into the site during a seismic event.

We appreciate the opportunity to provide our professional services on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
Tetra Tech, Inc.

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1. INTRODUCTION

Presented herein is a geotechnical evaluation and recommendations provided as part of the remediation of the Installation Restoration (IR) Site 2. The selected remedy will consist of a multilayer soil cover placed to isolate the refuse and prevent animal burrowing. The multilayer soil cover will consist of a biotic geonet barrier followed by a minimum 2-foot layer of general soil, including a 6-inch minimum vegetative layer, to provide a cover for the former landfill area. Site grades are proposed to be no greater than 1.5 percent.

The following geotechnical evaluations previously performed for the subject site were reviewed for the development of the presented design recommendations:

- "Draft Geotechnical Investigation Report, Installation Restoration Site 2, Alameda Point, Alameda, California", CH2M Hill Kleinfelder (KCH), A Joint Venture, August 2011, hereafter referred as the "**KCH report**".

- "Final Ordinance and Explosive Waste/Geotechnical Characterization Report", Tetra Tech Foster Wheeler, Inc. (Tetra Tech FW), January 2004, hereafter referred as the "**Tetra Tech FW report**".

Relevant field exploration and laboratory testing data from the above referenced reports are included in Appendices A and B of this report, respectively.

Previous investigations of the site have identified potential seismic-related instability of the perimeter of the site due to liquefaction, lateral spreading, liquefaction flow failure and/or large seismically induced permanent deformations. The perimeter containment of the refuse consists of a seawall retaining hydraulic fill, a coastal margin clean of refuse, and a perimeter berm. The critical areas where the refuse approaches the waters of the San Francisco Bay are located at the northwest and southeast corners of IR Site 2. These perimeter containment areas are hereafter referred to as the western and southern coastal margins.

The Geotechnical Report included in Attachment 1 of the 90% Remedial Design (May 4, 2012) indicated that a wide range of permanent seismic deformations and liquefaction-induced flow failures were predicted for a potential MCE event at IR Site 2. That report recommended ground improvement including cement deep soil mixing to mitigate the predicted seismic deformation and flow failure. In order to confirm that those ground improvements provided best value for this project, the Navy performed additional analyses and focused modeling of permanent seismic deformations and flow run-outs to better and more accurately quantify the impact of an MCE event. This revised Draft Final version presents the additional analyses, and indicates that ground improvements are not required because:

- Solid refuse is not anticipated to be released into the San Francisco Bay by the predicted permanent seismic deformations and /or flow run-outs; and

- The site will remain isolated from and will not be flooded by waters of the San Francisco Bay.

The predicted nature and magnitude of the seismic displacements and deformations are quantified in this revised report, and summarized in Section 12. Since the waste will still be isolated from the San Francisco Bay following an MCE event and therefore the cover integrity to act as a pathway interruption between the landfill waste and human and environmental receptors is expected to remain effective; the MCE would not compromise the CERCLA remedy and ground improvements such as cement cement deep soil mixing are not warranted. However, some level of damage to the cover and seawall should be anticipated after an MCE event, and will require repair.

2. BASIS OF DESIGN

Permanent seismic deformations and liquefaction-induced flow failures have been modeled for the IR Site 2 in the above referenced geotechnical evaluations. The purpose of this report is to further evaluate the findings of the previous investigations, with a focus on evaluating the magnitudes of the predicted permanent deformations and flow run-outs in relation to the width of the coastal margin and waters of the San Francisco Bay. Also included in this report is the further evaluation of long term settlement potential of the proposed cover grades. This report was prepared in support of the 100% Remedial Design (100% RD), utilizing the results of the previous investigations.

In accordance with the Applicable or Relevant and Appropriate Requirements (ARARs) presented in the Record of Decision (ROD) (United States Department of Navy and Unites States Environmental Protection Agency, 2010), the cover should accommodate the forces generated by the maximum credible earthquake (MCE) so that the integrity of the cover is maintained as required by article §66264.310 of Title 22, Chapter 14 – Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities. For the purposes of this investigation, the integrity of the cover is considered to be maintained if the following conditions are satisfied:

- There is no release of solid refuse to the San Francisco Bay beyond the perimeter seawall;
- The site will remain isolated from and will not be flooded by the San Francisco Bay waters; and
- The function of the cover to act as a pathway interruption between landfill content and human and environmental receptors will not be rendered ineffective, provided remedial grading is planned for after the MCE.

The existing slurry wall along the western coastal margin will be disturbed commensurately with the predicted deformations. However, according to the ROD, there are no engineering controls associated with the selected groundwater remedy, and the capacity of the existing slurry wall to impede groundwater before or after the MCE is not considered as part of the basis of design.

Consequently, the focus of this report is to predict and quantify seismic deformations and flows and evaluate the impact of the predicted permanent deformations and flow run-outs on cover integrity. In the event of the MCE, it should be understood given the magnitude of predicted deformations presented herein that the planned recreational areas at IR Site 2 will have to be closed to unauthorized personnel and remedial grading performed to disrupt any potential exposure pathways.

3. SCOPE OF WORK

The following geotechnical issues were evaluated and addressed in this report to support the 100% RD:

- Review of the previous investigations of the site and preparation of design cross-sections;
- Evaluation of the site seismic demand using the latest generation ground motion prediction equations and site specific ground response analyses;
- Analyses of slope stability;
- Estimation of permanent seismic deformations;
- Estimation of run-out distances of liquefaction- and seismically- induced flows; and
- Evaluation of long term settlement potential.

Based on the previous reports and as confirmed by evaluations and analyses presented herein, the western and southern coastal margins are susceptible to seismically induced displacements or flow failures.

4. SITE DESCRIPTION AND HISTORY

The IR Site 2 is located on the coastline of Alameda Point, in Alameda, California, and includes:

- West Beach Landfill (70 acres);
- Wetlands (33 acres); and
- Coastal margins (17 acres).

Alameda Point is located on the western point of Alameda Island near Oakland, on the eastern side of the San Francisco Bay. The location of the site within the San Francisco Bay area is shown on Plate 1, Project Location Map, attached to this report.

The IR Site 2 was reclaimed from the San Francisco Bay by constructing a rockfill seawall in 1956 along the western margin of the site and filling the interior with hydraulic fill dredged from the ship channel south of the site. In 1958, an extension of the seawall and additional hydraulic fill completed the southern margin of the IR Site 2. The site was used as a refuse disposal site shortly after the completion of the seawall until 1978 and contains an estimated 1.6 million tons of waste. The Tetra Tech FW report (2004) describes the waste as generally consisting of municipal solid waste, chemical waste drums, solvents, oily waste and sludge, paint, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB) containing liquids, batteries, scrap metal, inert ordinance, asbestos, pesticides, biological waste, tear gas agents, and low-level radiological waste.

In 1982 as a part of earlier remediation, a perimeter berm was constructed around the landfill. Recent borings provided in the KCH report (2011) indicate that some debris is present beneath the perimeter berm, at least along the western and southern coastal margins. Based on the KCH and Tetra Tech FW reports, between 1983 and 1985, a partial soil cover was constructed over the site, a slurry seepage cut-off wall was constructed along the western coastal margin adjacent to the seawall, and unspecified repairs were performed to the seawall. The slurry wall is about 820 feet long, 2 feet wide and 20 to 30 feet deep and intended to restrict contaminant migration from the landfill into the San Francisco Bay. In 1986, approximately 20,000 cubic yards of imported soil was graded over portions of the landfill to backfill depressions that were causing water ponding. At that time, an estimated 55,000 cubic yards of fill were still planned to complete the uniform cover of the landfill. In 1999, the IR Site 2 was official added to the National Priorities List of Superfund sites.

5. SUBSURFACE CONDITIONS

5.1. Subsurface Conditions

Subsurface conditions were evaluated by reviewing relevant logs of soil borings, test pits, and Cone Penetration Test (CPT) soundings presented in the Tetra Tech FW and KCH reports. The locations of considered explorations are shown on Plate 2, Site and Exploration Location Map, attached to this report. Applicable exploration logs are reproduced in Appendix A of this report. The related representative Geologic Sections cross sections A-A', B-B', C-C', and D-D' are shown on Plates 3 through 6.

The IR Site 2 is generally underlain by loose man-made hydraulic fill over soft Young Bay Mud. Geologic stratigraphic units underlying the refuse at the site are taken from Seismic Hazard Zone Report 081, Oakland West 7.5-Minute Quadrangle (California Geologic Survey, 2003), and summarized as follows. The lithographic descriptions are based on borehole and CPT logs performed during previous investigations. The material descriptions which follow generally comply with the Unified Soil Classification System as presented in ASTM D2487.

5.1.1. Artificial Fill over Bay Mud (afbm)

At the IR Site 2, this material is present over the entire area and is primarily hydraulic fill consisting of loose sand dredged from the ship channel south of the site where the source material is likely Merritt Sand (Qds) or coarse Young Bay Mud (Qhbm) described subsequently, but also includes more recent refuse where waste has been buried, perimeter berm fill and landfill cover. This material is a thickness of approximately 20 to 30 feet. This material generally consists of *poorly graded sand*, *poorly graded sand with silt*, and *silty sand*, is loose in compactness, and has high liquefaction susceptibility.

5.1.2. Holocene San Francisco Bay Mud (Qhbm) – Young Bay Mud

Qhbm is commonly referred to as Young Bay Mud. Both fine-grained and coarse-grained members of this stratigraphic unit are present underlying the hydraulic fill at the site, with thick deposits of fine-grained mud beneath the landfill perimeter along the western coastal margin and north portion of the site, and relatively thin deposits of coarse-grained sediments beneath the southern coastal margin.

The fine-grained member generally consists of *lean clay* and *fat clay* whereas the course-grained member consists of *poorly graded sand with silt* and *silty sand*. This material is of variable thickness ranging from approximately 60 feet at the northwest corner to as little as 10 feet at the southeast corner of the IR Site 2. The coarse-grained member of the Young Bay Mud unit possesses high liquefaction susceptibility. The fine-grained member is soft to firm in consistency and prone to consolidation under static loads and softening during cyclic loading.

5.1.3. Latest Pleistocene to Holocene Dune Sand (Qds) – Merritt Sand

Qds is commonly referred to as Merritt Sand. This relatively extensive unit makes up the core of Alameda Island and underlies much of downtown Oakland. This material underlies the Young Bay Mud and generally consists of *poorly graded sand*, *poorly graded sand with silt*, and *silty sand*, is medium dense to dense in consistency, and has low liquefaction susceptibility. The thickness of this material is uncertain over most of the site due to most of the borings terminating within this stratigraphic unit. However, this material appears to have a thickness on the order of 40 feet at the southeast corner and thinning towards the northwest corner of the IR Site 2.

5.1.4. Latest Pleistocene San Francisco Bay Mud (Qpbm) – Old Bay Mud

Qpbm is commonly referred to as the Old Bay Mud, but also the Yerba Buena Mud in the Tetra Tech FW report. This material underlies the Merritt Sand and generally consists of *lean clay* and *fat clay*, is stiff to very stiff in consistency and prone to softening during cyclic loading. The thickness of this unit was found to be on the order of 100 feet in borings performed between IR Sites 1 and 2.

5.1.5. Early to Late Pleistocene Alluvial Fan Deposits (Qof)

Qof is referred to as the Alameda Formation in the Tetra Tech FW report and in this investigation. This material underlies the Old Bay Mud and primarily consists of a relatively thin stiff *lean clay* cap over relatively thick very dense *silty sand* which was deposited on bedrock and has low liquefaction susceptibility. The thickness of this unit is likely to be on the order of 200 feet.

5.1.6. Bedrock – Franciscan Complex (KJc)

Bedrock at Alameda Point consists of the Franciscan Complex, a mélange of greywacke-type coarse-grained and poorly sorted sandstone (deposited as marine debris flows), shallow marine siltstone and claystone, and serpentine derived from basaltic crust formed as the oceanic crust accreted onto the North American continent during the early Jurassic to late Cretaceous period some 145 million years ago. Bedrock was not reached in the borings but is inferred based on geological mapping to be at a depth of approximately 400 feet at the IR Site 2 as reported in the Tetra Tech FW report.

5.2. Groundwater

Groundwater is relatively shallow at the IR Site 2 as documented most recently in the KCH report at elevations ranging from approximately 0 to 4 feet above mean sea level, or depths ranging from about 3 to 5 feet below ground surface at the interior of the landfill. Groundwater levels at the IR Site 2 fluctuate with tidal and seasonal influences as described in the 2004 tidal study (Shaw, 2005).

6. SEISMIC DEMAND

Based on the Record of Decision (ROD) findings, the integrity of the cover shall be maintained following the effect of the lateral and vertical forces and displacements induced by the Maximum Credible Earthquake (MCE). This seismic design demand is consistent with the requirements set forth by the California Code of Regulations (CCR) Title 22 – Environmental Health Standards for the Management of Hazardous Waste. The MCE is herein considered as the maximum earthquake that appears capable of occurring under the presently known geologic framework. The seismic demand was determined by the following procedure:

- Deterministic evaluation of causative faults near IR Site 2 known to be capable of large earthquakes and representative of the MCE event;
- Deterministic analyses using a fault model based on the Next Generation Attenuation (NGA) ground motion prediction equations to determine a target bedrock acceleration response spectrum;
- Selection of 7 bedrock outcropping acceleration time histories scaled individually such that the average of all records matches the target acceleration response spectrum as closely as possible; and
- One-dimensional wave propagation analyses to evaluate the site specific ground response to be used in stability analyses.

The above analytical steps are described in more detail as follows.

6.1. Causative Faults

Using a web-based tool provided by Caltrans, ARS Online v.1.0.4, the selected causative faults for the deterministic MCE event include the Hayward-Rogers Creek Fault and San Andreas Fault located 6.8 miles northeast and 11.8 miles southwest of the IR Site 2, respectively, at the closest point to the fault. These faults are utilized for development of the deterministic MCE. Causative fault parameters are summarized in Table 1.

Table 1
Causative Fault Parameters

Fault	Moment Magnitude	Closest Distance (miles)	Fault Type
Hayward-Rogers Creek	7.3	6.8	Strike slip
San Andreas	7.9	11.8	Strike slip

6.2. Target Bedrock Acceleration Response Spectrum

A fault model provided by Atik (2009) and based on the NGA relationships was used to determine the target MCE bedrock response spectrum to aid in selecting acceleration time histories for subsequent ground response analyses. A response spectrum was determined for both causative faults based on magnitude, distance, fault type and a presence of soft bedrock representative of the Franciscan Complex underlying the IR Site 2. Soft bedrock refers to rock having a shear wave velocity in the range of 2,500 to 5,000 feet per second (fps). The target response spectrum was conservatively taken as a composite of the Hayward-Rogers Creek Fault spectrum for periods less than 1 second and the San Andreas Fault spectrum for periods greater than 1 second as shown in Figure 1.

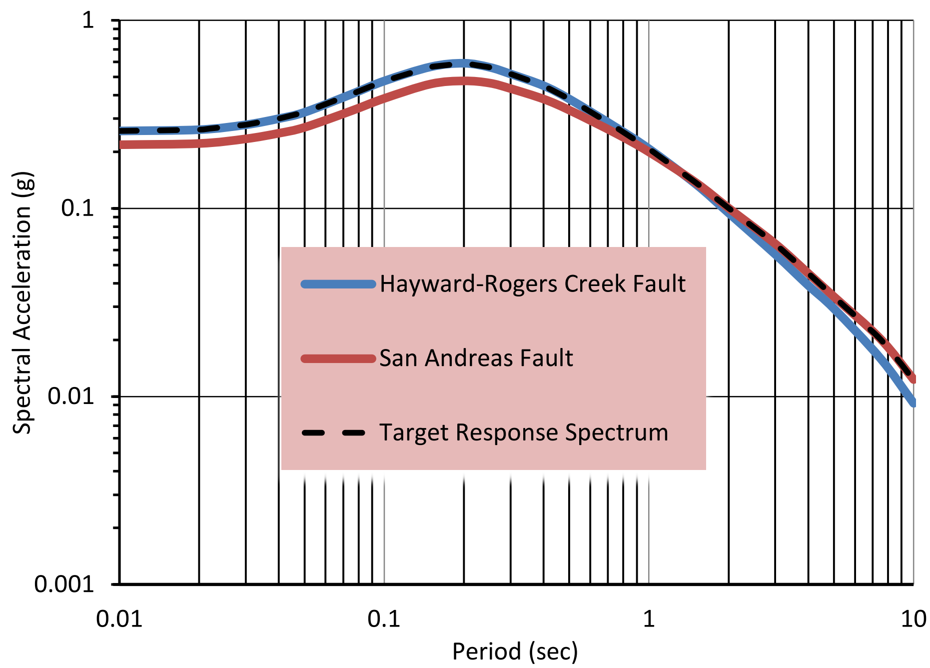

Figure 1 – Target MCE Bedrock Response Spectrum

6.3. Acceleration Time Histories

A set of 7 acceleration time histories were chosen using the 2010 Ground Motion Database provided by the Pacific Earthquake Engineering Research (PEER) Center which contains over 3,000 acceleration time histories obtained from about 100 shallow crustal earthquakes recorded at over 1,000 stations.

Acceleration time histories where chosen to match to the degree practicable the magnitude, distance, and fault type of the causative faults and to reflect the soft bedrock condition. Individual acceleration time histories were then linearly scaled such that the geometric mean of all 7 acceleration time histories matches the target bedrock response spectrum as closely as possible. The 7 acceleration time histories chosen from the database are summarized in Table 2.

Table 2
Selected Acceleration Time Histories

Record No.	Event	Year	Station	Magnitude	Fault Type	Closest Distance (mi)	Site Shear Wave Velocity (fps)	Duration (sec)	Scale Factor
164	Imperial Valley - 06	1979	Cerro Prieto	6.53	Strike slip	9.4	2,160	36	1.2486
2739	Chi Chi Taiwan - 04	1999	CHY080	6.2	Strike slip	7.8	2,230	11	1.7156
1787	Hector Mine	1999	Hector	7.13	Strike slip	7.3	2,250	10	0.7601
265	Victoria - Mexico	1980	Cerro Prieto	6.33	Strike slip	9.0	2,160	9	0.7981
1148	Kocaeli - Turkey	1999	Arcelik	7.51	Strike slip	8.4	1,720	11	1.2636
1111	Kobe - Japan	1995	Nishi-Akashi	6.9	Strike slip	4.4	2,000	10	0.6437
864	Landers	1992	Joshua Tree	7.28	Strike slip	6.8	1,240	26	0.8838
Target parameters				7.3 – 7.9	Strike slip	6.8 – 11.8	2,500 – 5,000		

The scaled acceleration time histories and geometric mean are shown in relation to the target bedrock response spectrum in the following Figure 2.

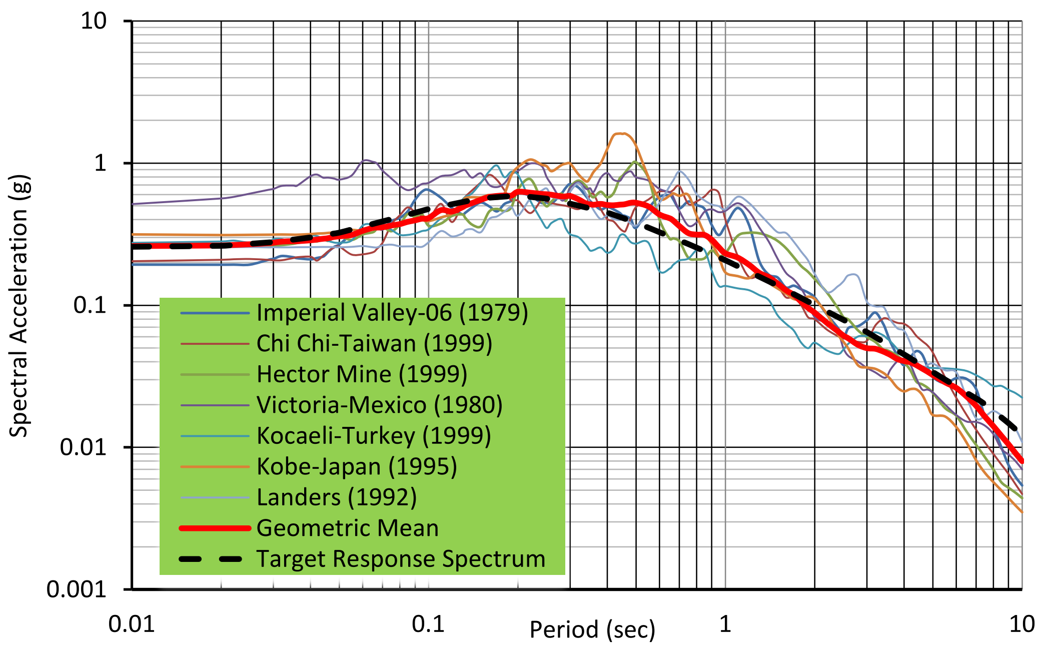

Figure 2 – Bedrock Acceleration Response Spectrum Matching

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6.4. Site Specific Ground Response Analyses

The site response at the ground surface was determined by one-dimensional wave propagation analyses using the program SHAKE2000. SHAKE2000 models wave propagation through a one-dimensional column of soil. Two soil profiles were evaluated: one for the western coastal margin and one for the southern coastal margin.

SHAKE2000 models the subsurface as a layered linear viscoelastic system using the following input parameters: layer thickness, mass density, shear modulus, and material damping. The nonlinearity of actual soil is taken into consideration by an iterative sequentially linear approach where the shear modulus is modified following each iteration until the calculated strain and shear modulus fall on the pre-determined shear modulus degradation curve. The shear modulus degradation curve has been determined by others for various soil types in the laboratory. Changes in material damping with strain are accounted for by a similar damping curve.

The small strain or maximum shear modulus of soils within the upper 100 feet was determined from shear wave velocity measurements made during CPT soundings at the IR Site 2 and documented in the Tetra Tech FW report. For deeper layers, the material shear wave velocity was assumed based on published values for known geologic stratigraphic units and studies performed for the replacement of the east span of the San Francisco-Oakland Bay Bridge (Fugro-EMI, 1999) and summarized in the Tetra Tech FW report. The only exception was the selection of the properties for the Franciscan Complex, which was taken as a soft rock to rock material based on the Bulletin of the Seismological Society of America (Wills, 2000) with a shear wave velocity of 2,550 fps, which is compatible with the target MCE bedrock response spectrum.

The material parameters utilized in SHAKE2000 for IR Site 2 subsurface materials are summarized in Table 3 and shown graphically in the following Figures 3 and 4 for the western and southern coastal margin profiles, respectively.

Table 3
SHAKE 2000 Material Input Parameters

Material	Mass Density (pcf)	Shear Wave Velocity (fps)	Maximum Shear Modulus (ksf)	Material Damping (%)
Artificial Fill	110	656	1,470	5
Young Bay Mud	105	656	1,403	5
Merritt Sand	125	1,353	7,106	5
Old Bay Mud	110	825-995	1,570-3,382	5
Alameda Clay	125	950	3,503	5
Alameda Sand	125	1,500	8,734	5
Franciscan Complex Bedrock	140	2,550	28,272	2

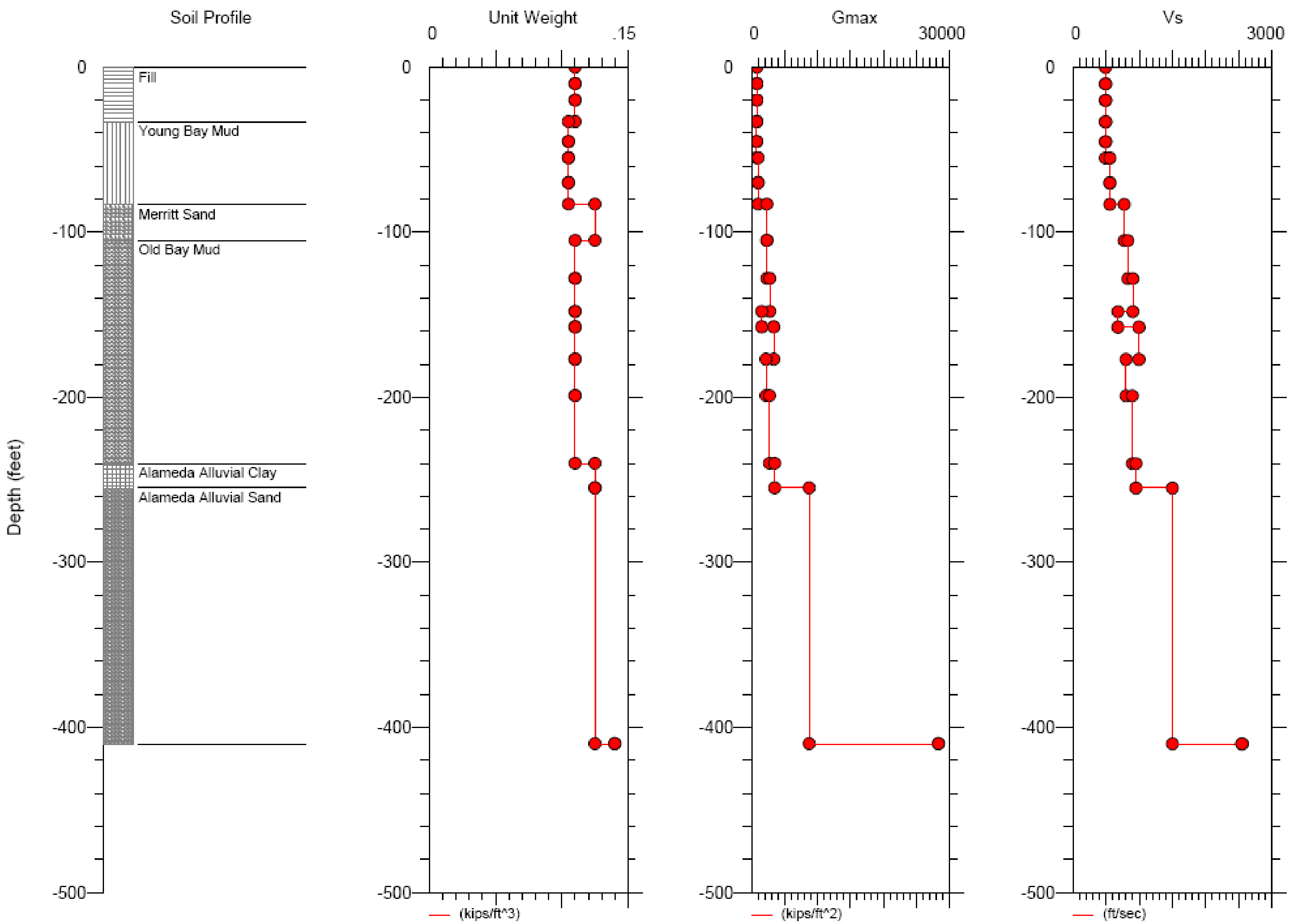

Figure 3 – Soil and Shear Wave Velocity Profile for <u>Western Coastal Margin</u>

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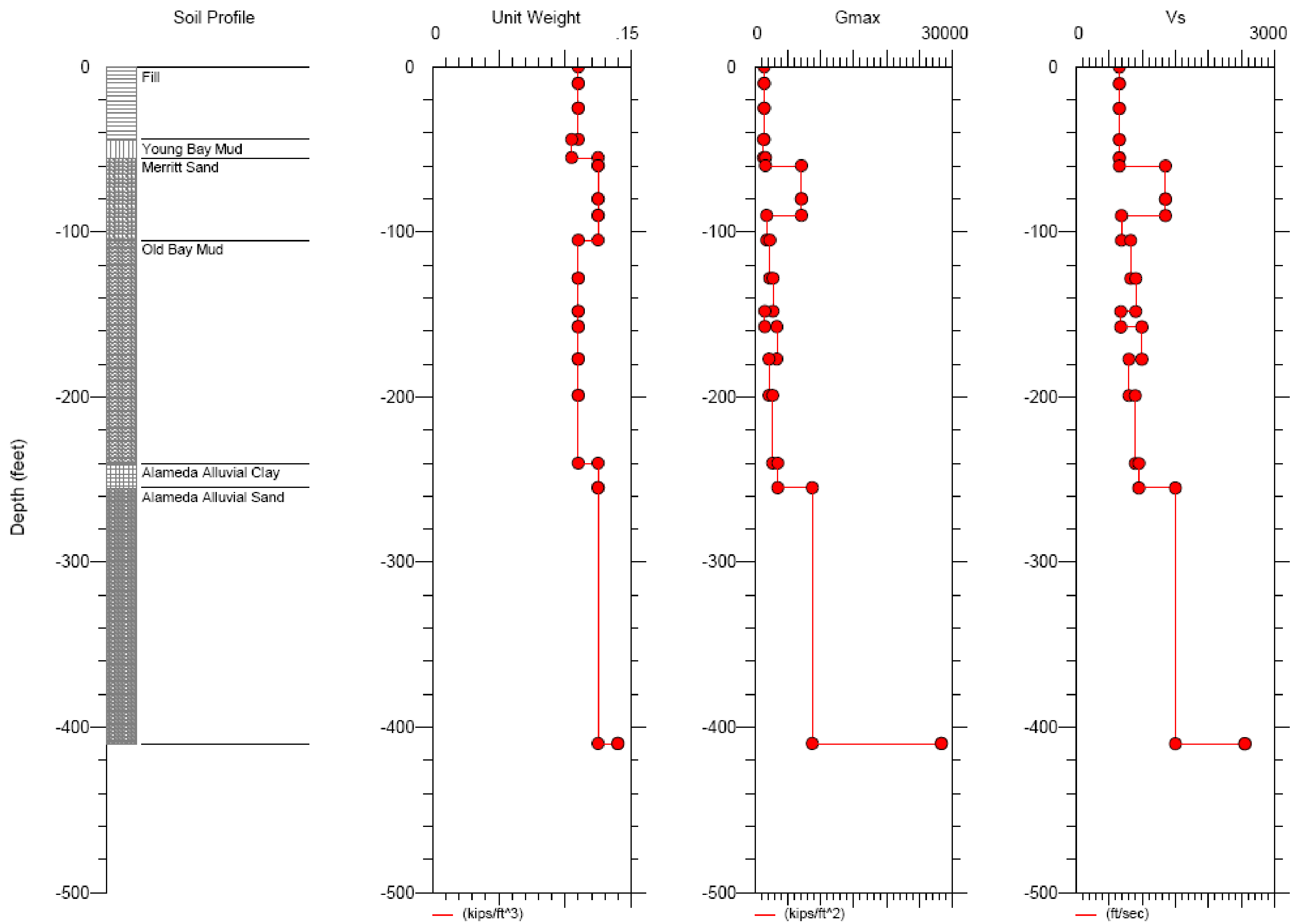

Figure 4 – Soil and Shear Wave Velocity Profile for Southern Coastal Margin

The shear modulus degradation and material damping curves used in SHAKE2000 are summarized in Table 4 and shown graphically in following Figures 5 and 6 for shear modulus and material damping, respectively.

Table 4
SHAKE 2000 Shear Modulus Degradation and Material Damping Curves

Material	Shear Modulus Degradation	Damping Curve
Artificial Fill	Sand, Average (Seed & Idriss, 1970)	Sand, Average (Seed & Idriss, 1970)
Young Bay Mud	Young Bay Mud (Sun et al., EERC-88/15)	Young Bay Mud (Sun et al., EERC-88/15)
Merritt Sand	Sand, Upper Bound (Seed & Idriss, 1970)	Sand, Lower Bound (Seed & Idriss, 1990)
Old Bay Mud	Vucetic and Dobry (1991), PI=30	Vucetic and Dobry (1991), PI=30
Alameda Clay	Vucetic and Dobry (1991), PI=30	Vucetic and Dobry (1991), PI=30
Alameda Sand	EPRI (1993), Z=75-150m	EPRI (1993), Z=75-150m
Franciscan Complex Bedrock	Rock (Schnabel, 1973)	Rock (Schnabel, 1973)

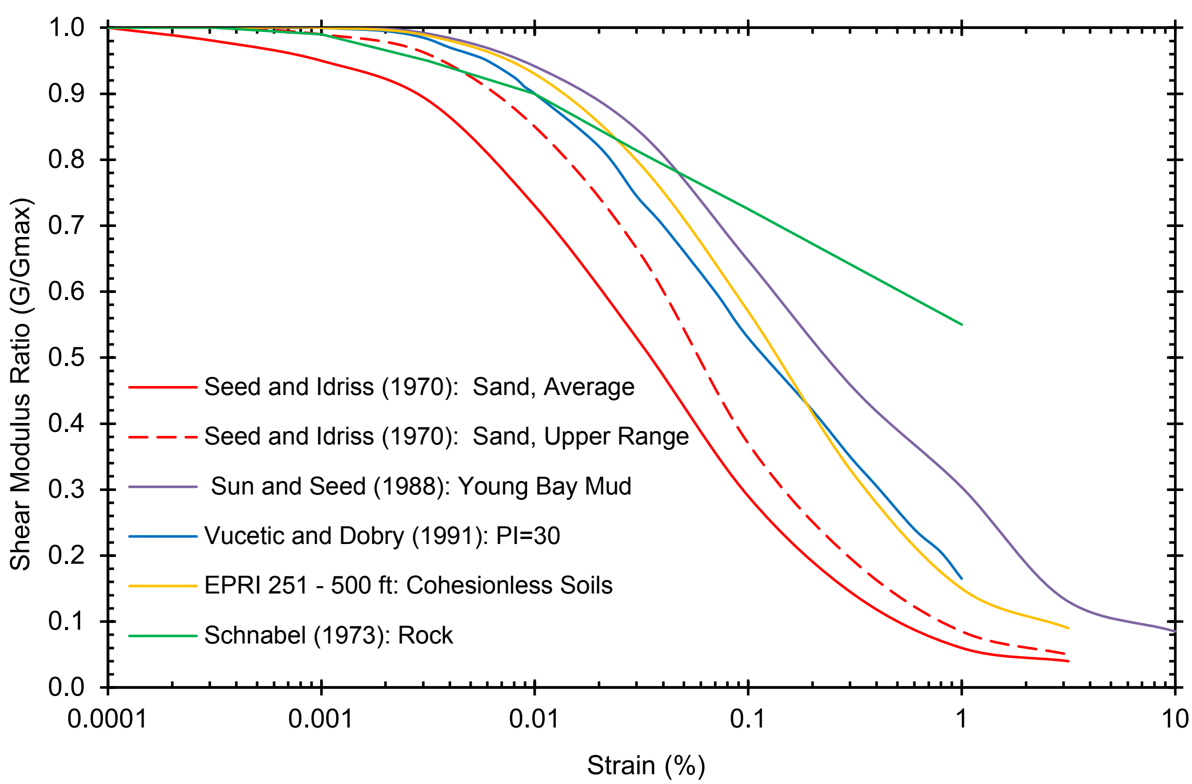

Figure 5 – Shear Modulus Degradation Curves

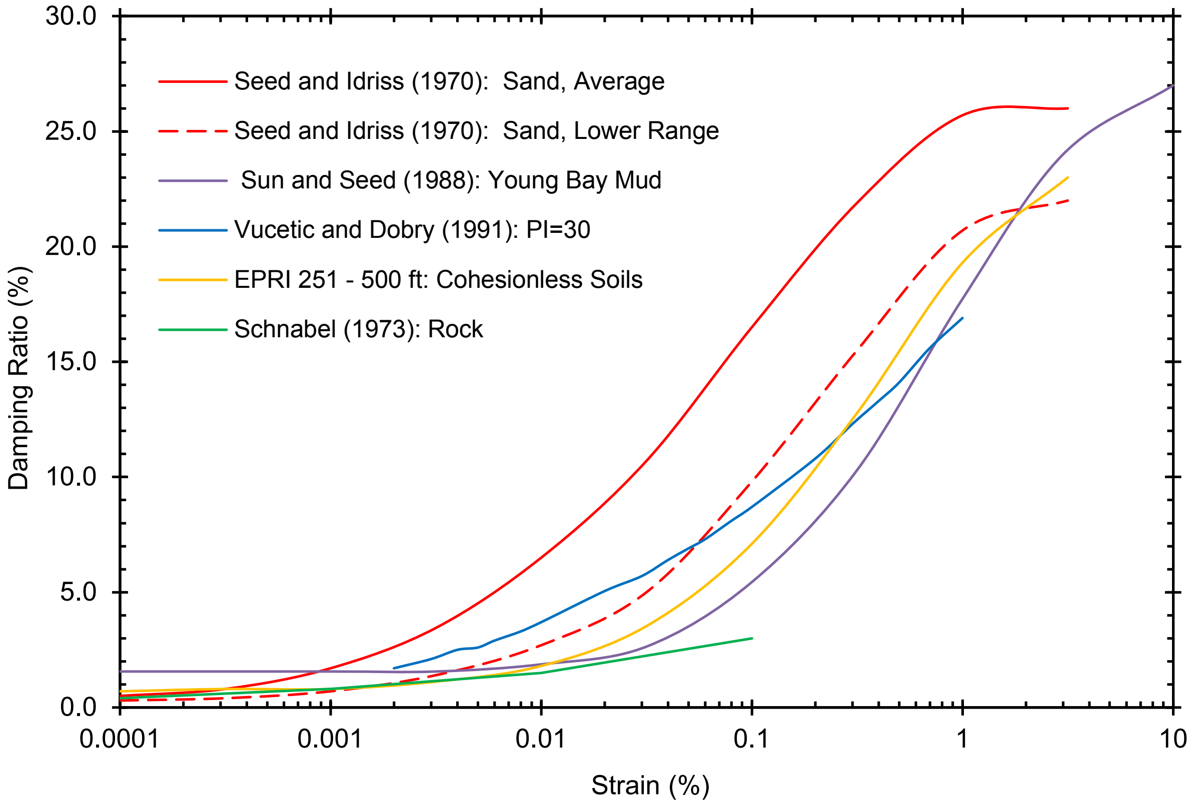

Figure 6 – Material Damping Curves

6.5. Design Peak Ground Acceleration

All 7 selected and scaled acceleration time histories were input into the SHAKE2000 model for the western and southern coastal margin profiles. Representative input and output of the SHAKE2000 model is included in Appendix C of this report. The results of the SHAKE2000 analyses are summarized in terms of peak ground acceleration (PGA) in Table 5 and shown graphically as site response spectra in the following Figures 7 and 8 for the western and southern coastal margins, respectively.

Table 5
SHAKE 2000 Results Summary

Acceleration Time History Record No.	Peak Bedrock Acceleration (g)	Peak Ground Acceleration (g)	
		Western Coastal Margin	Southern Coastal Margin
164	0.193	0.213	0.176
2739	0.204	0.228	0.141
1787	0.260	0.312	0.263
265	0.515	0.410	0.355
1148	0.275	0.212	0.159
1111	0.315	0.345	0.366
864	0.255	0.411	0.385
	Average	**0.31**	**0.26**

The design PGA is taken as the average result for the 7 input acceleration time histories to be 0.31 for the western coastal margin and 0.26 for the southern coastal margin.

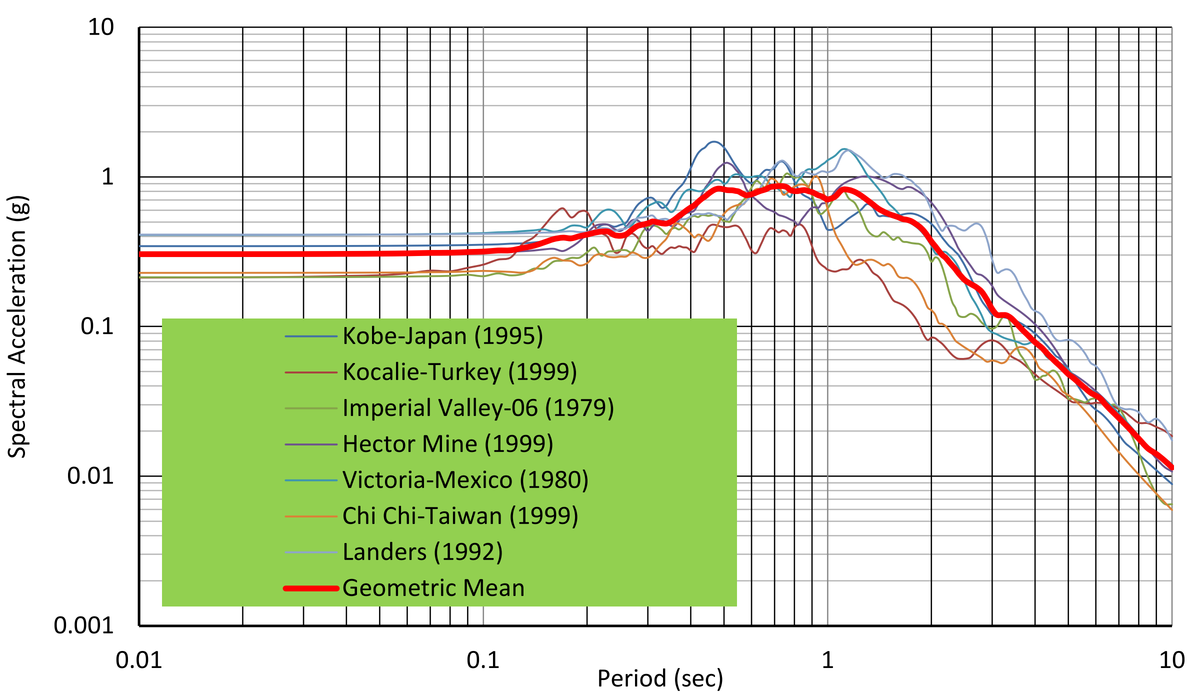

Figure 7 – Ground Response Spectrum for Western Coastal Margin

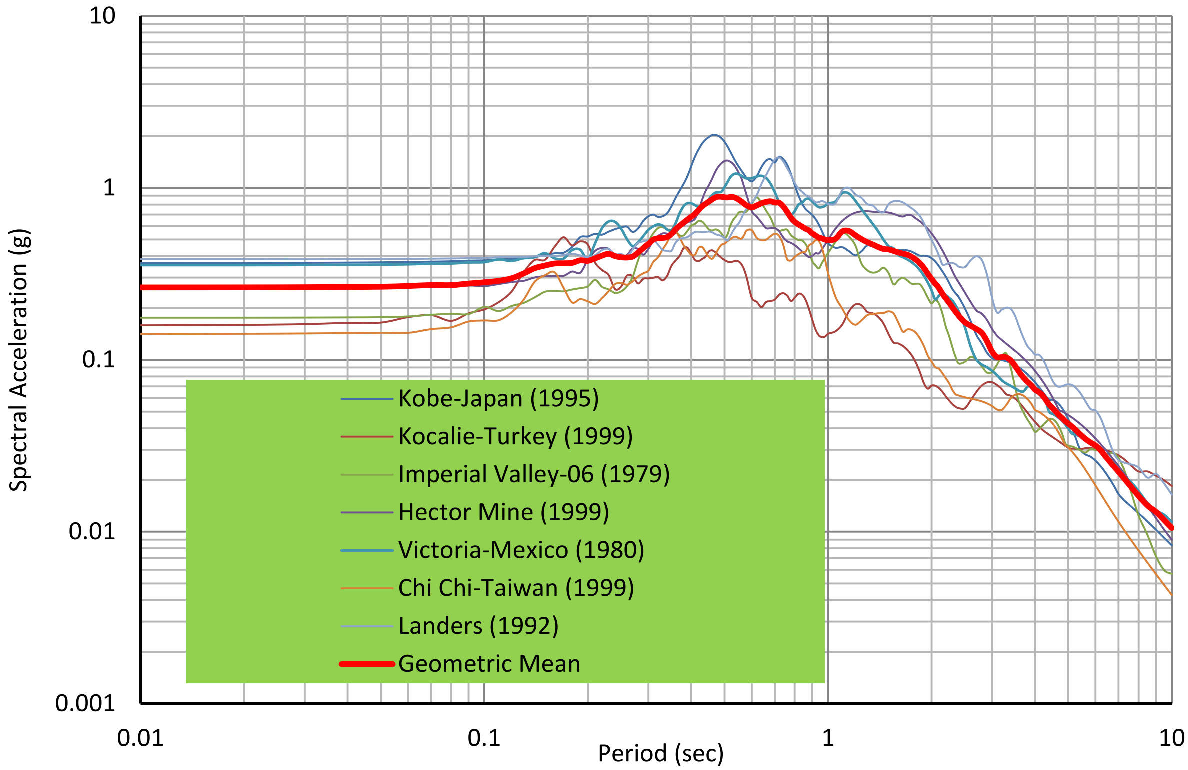

Figure 8 – Ground Response Spectrum for <u>Southern Coastal Margin</u>

7. SLOPE STABILITY AND NEWMARK-TYPE SEISMIC DEFORMATIONS

As previously stated, based on the prior reports and as confirmed by evaluations and analyses presented herein for the modeled maximum credible earthquake, the western and southern coastal margins are susceptible to seismically induced displacements or flow failure for the modeled maximum credible earthquake. The sections below provide a detailed summary of analyses performed to quantify the potential for failure and displacements.

7.1. Slope Stability and Newmark-Type Deformation Evaluation Methodology

The seawalls along the western and southern coastal margins of the landfill are considered to provide the confinement of the landfill refuse. However, the perimeter slopes, including the seawalls, were identified to be potentially unstable during a maximum credible earthquake and susceptible to permanent seismic deformation or flow failures as documented in both the Tetra Tech FW and KCH reports. Consequently, two critical sections representative of the western and southern coastal margins were developed for slope stability analyses utilizing the updated seismic demand presented in this report. For the purposes of this investigation, critical sections are defined as the steepest section at its maximum height providing the greatest potential for instability. The locations of the sections are shown on Plate 2, Site and Exploration Location Map, attached to this report. The sections are shown graphically as Geologic Sections A-A' and B-B', Plates 3 and 4, attached to this report, for the southern and western coastal margins, respectively.

A third section crossing the landfill boundary and the wetlands was considered. A similar section was also considered in the KCH report. This third section is shown graphically as Geologic Section C-C', Plate 5 attached to this report, and is considered the critical section for the wetlands margin.

To provide drainage above the steeper slopes described above, site grades have been revised since performing the slope stability evaluations presented herein. However, the analyzed design sections remain critical as defined above, and the conclusions regarding slope stability and permanent seismic deformations remain valid.

A fourth Geological Section D-D' is provided, but not for stability analysis. Section D-D' is oblique to the coastal margins and does not represent a critical section. The purpose of Geologic Section D-D' is to show the variability of the thickness of Young Bay Mud. As described in more detail in Section 11 of this report, the static long term settlement is largely controlled by the thickness of Young Bay Mud. To provide detail on such a lengthy section, a vertical exaggeration is used to make the layers legible. The vertical exaggeration results in artificially steep slopes, making the section inappropriate for stability analysis.

The purpose of the slope stability evaluation is to update the results presented in the Tetra Tech FW and KCH reports, with new consideration given to movements of the failure mass during the design earthquake event to help evaluate the potential and reach of post-earthquake flows. Slope stability evaluations were performed using the computer program SlopeW (Geo-Slope Office, 2007) using Spencer's rigorous limit equilibrium method, satisfying all three conditions of equilibrium: force equilibrium in the horizontal and vertical directions and moment equilibrium. A minimum Factor of Safety of 1 was considered acceptable for post-earthquake stability conditions as prescribed in United States Army Corps of Engineers (USACE) Manual EM 1110-2-1913 (USACE, 2000). Conversely, post-earthquake flow failure was considered eminent for a Factor of Safety less than 1.

Permanent deformations are anticipated to occur during the earthquake when inertial forces resulting from the earthquake destabilize the slope. After the earthquake, when soil strengths are fully reduced by liquefaction or softening, additional deformations may occur if the slope geometry remains unstable after the generally stabilizing deformations which occurred during the earthquake. Additional deformations after the earthquake may consist of rigid sliding mass displacements similar to the displacements predicted during the earthquake and described below until a stable configuration is achieved, or may consist of flow deformation. Flow deformation analyses based on fluid mechanics were performed to bracket the range of seismically induced permanent displacements as described in Section 8 of this report.

Deformation predictions during the earthquake were performed by pseudostatic slope stability analyses to determine the yield accelerations and double-integrating the acceleration time history for periods where the accelerations exceed the yield acceleration to compute cumulative permanent seismic displacements (Newmark, 1965).

Slope stability and Newmark-type permanent seismic deformation analyses were performed for the following cases and purposes:

- Before earthquake, static analyses mobilizing the soil's full strength were performed to evaluate the baseline stability using conventional slope stability analyses using SlopeW.

- During earthquake, pseudostatic analyses mobilizing strengths between before and after the earthquake were performed to determine the yield acceleration using SlopeW for calculating permanent seismic displacement taking place during the earthquake based on Newmark's method.

  For the coastal margin areas (Sections A-A' and B-B'), the SHAKE2000 computer program was used to perform the deformation analyses. The program uses double integration of the horizontal equivalent acceleration (HEA) time histories based on weighted-average motions within the sliding mass. The HEA is the acceleration applied to an ideal rigid sliding mass considered to be equivalent of accelerations within a flexible sliding mass where accelerations vary with depth. The deformations were calculated for all 7 scaled time histories and the average of all 7 computed deformations was taken as the prediction of permanent seismic rigid deformation during the earthquake.

  For the interior slope between the landfill and wetlands (Section C-C') where deformations are not as critical because of the width of the buffer zone between the landfill boundary and the seawall, a simplified method (Bray and Travasarou, 2007) based on a database of similar simulations as described above was used to predict permanent seismic deformations. This method is considered to yield adequate results compared to the more rigorous Newmark method. The simplified method also quantifies the probability of exceedance of a given seismic deformation, whereas the rigorous method provides a deterministic value calculated based on a given acceleration time history. The simplified method result presented for Section C-C' on Table 7 is a conservative value, i.e., probability of exceedance of only 16 percent. Results for other risk levels (probability of exceedance of 50 and 84 percent) are provided in Appendix E. The ground response spectrum shown in Figure 8 for the southern coastal margin was used for the simplified method because the subsurface conditions are similar to the interior wetlands margin slope, in particular relatively thin Young Bay Mud and thick Merritt Sand layers. The mean predicted deformation was taken as representative of anticipated permanent deformation during the earthquake.

- After earthquake, static slope stability analyses were performed to determine the stability of the sections when subgrade materials are fully weakened due to seismic loading either due to the liquefaction of sandy soils or strain softening of Young Bay Mud. When the Factor of Safety indicates instability, i.e., less than 1, additional analyses are performed to evaluate if the Newmark-type displacements during the earthquake have shifted the slope into a more stable configuration that is capable of withstanding the fully weakened strength of the subgrade materials. This analysis was accomplished by performing conventional slope stability analyses on a rotated/displaced slope geometry. The amount of rotation/displacement was chosen to roughly match the magnitude of the displacement during the earthquake calculated in the previous step. If such a configuration was stable, no post-earthquake displacements are anticipated and the magnitude of permanent seismic deformation is the Newmark-type displacement calculated in the previous step. This condition was determined applicable for the western coastal margin, Section B-B', and the wetlands margin, Section C-C'.

  However, if the displacement *during* the earthquake did not result in a stable configuration *after* the earthquake, post-earthquake movement was anticipated and in the case of the liquefied material the resulting reach of the post-earthquake flow was calculated using flow run-out analyses described in Section 8. This condition was determined applicable for the southern coastal margin, Section A-A'. This flow run-out analysis was also used in the conclusions of this report as the conservative upper-bound of the possible seismically induced permanent displacements.

7.2. Shear Strengths of On-Site Materials

Shear strength parameters were taken from applicable laboratory test results, CPT soundings, and Standard Penetration Test (SPT) results presented in the Tetra Tech FW and KCH reports. The relevant borehole logs and laboratory test results are included herein in Appendices A and B.

Shear strength parameters for the various materials comprising the perimeter slopes are summarized in Table 6 for the before and after earthquake cases. For the during earthquake case, before and after earthquake strengths were averaged and used to determine the yield acceleration for subsequent permanent deformation analyses.

The existing slurry wall is considered to be a typical bentonite-soil cut-off wall to impede gourndwater connection between the landfill and the Bay. Due to its size on the order of 2 feet wide, the existing slurry wall does not have any engineering impact on the deformation and stability analyses and was not rigorously considered.

Table 6
Shear Strength Parameters

Material	Before Earthquake			After Earthquake		
	Friction Angle (deg)	Cohesion (psf)	S_u/σ'_v (1)	Friction Angle (deg)	Cohesion (psf)	S_u/σ'_v (1)
Landfill Cover	32	150	-	32	150	-
Perimeter Berm Fill	32	150	-	32	150	-
Refuse	32	0	-	0	600	-
Hydraulic Fill	30	0	-	0	300	-
Young Bay Mud (fine-texture)	-	-	0.25	-	N/A	0.20
Young Bay Mud (coarse texture)	30	0	-	0	300	-
Merritt Sand	36	0	-	36	0	-
Old Bay Mud	-	-	0.30	-	-	0.24
Improvement Zone (western coastal margin)	0	4,750	-	0	4,750	-
Improvement Zone (southern coastal margin)	0	9,500	-	0	9,500	-

(1) Based on Stress History and Normalized Soil Engineering Properties (SHANSEP) model which relates undrained shear strength, S_u, to effective overburden stress, σ'_v, or preconsolidation pressure.

The determination of shear strength parameters are described in more detail in the following sections.

7.2.1. Landfill Cover and Perimeter Berm Fill

Strength parameters for the landfill cover and the berm fill were based on typical values for compacted fill consisting of primarily sand with some fines (NAVFAC DM 7.02, Table 1, pg. 7.2-39). No reduction in strength was used in stability analyses for these compacted fill materials above groundwater while evaluating post-earthquake stability.

7.2.2. Refuse

Strength parameters for refuse mixed with hydraulic sandy fill were estimated based on SPT results which indicate a slightly higher strength than the underlying fill, presumably due to compaction resulting from the mechanical mixing of refuse with pre-existing hydraulic fill. SPT results generally indicate a friction angle consistent with medium dense sandy material (Lambe and Whitman, 1969). This material is considered liquefiable and the residual liquefied post-earthquake strength was correlated from SPT results and taken as the lower third of the correlation (Seed and Harder, 1990).

7.2.3. Hydraulic Fill

Strength parameters for hydraulic fill were estimated based on SPT results similar to the approach described for refuse. SPT results generally indicate a friction angle consistent with loose sandy material (Lambe and Whitman, 1969). This material is considered liquefiable and the residual liquefied post-earthquake strength was correlated from SPT results and taken as the lower third of the correlation (Seed and Harder, 1990).

7.2.4. Young Bay Mud

Strength parameters for *fine-grained* Young Bay Mud were estimated based on the Stress History and Normalized Soil Engineering Properties (SHANSEP) model (Ladd and Foott, 1974) which relates the undrained shear strength to the effective overburden stress (or preconsolidation pressure) as a constant factor characteristic for the material. The Tetra Tech FW report references this factor to be 0.2 to 0.3 for the Young Bay Mud at the IR Site 2 based on strength testing and correlations with plasticity, as well as data from the nearby San Francisco-Oakland Bay Bridge east span replacement (FUGRO-EMI, 2001). Based on CPT soundings, a SHANSEP factor of 0.25 was utilized for stability analyses. Although this material is not considered liquefiable it is susceptible to weakening during a seismic event and the post-earthquake strength was estimated as 80 percent of the static strength based on testing at the San Francisco Marina District and typical for Young Bay Mud having a plasticity index of about 25 (Sitar and Rau, 1998) resulting in a SHANSEP factor of 0.20.

Strength parameters for *coarse-grained* Young Bay Mud were based on SPT results which generally indicate a friction angle consistent with loose sandy material (Lambe and Whitman, 1969). This material is considered liquefiable and the residual post-earthquake strength was correlated from SPT results and taken as the lower third of the correlation (Seed and Harder, 1990).

7.2.5. Merritt Sand

Strength parameters for the Merritt Sand were estimated based on SPT results which generally indicate a friction angle consistent with dense sandy material (Lambe and Whitman, 1969). This material is not prone to liquefaction, and no reduction in strength was considered for post-earthquake stability.

7.2.6. Old Bay Mud

Strength parameters for the Old Bay Mud were estimated based on the SHANSEP model using a constant ratio of 0.3, accounting for slightly overconsolidated stiff to very stiff clay. Although this material is not considered liquefiable it is susceptible to weakening during a seismic event and the post-earthquake strength was estimated as 80 percent of the static strength, resulting in a SHANSEP factor of 0.24. Because of the depth of the Old Bay Mud, the strength of this material has no influence on the results of stability analyses.

7.3. Results of Slope Stability Analyses

The results of the slope stability analyses are discussed in Section 9 and summarized in Table 7, including associated permanent seismic rigid deformation, and where applicable, flow run-out analyses. The graphical outputs of the slope stability analyses are presented in Appendix D of this report.

8. FLOW RUN-OUT ANALYSES

Liquefaction-induced slides of saturated sand or fully-softened, sensitive mud may be flow-like in character. Flow slides exhibit varied velocity profiles along the depth of the slide resembling the flow of fluids, whereas the rigid body displacements analyzed using conventional slope stability methods described in the previous section of this report imply a constant velocity "single-piece" movement of the slide during the analysis. Rigid materials deform by movement along discrete failure surfaces. Fluids, by contrast, deform as a whole and within the moving mass in what is termed flow. Flows exhibit deformations significantly greater than rigid body displacements.

Although most slides behave largely like rigid bodies, as the involved materials soften the deformation character transitions more towards the flow-type movement. An actual flow slide is likely to be somewhere between the two idealized end members: (1) rigid body movement previously discussed and (2) fluidized flow. The rigid body movement is conventionally and herein analyzed using limit equilibrium methods. The fluidized flow deformation analyses described below are intended to constraint the other extreme of possible deformations.

The flow-type analysis described below was used for the southern coastal margin because at this location the slope is predicted to be unstable after strong ground shaking due to the MCE has subsided. That is, the deformation occurring during the earthquake is not predicted to result in a stable configuration after the earthquake, and the slope flows until reaching a stable run-out distance predicted as follows.

8.1. Flow Rheological Model

The flow resistance depends on the rheology of the fluid. A plastic flow rheological model was chosen for the simplified flow analyses described below. Plastic flow is characterized by flow initiated only after exceeding some threshold shear strength with little viscous resistance once flow begins. Viscous resistance refers to resistance which is a function of velocity and consequently varies within the flow depth and changes with time as the flow decelerates. In contrast, flow resistance in a plastic flow is provided by a uniform, steady-state shear strength. Because plastic flow may be defined by a single shear strength parameter, the closed-form solution described below may be readily used to estimate the flow run-out distance. In this regard, the choice of a plastic flow rheological model is a matter of convenience because it lends itself to a numerically simple solution. Given that the confining contribution of the seawall is completely ignored in the method described below, the predicted run-out distance is deemed to be conservative.. For liquefied sand, the shear strength parameter used to define plastic flow is the residual, post-earthquake shear strength taken as 300 psf for hydraulic fill presented in Table 6. Plastic flows generally exhibit changes in shape with little change in volume.

8.2. Approximate Energy Method

A flow model for simplified geometries applicable to the southern coastal margin utilized herein may be developed by applying two fundamental principles of physics: (1) conservation of energy and (2) conservation of mass. The initial geometry consists of a vertical face 25 feet in height representing the seawall behind which is a uniform height/thickness of liquefied dredged sand. The final geometry is taken as a parabolic profile representing the run-out, based on the theory of roll waves in plastic medium (Lucia, 1981).

The simplified model geometry described above may also be applied to all geometries subject to plastic flow. However, this method was used only for the southern coastal margin because only at this location is the coastal margin predicted to be unstable after strong ground shaking due to the MCE has subsided and therefore subject to further flow run-out analysis.

The initial and final model geometries are shown in Figure 9.

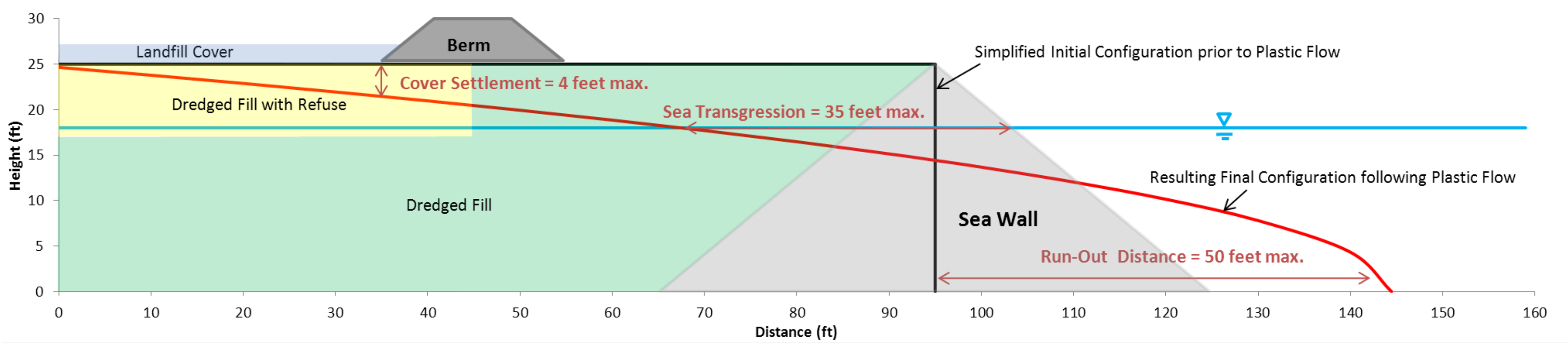

Figure 9.1 – Flow Run-Out Model, Simplified Initial and Final Geometries

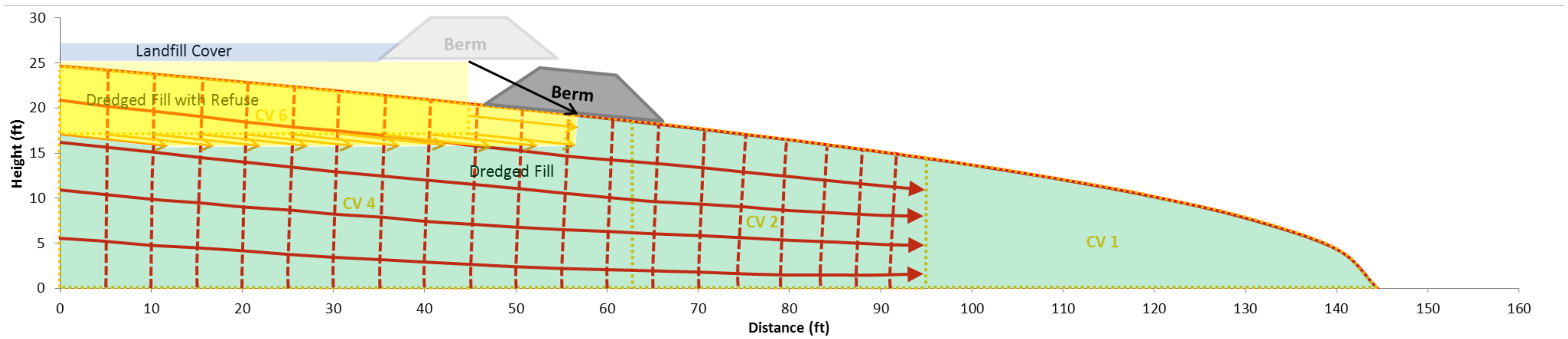

Figure 9.2 – Flow Run-Out Model, Interpreted Plastic Flow of Dredged Fill and Refuse

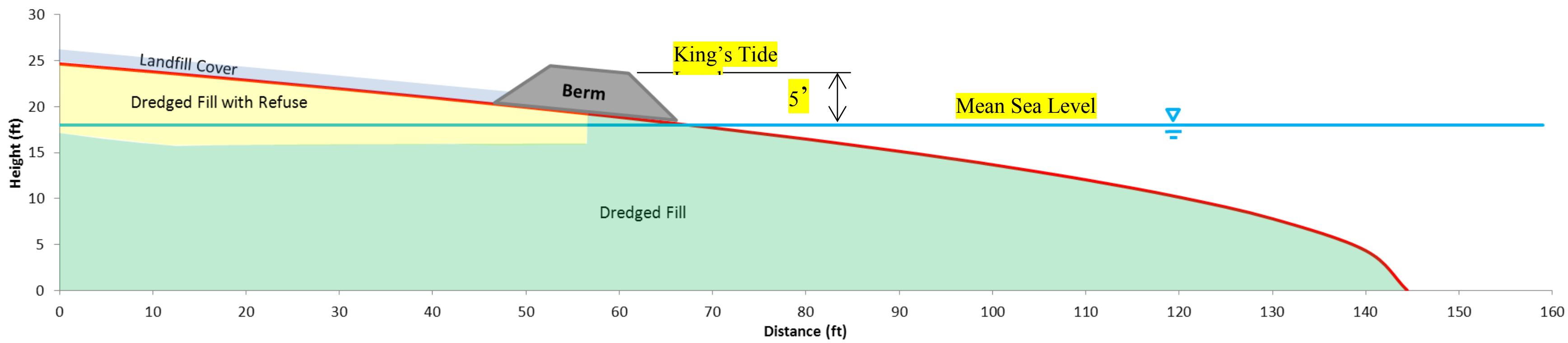

Figure 9.3 – Flow Run-Out Model, Interpreted Rigid Translation of Berm and Final Configuration

Conservation of energy is accomplished by equating the change in potential energy from the initial geometry to the final run-out geometry to the work done by the shear stress acting on the base of the flow, formulated as Equation 1; and conversation of mass is accomplished by equating the volume of the initial geometry to the volume of the final run-out geometry, formulated as Equation 2 (Hungr, 1995):

9. RESULTS OF SLOPE STABILITY AND PERMANENT SEISMIC DEFORMATION ANALYSES

The results of the slope stability and permanent deformation analyses are summarized in Table 7. The graphical outputs of the slope stability analyses are presented in Appendix D of this report. Graphical output of the SHAKE2000 deformation computations showing equivalent acceleration time histories, velocity time histories by integration, and cumulative deformation by double integration are included in Appendix E of this report. The simplified method computations for the interior wetlands margin slope are also included in Appendix E.

Table 7
Summary of Slope Stability and Permanent Seismic Deformation Analyses

Section A-A' Southern coastal margin					
Case	Before Earthquake	During Earthquake	After Earthquake		
Analysis method	Conventional static slope stability (Slope/W)	Pseudostatic slope stability (SlopeW) with intermediate strengths and Newmark-type displacement (SHAKE2000)	Conventional static slope stability (Slope/W) with fully weakened strengths	Rigid body rotation by 1° (Slope/W)	Plastic flow model
Factor of Safety or Yield Acceleration	$FS_{static} = 2.14$	$k_{yield} = 0.095g$	$FS_{static} = 0.88$	$FS_{static} = 0.97$	n/a
Permanent Displacement	n/a	1.1 feet	n/a	Crest translation of 1.7 feet	Up to 50 feet; See Figure 9 for flow deformation potential
Note		Deformation during seismic event	Indicates potential instability at the end of earthquake event	Confirms continued instability at the end of earthquake event and post-earthquake movements	Post-earthquake movements
Appendix D Page	D-1	D-2	D-3	D-4	Figure 9

Table 7 Continued
Summary of Slope Stability and Permanent Seismic Deformation Analyses

Section B-B' Western coastal margin					
Case	Before Earthquake	During Earthquake	After Earthquake		
Analysis method	Conventional static slope stability (Slope/W)	Pseudostatic slope stability (SlopeW) with intermediate strengths and Newmark-type displacement (SHAKE2000)	Conventional static slope stability (Slope/W) with fully weakened strengths	Rigid body rotation by **7.5°** (Slope/W)	Plastic flow model
Factor of Safety Yield Acceleration	$FS_{static} = 1.38$	$k_{yield} = 0.02g$	$FS_{static} = 0.95$	$FS_{static} = 2.68$	Analyses not needed because the post-earthquake configuration is stable after 10 feet of displacement
Permanent Displacement	n/a	10.0 feet	n/a	Crest translation of 10 feet; and vertical drop of 12.5 feet	
Note		Deformation during seismic event	Indicates potential instability at the end of earthquake event	Indicates stability of the deformed configuration at the end of earthquake event	
Appendix D Page	D-5	D-6	D-7	D-8	

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Table 7 Continued
Summary of Slope Stability and Permanent Seismic Deformation Analyses

<table>
<tr><td colspan="6">Section C-C'
Landfill – wetlands boundary</td></tr>
<tr><td>Case</td><td>Before Earthquake</td><td>During Earthquake</td><td colspan="3">After Earthquake</td></tr>
<tr><td>Analysis method</td><td>Conventional static slope stability (Slope/W)</td><td>Pseudostatic slope stability (Slope/W) with intermediate strengths and Newmark-type displacement (Bray & Travasarou, 2007)</td><td>Conventional static slope stability (Slope/W) with fully weakened strengths</td><td>Rigid body rotation (Slope/W)</td><td>Plastic flow model</td></tr>
<tr><td>Factor of Safety/Yield Acceleration</td><td>$FS_{static} = 1.69$</td><td>k_{yield} 0.06g</td><td>$FS_{static} = 1.36$</td><td colspan="2" rowspan="4">Analyses are not needed because the post-earthquake configuration is stable</td></tr>
<tr><td>Permanent Displacement</td><td>n/a</td><td>1.9 feet</td><td>n/a</td></tr>
<tr><td>Note</td><td></td><td>Deformation during seismic event</td><td>Indicates stability at the end of earthquake event</td></tr>
<tr><td>Appendix D Page</td><td>D-9</td><td>D-10</td><td>D-11</td></tr>
</table>

9.1. Slope Stability and Newmark-Type Displacement Interpretation and Conclusions

The results presented in Table 7 offer the following observations and conclusions:

- The perimeter slope at the southern coastal margin is susceptible to liquefaction and may flow as evidenced by a Factor of Safety less than 1 after the earthquake. The rigid body rotation model is not applicable to where liquefaction and/or softening reduce appreciably the soil strength. Therefore, the predicted rigid body displacements summarized above should be considered a reasonable lower bound, whereas the flow run-out displacement of 50 feet modeled after the earthquake and discussed in the following section should be considered a conservative upper bound.

- The perimeter slope at the western coastal margin stabilizes after rotation of the sliding mass during the earthquake as evidenced by a Factor of Safety greater than 1 after the earthquake;

- Based on rigid body rotation, solid refuse at the western coastal margin is not predicted to be released into the San Francisco Bay, and nor is it predicted to be inundated with water overtopping the seawall;

- The headscarp at the western coastal margin after rigid rotation is predicted to be on the order of 12 feet in height, and may expose some incidental debris beneath the perimeter berm but will generally leave the refuse prism behind the berm intact;

- The wetlands margin is stable after the earthquake even without considering potentially stabilizing deformations during the earthquake; and

- Deformations accumulating during the earthquake at the wetlands margin are not predicted to exceed 2 feet.

9.2. Flow Model Interpretation and Conclusions

The flow model makes a key simplifying, conservative but unrealistic assumption by assuming that the seawall is instantaneously whisked out of existence leaving a vertical height of liquefied sand to flow out into the San Francisco Bay. By inspection of the volume of the seawall relative to the flow mass as shown in Figure 9, it is apparent that the seawall would provide a considerable rigid shell restricting outward flow. In other words, the actual flow is a composite flow with both rigid inclusions and liquefied zones. At the southern coastal margin, where the seawall rests on liquefiable dredged sand, the seawall may drift seaward on the underlying liquefied flow. At the western coastal margin, where the seawall rests on soft bay mud, the seawall may rotate out or sink as a result of plastic flow. The above descriptions of possible seawall distortions are nowhere near as unfavorable as assumed in the model.

The berm consists of compacted fill. The materials comprising the berm are not below groundwater and consequently are not prone liquefaction. For the purposes of the model, the berm is considered to be a rigid body rafting on top of a subgrade subject to plastic flow as shown of Figure 9.2.

The following conclusions (also shown graphically on Figure 9) may be drawn:

- The conservative maximum predicted run-out of a flow slide is 50 feet past the crest of the perimeter seawall and the solid refuse is not predicted to be released into the San Francisco Bay;

- The freeboard provided by the seawall is predicted to be lost with inundation of the coastal margin;

- The cover is predicted to settle a maximum of 4 feet adjacent to the perimeter berm;

- Based on an existing top of berm elevation of 16 to 17 feet above sea level, the top of the berm after flow run-out is predicted to be at elevation 11 to 12 feet; and

- Based on a high King's tide elevation of 11.7 feet (Shaw, 2005), the berm may be crested and overtopped if a King's tide were to coincide with or occur immediately after the MCE (see Figure 9.3).

Following any significant earthquake event and in order to maintain an adequate freeboard during the King's tide and to protect against the wave lap erosion of a submerged toe of the perimeter berm, the berm should be inspected, assessed, and raised and/or armored as necessary as a part of remedial grading immediately.

Rising sea level on the order of 0.1 foot over a period of time measured in decades has been recorded at the site (Shaw, 2005). Rising sea level is considered relevant to long term maintenance of the coastal margin, not to remedial grading after an MCE or a significant earthquake event . If sea level rise is appreciable in the coming decades, the berm should be raised to keep pace with rising mean sea level as part of long term maintenance of the coastal margin.

10. LIQUEFACTION

Alameda Point including the IR Site 2 is susceptible to the hazard of liquefaction as evidenced during the 1989 Loma Prieta earthquake which resulted in sand boils, lateral spreads and ground settlement, damaging two runways at the Alameda Naval Air Station (Tinsley, 1998). The observed liquefaction hazard at the IR Site 2 is a result of loose, saturated sandy hydraulic fills placed behind the seawalls. The Tetra Tech FW report describes reported transverse cracks up to 4 inches wide and 3 to 4.5 feet deep as a result of liquefaction during the Loma Prieta earthquake. The 1989 Loma Prieta earthquake had a magnitude of 7.1 and occurred about 60 miles south of Alameda Point with a PGA of approximately 0.21g recorded at Hanger 23 of the Alameda Naval Air Station, less than 1 mile from IR Site 2. Strong shaking was observed for approximately 20 seconds.

10.1. Liquefaction Induced Settlements

The KCH report modeled liquefaction induced settlements of generally less than 4 inches, with the exception of the southern coastal margin and the center of the landfill where 10 and 12 inches of liquefaction induced settlements are modeled, respectively. The Tetra Tech FW report presents liquefaction induced settlement predictions only for the coastal margins, not the interior of the landfill, but provided similar results modeling 8 to 10 inches for the southern coastal margin and 2 to 9 inches for the western coastal margin.

The seismic demand presented in this report based on the latest generation ground motion prediction equations is less than that provided in the KCH and Tetra Tech FW reports. However, the cyclic stress ratio causing liquefaction still generally exceeds the cyclic resistance ratio of the hydraulic fill, and therefore the predictions provided in the KCH and Tetra Tech FW reports remain applicable. Predictions of liquefaction induced settlements at the IR Site 2 are included in Appendix F of this report.

10.2. Liquefaction Induced Lateral Spreading

Using empirical predictions of lateral spreads (Youd, 2002), the Tetra Tech FW and KCH reports model a broad range of liquefaction induced lateral spreads from a few inches to flows of many tens of feet. It should be understood that the method used is based on case histories of liquefaction for similar site conditions and the higher estimates for the IR Site 2 are well beyond documented case histories. As a result, estimates of lateral spreads for the MCE event at the IR Site 2 are poorly constrained and uncertain, but are generally conservative estimates.

Due to the confinement provided by the seawalls, it is our opinion that lateral spreads will be localized similarly to the experience of the 1989 Loma Prieta earthquake described in the subsequent California Geological Survey Report:

"In Alameda, Youd and Hoose (1978) identified two 1906 newspaper reports of ground settlement that caused railroad tracks in Alameda to sink about 4 feet (sites 173 and 174, Plate 1.2). Tinsley and others (1998) recorded four liquefaction sites in Alameda. Liquefaction at site 39 (Plate 1.2) made the two runways and taxiways at the Alameda Naval Air Station inoperable following the 1989 earthquake (site 39, Plate 1.2). Pipelines broke at Mariner Square (site 42), sand boils were observed at the southwestern shoreline of Alameda, at Robert W. Crown Memorial State Beach (site 44), and various effects, including approximately two dozen residential pipeline breaks, were evident at site 45, in neighborhoods near the state beach " (California Geological Survey 2003).

However, with the MCE event, lateral spreads in some areas may be on the order of several feet. Localized soil movements during the MCE event should be anticipated to distort the cover and may result in localized depressions, drainage reversals or similar effects which might require remedial grading.

It should be noted that based on the presented analyses the seawall along the southern coastal margin which is founded on liquefiable hydraulic fill and coarse-grained Young Bay Mud is susceptible to edge failure and lateral spreading.

11. STATIC LONG-TERM SETTLEMENTS

The fine-grained Young Bay Mud underlying the IR Site 2 is soft and compressible. As a result, the IR Site 2 is susceptible to consolidation settlements when surcharged with new fills. Magnitudes of consolidation settlements are anticipated to be governed by the following key factors.

- Thickness of surcharge fills; and
- Thickness of compressible fine-grained Young Bay Mud.

The KCH report predicts settlements for two conditions: thick Young Bay Mud and thin Young Bay Mud. A settlement contour map and two settlement query profiles for each condition above are reproduced in Appendix F of this report. It should be understood that the predicted settlements provided in Appendix F are based on the 60% RD grading plans. Plans currently under development propose significantly thinner fills and commensurately lower settlements should be anticipated.

For the 90% RD grading plan, based on the settlement models provided in the KCH report, settlements of up to 18 inches maybe anticipated at the northern portion of the IR Site 2 where thick deposits of fine-grained Young Bay Mud prevail and the greatest fills are planned. At the southern portion of the IR Site 2, settlements up to 3 inches maybe anticipated where the thin deposits of fine-grained Young Bay Mud prevail and the least fills are planned.

12. SUMMARY OF ANALYSES

Based on the review of the referenced geotechnical reports prepared for the IR Site 2 and additional evaluations of the seismic demand, slopes stability, predicted permanent deformations, and flow run-out analyses, the following conclusions are presented.

Permanent seismic deformations and liquefaction-induced flow failures have been modeled for the MCE event at IR Site 2. These predictions are corroborated by the analyses presented in this report. However, further analyses of permanent seismic deformations and flow run-outs presented in this report predict that the integrity of the cover will be maintained after the MCE event, based on meeting the following performance goals:

- Solid refuse is not anticipated to be released into the San Francisco Bay by the predicted permanent seismic deformations and/or flow run-outs; and
- The site will remain isolated from and will not be flooded by waters of the San Francisco Bay.

In the event that the modeled seismic deformations and liquefaction-induced flow failures occur after the MCE event, substantial remedial grading of the cover and repairs to the seawalls should be anticipated. Contingency provisions to facilitate such repairs should be developed and would need to be implemented. The function of the cover to act as a pathway interruption between landfill content and human and environmental receptors is expected to remain effective, however if left unrepaired further damage, may in time render the cover ineffective. Immediately after the MCE, cracks or openings in the cover resulting from lateral spreads should be filled by pushing in adjacent cover soil, or if needed by placing imported soil, to provide a continuous cover. Thereafter, the minimum cover thickness and grades should be re-established by remedial grading. A revised grading design may be necessary. The impact of the MCE event is summarized as follows:

- Maximum lateral displacement of seawall on the order of 10 to 50 feet;
- Maximum settlement of the cover adjacent to the coastal margin area of 4 feet;
- Lowest subsided top of berm elevation of 11 feet above sea level;
- Maximum vertical head scarp within the coastal margin and perimeter berm areas of 12 feet;
- Maximum settlement of the cover throughout the interior of the landfill of 12 inches; and
- Lateral spreads of the cover throughout the interior of the landfill of intensity capable of breaking pipelines and rendering pavements unusable where present, estimated to be on the order of several feet.

13. COVER CONSTRUCTION RECOMMENDATIONS

Prior to any grading activities, the surface should be cleared of vegetation and surface trash or debris to the degree practicable. After clearing, the exposed subgrade should be moisture conditioned to at least the optimum moisture content and compacted to at least 85 percent of the maximum dry density as determined by ASTM D1557. Prior to placing any fill materials, a representative of the Geotechnical Engineer should observe the subgrade to verify all necessary removals have been made and fill will be placed on suitable materials.

Imported fill materials necessary to achieve final grades and provide the cover should be clean and predominantly granular. Imported soils should be approved by the Geotechnical Engineer prior to arrival on site.

Fill materials should be placed in horizontal lifts of no more than 8 inches in loose thickness, moisture conditioned to at least the optimum moisture content, and compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557.

14. LIMITATIONS

The recommendations and opinions expressed in this report are based on Tetra Tech's review of background documents and on information obtained from field explorations and the associated laboratory testing performed by others. It should be noted that this seismic study did not evaluate the possible presence of hazardous materials on any portion of the site which was evaluated elsewhere.

Conditions not observed and described in this report may be present on the site. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations.

Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this document may, therefore, be invalidated over time, in part or in whole, by changes over which Tetra Tech has no control.

Tetra Tech's recommendations for this site are dependent upon appropriate quality control. Accordingly, the recommendations are made contingent upon the opportunity for Tetra Tech to observe grading operations. If parties other than Tetra Tech are engaged to provide such services, such parties must be notified that they will be required to assume complete responsibility as the Geotechnical Engineer of Record for the geotechnical phase of the project by concurring with the recommendations in this report and/or by providing alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Tetra Tech should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

Tetra Tech has endeavored to perform its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

15. SELECTED REFERENCES

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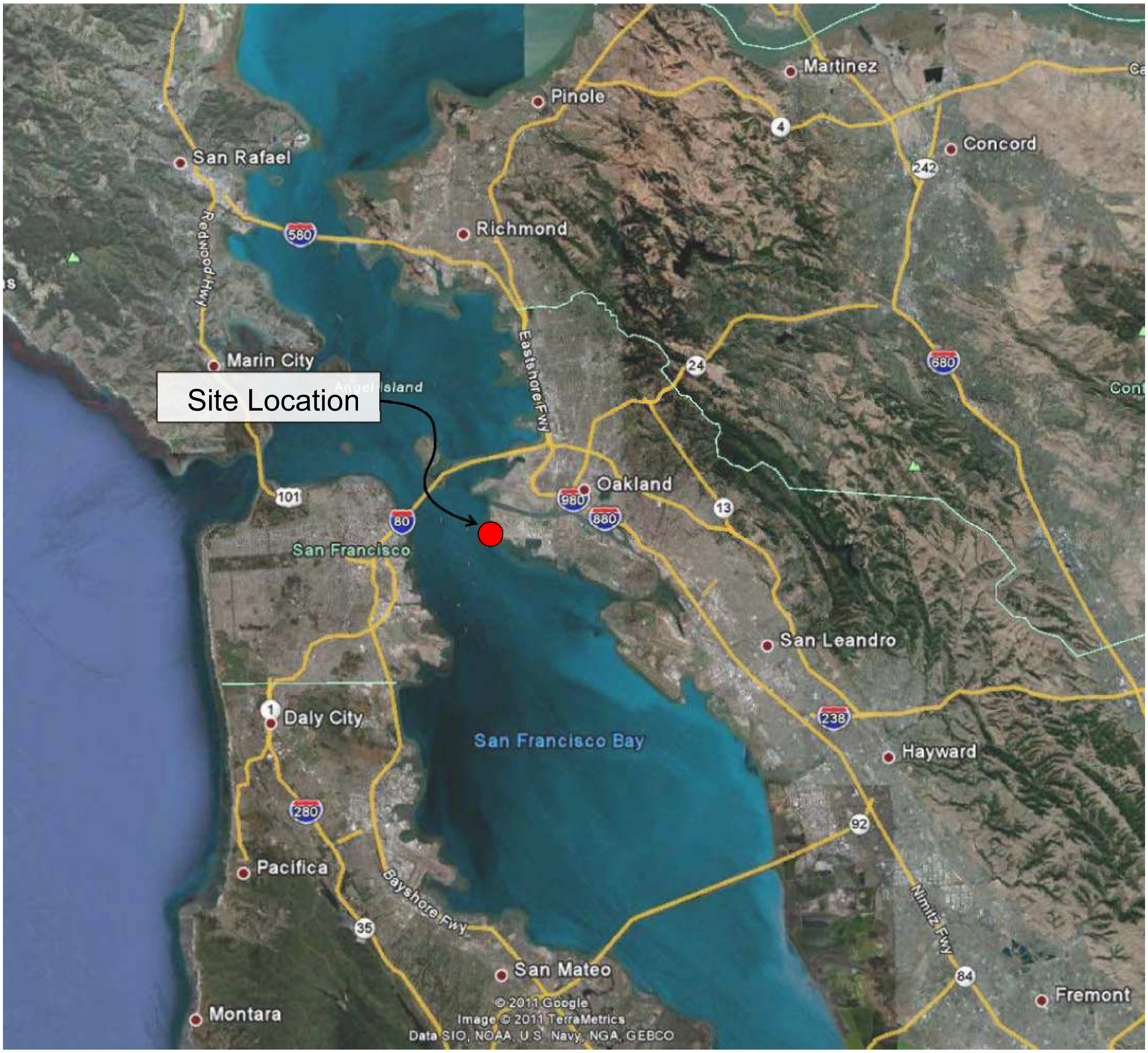
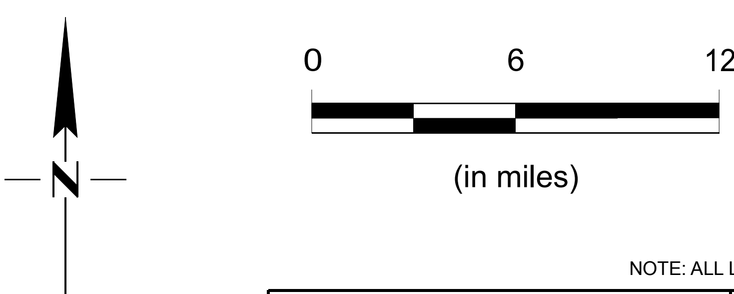
Plates
(on CD only)





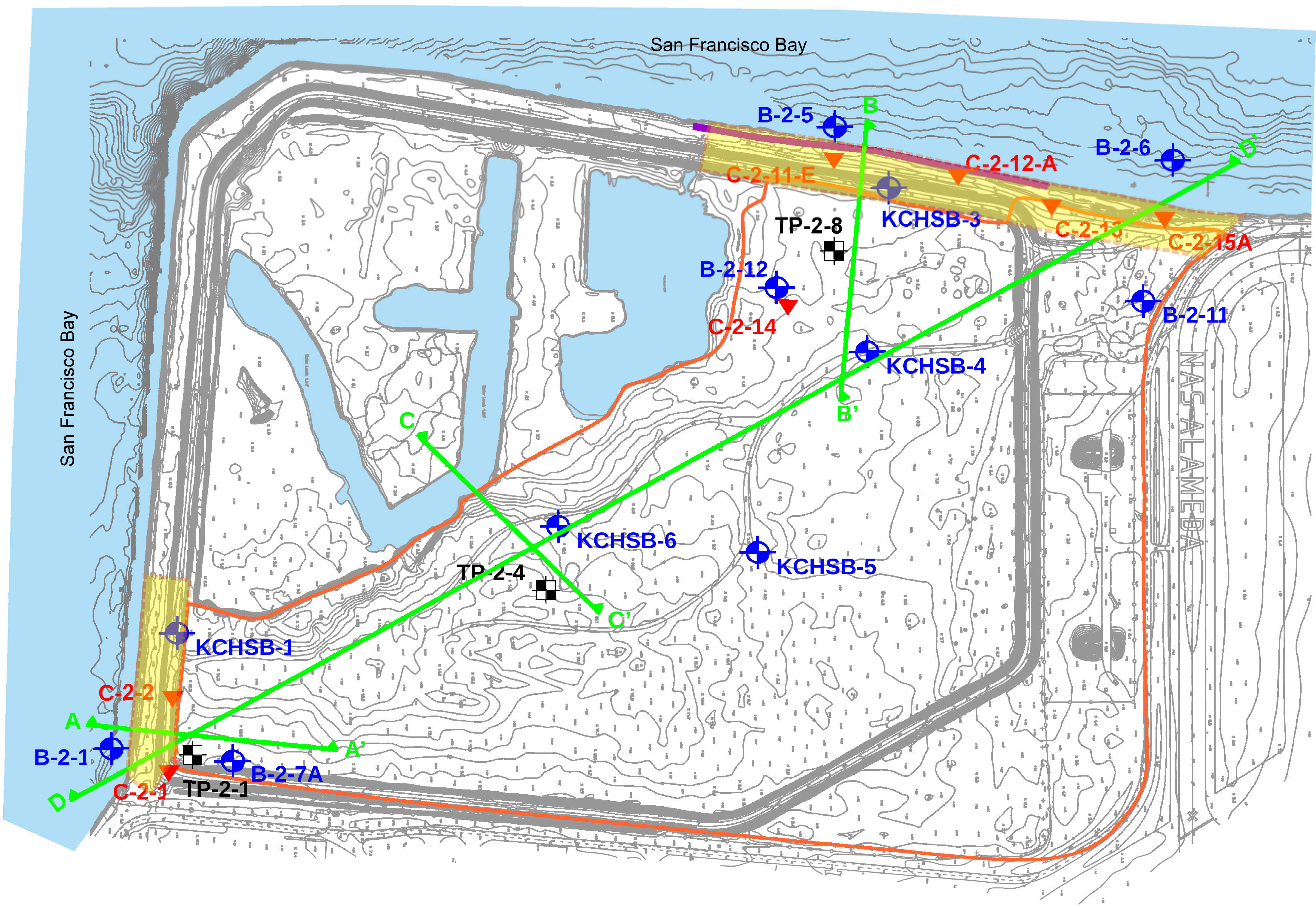
NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

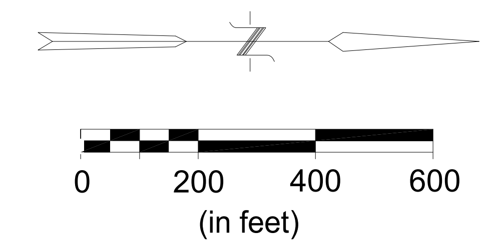
TETRA TECH
1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

Project Location Map

Project Name:	Alameda NAS Area IR2
Project Number: BAS 11-63E	DATE: November 2011

Plate 1





LEGEND

	Coastal Margin Areas
B-2-12	Boring Locations
C-2-12-A	CPT locations
TP-2-4	Test pit locations
	Slurry Wall
C — C'	Geologic Cross Section
	Landfill Boundary

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

TETRA TECH

1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

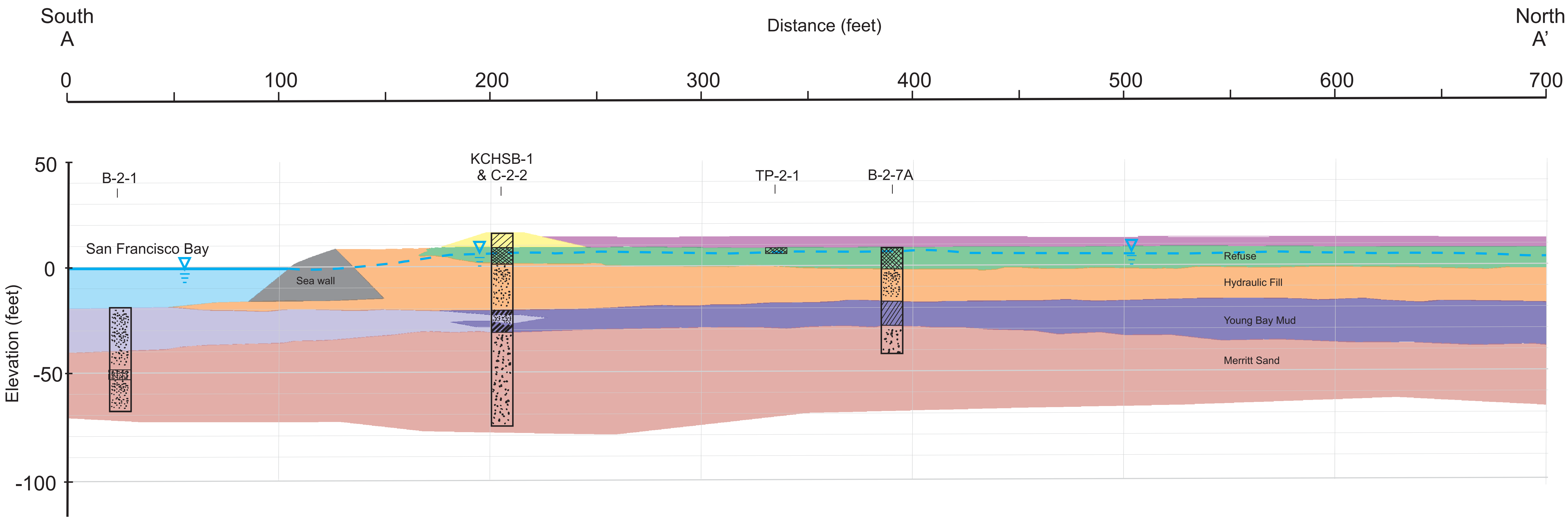
Project Name:
Alameda NAS Area IR2

Project Number:
BAS 11-63E

DATE:
April 2012

Site and Exploratory Location Map

Plate 2



Stratigraphy Legend

- Proposed Cover
- Refuse
- Berm Fill (CL)
- Hydraulic Fill (SP, SP-SM, SM)
- Rockfill Seawall
- Young Bay Mud - Fine (CL, CH)
- Young Bay Mud - Coarse (SP, SP-SM, SM)
- Merritt Sand (SP, SP-SM, SM)

Borehole Log Legend

- Refuse
- Fat Clay
- Lean Clay
- Silty Sand
- Sand

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

TETRA TECH

1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

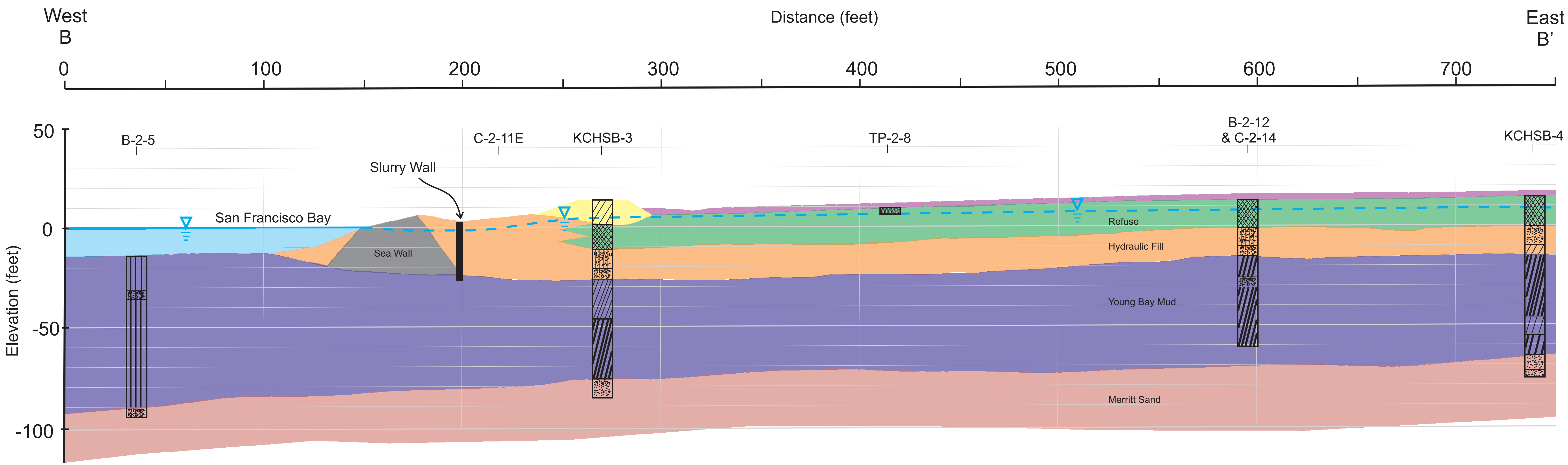
Project Name: Alameda NAS Area IR2

Project Number: BAS 11-63E

DATE: November 2011

Geologic Section A-A'

Plate 3



Note:
Presence of the hydraulic fill on the waterside of the sea wall is interpreted from a 1958 aerial photograph for the site

Stratigraphy Legend

- Proposed Cover
- Refuse
- Berm Fill (CL)
- Hydraulic Fill (SP, SP-SM, SM)
- Rockfill Seawall
- Young Bay Mud - Fine (ML, CL, CH)
- Merritt Sand (SP, SP-SM, SM)

Borehole Log Legend

- Refuse
- Fat Clay
- Lean Clay
- Silt
- Silty Sand
- Sand

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

TETRA TECH
1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

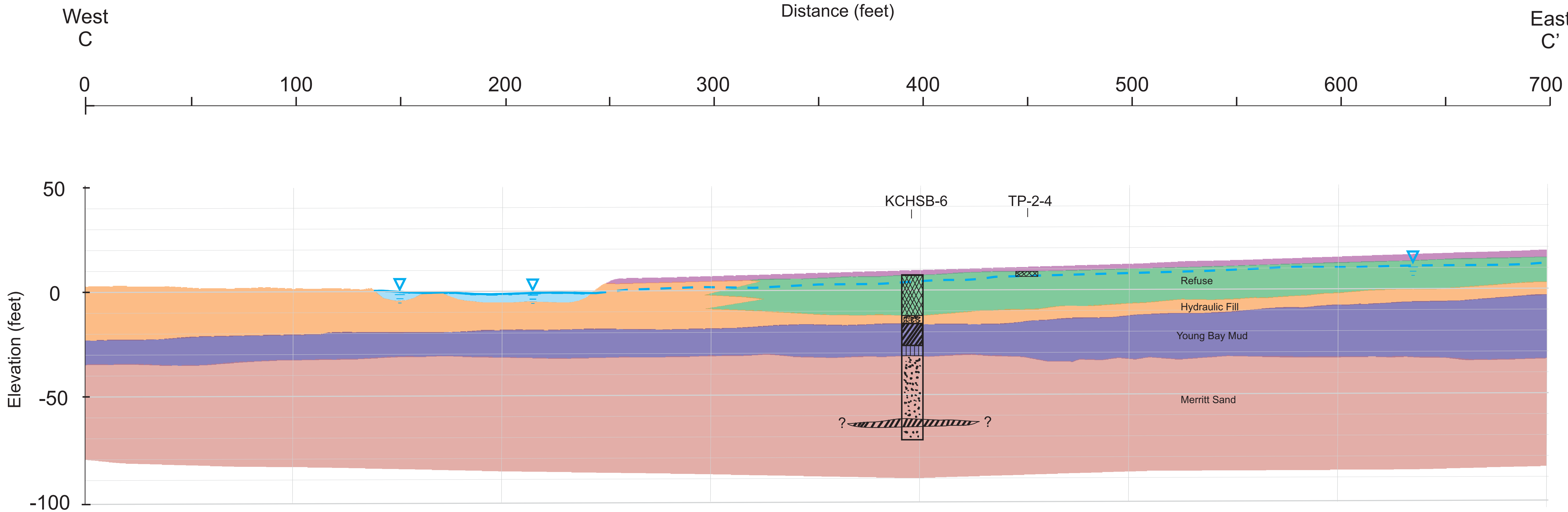
Project Name: Alameda NAS Area IR2

Project Number: BAS 11-63E

DATE: November 2011

Geologic Section B-B'

Plate 4



Stratigraphy Legend

- Proposed Cover
- Refuse
- Hydraulic Fill
- Young Bay Mud
- Merritt Sand

Borehole Log Legend

- Refuse
- Fat Clay
- Sand
- Silt

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

TETRA TECH

1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

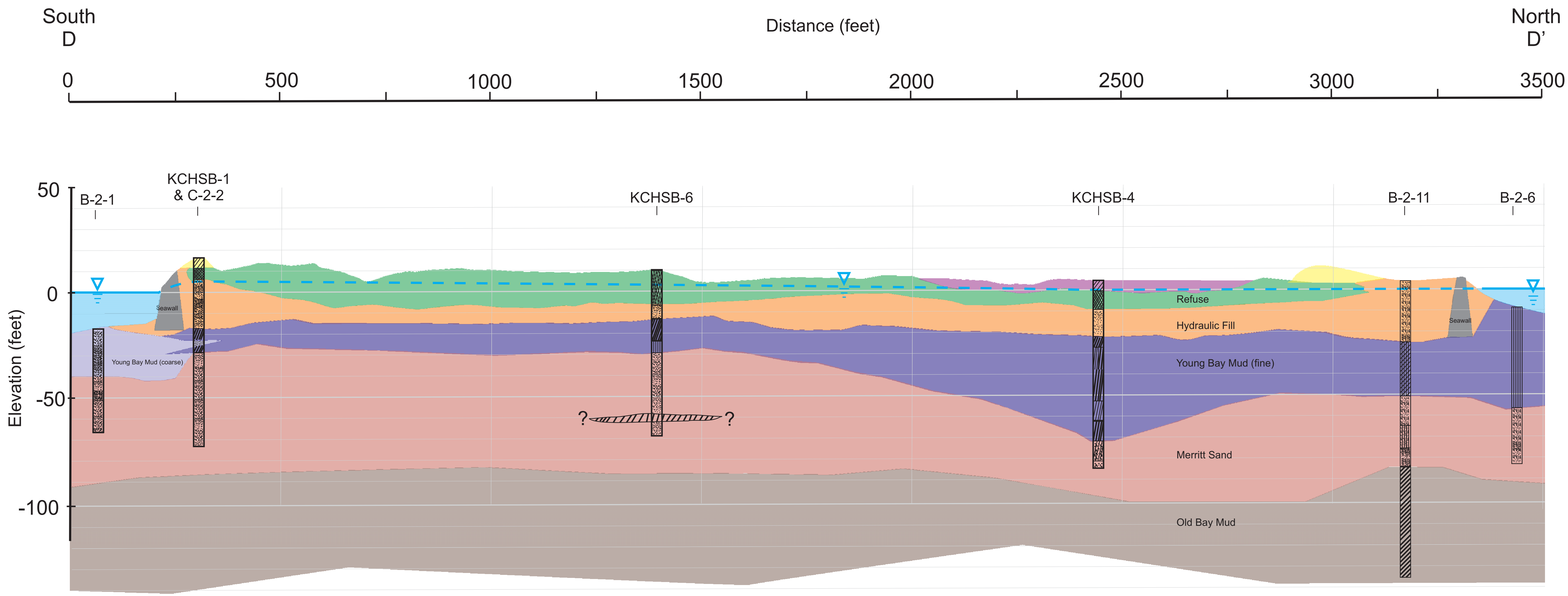
Project Name: Alameda NAS Area IR2

Project Number: BAS 11-63E

DATE: November 2011

Geologic Section C-C'

Plate 5



Stratigraphy Legend

- Existing Cover
- Berm Fill (CL)
- Hydraulic Fill (SP, SP-SM, SM)
- Rockfill Seawall
- Refuse
- Young Bay Mud - Coarse (SP, SP-SM, SM)
- Young Bay Mud - Fine (CL, CH)
- Merritt Sand (SP, SP-SM, SM)
- Old Bay Mud

Borehole Log Legend

- Refuse
- Fat Clay
- Lean Clay
- Sand
- Sandy Clay
- Silty Sand
- Silt

NOTES:
VERTICAL EXAGGERATION: 5:1
ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

TETRA TECH
1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

Project Name:
Alameda NAS Area IR2

Project Number:
BAS 11-63E

DATE:
November 2011

Geologic Section D-D'

Plate 6

Appendix A
(on CD only)

Field Exploration Results from Previous Investigations

CH2M Hill Kleinfelder, a Joint Venture
Document Control No. KCH-2622-0006-0029

and

Tetra Tech Foster Wheeler
Document Control No. FWSD-RAC-02-1787

LOG SYMBOLS

	BULK / BAG SAMPLE	-4	PERCENT FINER THAN THE NO. 4 SIEVE (ASTM Test Method C 136)
	MODIFIED CALIFORNIA SAMPLER (2-1/2 inch outside diameter)	-200	PERCENT FINER THAN THE NO. 200 SIEVE (ASTM Test Method C 117)
	CALIFORNIA SAMPLER (3 inch outside diameter)	LL	LIQUID LIMIT (ASTM Test Method D 4318)
	STANDARD PENETRATION SPLIT SPOON SAMPLER (2 inch outside diameter)	PI	PLASTICITY INDEX (ASTM Test Method D 4318)
	CONTINUOUS CORE	TXUU	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (EM 1110-1-1906)/ASTM TEST METHOD D2850
	SHELBY TUBE	EI	EXPANSION INDEX (UBC STANDARD 18-2)
	ROCK CORE	COL	COLLAPSE POTENTIAL
	WATER LEVEL (level where first encountered)	UC	UNCONFINED COMPRESSION (ASTM Test Method D 2166)
	WATER LEVEL (level after completion)		
	SEEPAGE	MC	MOISTURE CONTENT (ASTM Test Method D 2216)

GENERAL NOTES

Boring log data represents a data snapshot.

This data represents subsurface characteristics only to the extent encountered at the location of the boring.

The data inherently cannot accurately predict the entire subsurface conditions to be encountered at the project site relative to construction or other subsurface activities.

Lines between soil layers and/or rock units are approximate and may be gradual transitions.

The information provided should be used only for the purposes intended as described in the accompanying documents.

In general, Unified Soil Classification System designations presented on the logs were evaluated by visual methods.

Where laboratory tests were performed, the designations reflect the laboratory test results.

Project Number: 106454	**LOG KEY**	**Plate**
Date: 06-15-11		**A-1**
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**	
Checked By: M.John		
File Name:		

SOIL BORING KEY

MOISTURE CONTENT

FIELD TEST	ABBR	DESCRIPTION
Dry	D	Absence of moisture, dusty, dry to the touch
Moist	M	Damp but no visible water
Wet	W	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	ABBR	FIELD TEST
Weakly	WC	Crumbles or breaks with handling or slight finger pressure
Moderately	MC	Crumbles or breaks with considerable finger pressure
Strongly	SC	Will not crumble or break with finger pressure

PLASTICITY

DESCRIPTION	ABBR	CRITERIA
Nonplastic	NP	A 1/8-in (3-mm) thread cannot be rolled at any water content
Low (L)	LP	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit
Medium (M)	MP	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit
High (H)	HP	It takes considerable time rolling and kneeding to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit

STRUCTURE

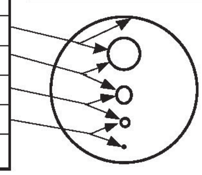
DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4 in thick; note thickness
Laminated	Alternating layers of varying material or color with the layers less than 1/4 in thick; note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture Planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CONSISTENCY -FINE-GRAINED SOIL

CONSISTENCY	FIELD TEST
Very Soft	Thumb will penetrate soil more than 1 in. (25 mm)
Soft	Thumb will penetrate soil about 1 in. (25 mm)
Firm	Thumb will indent soil about 1/4 in. (6 mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029"	Flour-sized and smaller

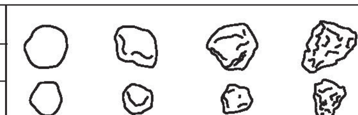


REACTION WITH HCL

DESCRIPTION	CRITERIA
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

ANGULARITY

DESCRIPTION	ABBR	CRITERIA
Angular	A	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	SA	Particles are similar to angular description but have rounded edges
Subrounded	SR	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	R	Particles have smoothly curved sides and no edges



APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	ABBR	SPT (# blows/ft)	MODIFIED CA. SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very loose	VL	<4	<4	<5	0 - 15	Easily penetrated with 1/2-inch reinforcing rod pushed by hand.
Loose	L	4 - 10	5 - 12	5 - 15	15 - 35	Difficult to penetrate with 1/2-inch reinforcing rod pushed by hand.
Medium dense	ML	10 - 30	12 - 35	15 - 40	35 - 65	Easily penetrated a foot with 1/2-inch reinforcing rod driven with 5-lb hammer.
Dense	D	30 - 50	35 - 60	40 - 70	65 - 85	Difficult to penetrate a foot with 1/2-inch reinforcing rod driven with 5-lb hammer.
Very dense	VD	>50	>60	>70	85 - 100	Penetrated only a few inches with 1/2-inch reinforcing rod driven with 5-lb hammer.

File Name: gINT Soil Boring Key A-1

KLEINFELDER
Bright People. Right Solutions.

Project Number: 113235	**SOIL BORING KEY**	Plate
Date: 12-16-10		
Entry By: J. Sala	PG&E SALINAS #1 LINE LEANING TOWERS NEAR THE INTERSECTION OF WEST BLANCO ROAD & ARMSTRONG ROAD SALINAS, CALIFORNIA	**A-2**
Checked By: L. Serrano		
File Name:		

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM 2487)

MAJOR DIVISIONS				*GRAPHIC LOG*		*TYPICAL DESCRIPTIONS*
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH <5% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			$Cu < 4$ and/or $1 > Cc > 3$		GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5 to 12% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$		GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			$Cu < 4$ and/or $1 > Cc > 3$		GP-GM	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH >12% FINES			GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
					GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$		SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			$Cu < 6$ and/or $1 > Cc > 3$		SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5 to 12% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$		SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			$Cu < 6$ and/or $1 > Cc > 3$		SP-SM	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SP-SC	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH >12% FINES			SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
					SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)				ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY,
					CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
					CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
					OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)				MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
					CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
					OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

USCS (D2487) KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

KCH

Project Number: 106454	**UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487)**	**Plate**
Date: 06-15-11		**A-3**
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**	
Checked By: M.John		
File Name:		

Boring Number: KCHSB-1	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6033880.823 ft / 2112143.035 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-21-11 / 03-21-11	**Top of Boring Elevation:** 19.5 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 14.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CL	**Lean CLAY With Sand** (CL): 0% gravel, 10% sand, 90% fines, olive brown, moist, (BERM ROAD FILL)	F	LP							MEC screening with MG 230 every 1 foot from 0-10' Hollow Stem Auger (6") 0-15'
5	14.5																Casing set 0-18.5' (pounded in last few feet)
							SC	**Clayey SAND** (SC): 0% gravel, 70% sand, 30% fines, gray, moist, (FILL)	F	MP							
							OL	**Sandy ORGANIC SOIL** (OL): 0% gravel, 25% sand, 5% fines, 70% organics, very dark gray to black, moist, Organics = Wood Fragments . (LANDFILL) Plastic Sheet Scraps at 9-10'	F	LP							
10	9.5																
								Insulation Scraps at 12-13'									
							SP	**Poorly Graded SAND** (SP): 0% gravel, 95% sand, 5% fines, greenish black, wet, rounded sand	MD MD								Driller notes change to sandy material at ~13'
15	4.5		1 2	5 6 8	0								20	111		5	Stopped to set up mud rotary
																	Mud rotary 18.5' to bottom

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Project Number: 106454	**BORING LOG KCHSB-1**	**Plate** 1 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-4**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-1	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6033880.823 ft / 2112143.035 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-21-11 / 03-21-11	**Top of Boring Elevation:** 19.5 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 14.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			3	1 1 2			SP	**Poorly Graded SAND** (SP): 0% gravel, 100% sand, 0% fines, olive gray, wet	VL								Note: driller forgot to use liners. Sample bagged
25	-5.5		4	4 2 2				97% sand, 3% fines	L				21	106		3	
30	-10.5		5	3 5 6													
35	-15.5		6 7	1 4 3					L								
							CH/SP	**Interbedded Poorly Graded SAND AND Lean To Fat Clay** (CH/SP): olive gray, wet	F	HP							

Project Number: 106454	**BORING LOG KCHSB-1**		**Plate**
Date: 06-15-11			2 of 5
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA		**A-4**
Checked By: M.John			
File Name:			

Boring Number: KCHSB-1	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6033880.823 ft / 2112143.035 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-21-11 / 03-21-11	**Top of Boring Elevation:** 19.5 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 14.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CH/SP	**Interbedded Poorly Graded SAND AND Lean To Fat Clay** (CH/SP): olive gray, wet, (continued)	F	HP	25	41	39		93	44	
			8				SM	**Silty SAND** (SM): 0% gravel, 85% sand, 15% fines, wet, rounded sand	MD	LP							500 PSI PUSH
45	-25.5						SC	**Clayey SAND With Shells** (SC): 25% gravel, 50% sand, 25% fines, olive gray, wet, gravel-sized Shell Hash	S	HP						24	0 PSI PUSH
			9				SM	**Silty SAND** (SM): 0% gravel, 90% sand, 10% fines, gray, wet, rounded sand	MD	HP							
							SC	**Clayey SAND With Shells** (SC): 25% gravel, 50% sand, 25% fines, gray, wet, rounded sand, gravel-sized Shell Hash	MD	HP							
50	-30.5		10				SM	**Silty SAND** (SM): 0% gravel, 75% sand, 25% fines, gray, wet, rounded sand			NP	NP	23 22 23	105 107 104			TXUU
55	-35.5																
							SM	**Silty SAND** (SM): 0% gravel, 80% sand, 20% fines, yellowish brown, wet, rounded sand									Color changed in cuttings at 58 ft.

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Project Number: 106454	**BORING LOG KCHSB-1**	**Plate** 3 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-4**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-1	Location: Alameda Point, Alameda, CA	Drilling Method: Mud Rotary
Boring Total Depth: 91.5 ft	Coordinates (X/Y, Lat/Long): 6033880.823 ft / 2112143.035 ft	Drilling Equipment: Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	Datum/Coordinate System: NAD83/NAVD 88	Drilling Company: Gregg Drilling
Date Begin/End: 03-21-11 / 03-21-11	Top of Boring Elevation: 19.5 ft	Bit Size/Type: 4-inch
Surface Conditions: GRASS	Coordinate Data Source:	Hammer Type/Method: Auto Trip
WL Measurement Point: Ground Surface	Depth to Groundwater Initial/Time: 14.0 ft / 0.2 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: M.John	Depth to Groundwater Final/Time:	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			11 12	9 19 22			SM	**Silty SAND** (SM): 0% gravel, 80% sand, 20% fines, yellowish brown, wet, rounded sand, (continued)	D	LP							
65	-45.5																
70	-50.5		13 14	8 17 21					D	LP			19	110		20	
75	-55.5																

Project Number: 106454	BORING LOG KCHSB-1	Plate
Date: 06-15-11		4 of 5
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	A-4
Checked By: M.John		
File Name:		

Boring Number: KCHSB-1	Location: Alameda Point, Alameda, CA	Drilling Method: Mud Rotary
Boring Total Depth: 91.5 ft	Coordinates (X/Y, Lat/Long): 6033880.823 ft / 2112143.035 ft	Drilling Equipment: Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	Datum/Coordinate System: NAD83/NAVD 88	Drilling Company: Gregg Drilling
Date Begin/End: 03-21-11 / 03-21-11	Top of Boring Elevation: 19.5 ft	Bit Size/Type: 4-inch
Surface Conditions: GRASS	Coordinate Data Source:	Hammer Type/Method: Auto Trip
WL Measurement Point: Ground Surface	Depth to Groundwater Initial/Time: 14.0 ft / 0.2 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: M.John	Depth to Groundwater Final/Time:	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			15 16	13 14 19			SM	**Silty SAND** (SM): 0% gravel, 80% sand, 20% fines, brown and gray, wet, rounded sand, (continued)									
85	-65.5																
90	-70.5		17	23 34 38									20	115		15	
								Boring completed at a depth of 91.5 ft below existing site grade. NOTES: 1. Boring backfilled with neat cement grout. 2. Blow counts shown are raw, uncorrected values. 3. Depth to water measured at approximately 14 ft during drilling.									
95	-75.5																

Project Number: 106454	**BORING LOG KCHSB-1**	Plate
Date: 06-15-11		5 of 5
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-4**
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-3	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 98.5 ft	**Coordinates (X/Y, Lat/Long):** 6032517.878 ft / 2114142.695 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-22-11 / 03-23-11	**Top of Boring Elevation:** 16.2 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 10.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CL	**Lean CLAY** (CL): 0% gravel, 5% sand, 95% fines, medium brown, moist, (BERM FILL)	F	MP							Hollow stem auger 6" FROM 0-15'
																	MEC SCREENING WITH MG 230 EVERY 1' IN UPPER 10'
5	11.2																RAD SCREENING ON ALL AUGERS, SAMPLES
							SP	**Poorly Graded SAND** (SP): 0% gravel, 85% sand, 15% fines, brown, moist, (BERM FILL)	F MD	MP							
							CH	**Sandy FAT CLAY** (CH): 0% gravel, 30% sand, 70% fines, very dark gray, moist, (BERM FILL)	S	MP							
								Grades to FAT CLAY (CH) with sand									
10 ▽	6.2		1	W O H													
																	SOMETHING HARD (CONCRETE?) AT 13 FEET. DRILLER NOTES CHATTER.
15	1.2							Wood fragments									
								Lost circulation									LOST CIRCULATION; CASING SET 0-17'. HARD TO DRIVE 16.5-17'

Project Number: 106454	**BORING LOG KCHSB-3**	**Plate** 1 of 5
Date: 06-15-11		
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**	**A-6**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-3	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 98.5 ft	**Coordinates (X/Y, Lat/Long):** 6032517.878 ft / 2114142.695 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-22-11 / 03-23-11	**Top of Boring Elevation:** 16.2 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 10.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CH	**FAT CLAY With Sand** (CH): 0% gravel, 30% sand, 70% fines, very dark gray, moist, (continued) Lightbulb base in cuttings from somewhere between 0-25'									LOST CIRCULATION AT 21' HARD DRILLING
							SP-SM	**Poorly Graded SAND With Silt** (SP-SM): 0% gravel, 90% sand, 10% fines, gray, wet, rounded sand, fine to medium sand (FILL)	MD	MP							SOFTER
25	-8.8		2 3	6 8 11									18	114		10	AUGERING EXTENDED TO 25'. MUD ROTARY 25' TO BOTTOM OF HOLE NOTE : SPT at 25' THRU HOLLOW STEM AUGER. NOT SUITABLE FOR LIQUEFACTION ANALYSIS
30	-13.8		4														DUE TO CLAY CUTTINGS SHELBY (NOT SPT) RECOVERY = 12"
35	-18.8		5 6	W O H			SC	**Clayey SAND** (SC): 0% gravel, 77% sand, 23% fines, dark gray, wet, rounded sand, (FILL)	VL	MP	4	20	24 25	105 101		23	

Project Number: 106454	**BORING LOG KCHSB-3**	**Plate** 2 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-6**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-3	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 98.5 ft	**Coordinates (X/Y, Lat/Long):** 6032517.878 ft / 2114142.695 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-22-11 / 03-23-11	**Top of Boring Elevation:** 16.2 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 10.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			7 8	W O H			CL	**Lean CLAY** (CL): 0% gravel, 0% sand, 100% fines, dark gray, wet, (BAY MUD)	VS	HP							
45	-28.8		9					0% gravel, 5% sand, 95% fines	VS	HP							Su(TV) = 3.0 tsf
											20	43	49	73			UC CONSOL
							CL	**Sandy Lean CLAY** (CL): 0% gravel, 20% sand, 80% fines, dark gray, wet, very fine sand (BAY MUD)									
50	-33.8		10						S								Su(TV) = 2.0 tsf
55	-38.8																
							CH	**Fat CLAY** (CH): 0% gravel, 0% sand, 100% fines, olive gray, wet	S	HP							

Project Number: 106454	**BORING LOG KCHSB-3**	**Plate** 3 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-6**
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-3	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 98.5 ft	**Coordinates (X/Y, Lat/Long):** 6032517.878 ft / 2114142.695 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-22-11 / 03-23-11	**Top of Boring Elevation:** 16.2 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 10.0 ft / 0.2 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			11				CH	**Fat CLAY** (CH): 0% gravel, 0% sand, 100% fines, olive gray, wet, (continued)	S	HP							Su(TV) = 3.75 tsf
65	-48.8																
70	-53.8		12						VS	HP							Su(TV) = 2.0 tsf
75	-58.8																

Project Number: 106454	**BORING LOG KCHSB-3**	**Plate** 4 of 5
Date: 06-15-11	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-6**
Entry By: A.Markey		
Checked By: M.John		
File Name:		

Boring Number: KCHSB-3	Location: Alameda Point, Alameda, CA	Drilling Method: Mud Rotary
Boring Total Depth: 98.5 ft	Coordinates (X/Y, Lat/Long): 6032517.878 ft / 2114142.695 ft	Drilling Equipment: Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	Datum/Coordinate System: NAD83/NAVD 88	Drilling Company: Gregg Drilling
Date Begin/End: 03-22-11 / 03-23-11	Top of Boring Elevation: 16.2 ft	Bit Size/Type: 4-inch
Surface Conditions: GRASS	Coordinate Data Source:	Hammer Type/Method: Auto Trip
WL Measurement Point: Ground Surface	Depth to Groundwater Initial/Time: 10.0 ft / 0.2 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: M.John	Depth to Groundwater Final/Time:	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			13				CH	**Fat CLAY** (CH): 0% gravel, 0% sand, 100% fines, olive gray, wet, (continued)					39 37 40	82 84 79			TXUU Su(TV) = 3.0 tsf
								Grades lean, sandy									
85	-68.8																
90	-73.8																
			14				SP-SC	**Poorly Graded SAND With Clay** (SP-SC): 0% gravel, 90% sand, 10% fines, gray, wet, rounded sand		MP							
95	-78.8																NOTES: 1. Boring backfilled with neat cement grout. 2. Blow counts shown are raw, uncorrected values. 3. Depth to water measured at approximately 10 ft during drilling.
			15 16	18 22 24			SC	**Clayey SAND** (SC): 0% gravel, 80% sand, 20% fines, gray, wet, rounded sand, with fat clay lenses	D	MP			22 17	101 108		15	
								Boring completed at a depth of 98.5 ft below existing site grade.									

Project Number: 106454	**BORING LOG KCHSB-3**	Plate
Date: 06-15-11		5 of 5
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-6**
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-4	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6032981.199 ft / 2114052.412 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-15-11 / 03-16-11	**Top of Boring Elevation:** 9.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 6.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
0							CL	**Sandy Lean CLAY With Gravel** (CL): 20% gravel, 20% sand, 60% fines, dark brown, moist, subangular sand, (FILL)	S	LP							8" Hollow stem auger FROM 0-15.5'
																	MEC SCREENING WITH MG 230 EVERY 1' IN UPPER 10'
4							OL	**Organic SOIL** (OL): 20% fines, 80% organics (wood), Creosote odor (LANDFILL)	F								
5	4.4																RAD SCREENING ON ALL AUGERS, SAMPLES
6 (▽)								Water flowing into hole									
10	-0.6			5 5 3													NO SAMPLE RETAINED
								0% gravel, 10% sand, 10% fines, 80% organics (wood), Strong chemical odor									
								No abnormal or elevated multi-rae readings									
15	-5.6			12 15 5													NO SAMPLE RETAINED
							SP	**Poorly Graded SAND** (SP): 0% gravel, 95% sand, 5% fines, gray, wet, subrounded sand, (FILL)	VL								MUD ROTARY 15.5' TO BOTTOM OF HOLE
				3 2 2 7													NO SAMPLE RETAINED

Project Number: 106454	**BORING LOG KCHSB-4**	**Plate** 1 of 5
Date: 06-15-11		**A-7**
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**	
Checked By: M.John		
File Name:		

Boring Number: KCHSB-4	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6032981.199 ft / 2114052.412 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-15-11 / 03-16-11	**Top of Boring Elevation:** 9.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 6.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			1	2 1			SP	**Poorly Graded SAND** (SP): 0% gravel, 95% sand, 5% fines, gray, wet, (continued) Wood fragments and fat clay , possibly sloughed from upper layers									
25	-15.6		2	1 1 WOH			CL	**Sandy Lean CLAY** (CL): 0% gravel, 40% sand, 60% fines, dark gray, wet, subrounded sand, Trace fine shell fragments - could be either fill or native	VS	MP	15	33	41		100	60	
30	-20.6		3	W O H			CH	**FAT CLAY With Sand** (CH): 0% gravel, 10% sand, 90% fines, olive gray, wet, (NATIVE)	VS	HP							
35	-25.6		4	W O H			CL/CH	**Sandy Lean To FAT CLAY** (CL/CH): 0% gravel, 25% sand, 75% fines, medium gray to olive gray, wet, (NATIVE)	VS	MP							
			5														0 PSI PUSH

Boring Number: KCHSB-4	Location: Alameda Point, Alameda, CA	Drilling Method: Mud Rotary
Boring Total Depth: 91.5 ft	Coordinates (X/Y, Lat/Long): 6032981.199 ft / 2114052.412 ft	Drilling Equipment: Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	Datum/Coordinate System: NAD83/NAVD 88	Drilling Company: Gregg Drilling
Date Begin/End: 03-15-11 / 03-16-11	Top of Boring Elevation: 9.4 ft	Bit Size/Type: 4-inch
Surface Conditions: GRASS	Coordinate Data Source:	Hammer Type/Method: Auto Trip
WL Measurement Point: Ground Surface	Depth to Groundwater Initial/Time: 6.0 ft / 0.5 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: M.John	Depth to Groundwater Final/Time:	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CL/CH	**Sandy Lean To FAT CLAY** (CL/CH): 0% gravel, 25% sand, 75% fines, medium gray to olive gray, wet, (NATIVE) (continued)									
45	-35.6		6 7	W O H			CH	**Sandy FAT CLAY** (CH): 0% gravel, 25% sand, 75% fines, gray, wet, gravel-sized shell fragments (shell hash)	VS	HP							
								95% fines, 5% shell fragments									
50	-40.6		8										46	73			RECOVERY = 27" 0 PSI PUSH
								Wood fragments 3" to 6" in size	VS	HP							
55	-45.6																

KCH

Project Number: 106454	BORING LOG KCHSB-4	Plate 3 of 5
Date: 06-15-11	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	A-7
Entry By: A.Markey		
Checked By: M.John		
File Name:		

Boring Number: KCHSB-4	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6032981.199 ft / 2114052.412 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-15-11 / 03-16-11	**Top of Boring Elevation:** 9.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 6.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			9				CL	**Lean CLAY** (CL): 0% gravel, 5% sand, 95% fines, gray to greenish gray, wet, Some 3-6" wood fragments	VS	LP-MP	20	41	49 48 46	70 73 73			RECOVERY = 28" TXUU 0 PSI PUSH
65	-55.6																
70	-60.6		10				CH	**Sandy FAT CLAY** (CH): 0% gravel, 25% sand, 75% fines, greenish gray, wet, subrounded sand	VS	MP							RECOVERY = 26" 0 PSI PUSH
75	-65.6																

Project Number: 106454	**BORING LOG KCHSB-4**	**Plate** 4 of 5
Date: 06-15-11		**A-7**
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-4	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 91.5 ft	**Coordinates (X/Y, Lat/Long):** 6032981.199 ft / 2114052.412 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-15-11 / 03-16-11	**Top of Boring Elevation:** 9.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 6.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			11 12	4 6 13			SC	**Clayey SAND** (SC): 0% gravel, 77% sand, 23% fines, gray, wet, rounded sand	MD	MP	4	19	24	99	100	23	
85	-75.6																
90	-80.6		13 14	4 9 24			SP	**Poorly Graded SAND** (SP): 0% gravel, 90% sand, 10% fines, gray, wet, rounded sand	D	MP							
								Boring completed at a depth of 91.5 ft below existing site grade. NOTES: 1. Boring backfilled with neat cement grout. 2. Blow counts shown are raw, uncorrected values. 3. Depth to water measured at approximately 6 ft during drilling.									
95	-85.6																

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

KCH

Project Number: 106454	**BORING LOG KCHSB-4**
Date: 06-15-11	
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**
Checked By: M.John	
File Name:	

Plate

A-7

Boring Number: KCHSB-5	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 92.5 ft	**Coordinates (X/Y, Lat/Long):** 6033583.227 ft / 2113759.741 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-17-11 / 03-17-11	**Top of Boring Elevation:** 10.9 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							SC	**Clayey SAND** (SC): medium brown, moist, (LANDFILL)	MD	MP							Hollow stem auger (6") FROM 0-18'
							SP	**Poorly Graded SAND With Gravel** (SP): dark brown, moist, (LANDFILL)	MD								MEC SCREENING WITH MG 230 EVERY 1' IN UPPER 10'
5	5.9																RAD SCREENING ON ALL AUGERS, SAMPLES
10	0.9																
			1	W O H			CH	**FAT CLAY With Sand** (CH): 0% gravel, 10% sand, 90% fines, dark gray, wet, (FILL)	VS	HP							
15	-4.1						SP	**Poorly Graded SAND** (SP): 0% gravel, 95% sand, 5% fines, gray, wet, (FILL)	L-MD								
			2	3 8 12			CH	**FAT CLAY** (CH): 0% gravel, 0% sand, 100% fines, dark gray, wet, (FILL) with some Organics	S	HP							CASING SET 0' to 18'. HARD TO DRIVE CASING at 17'. MUD ROTARY 18' TO BOTTOM OF HOLE

Project Number: 106454	**BORING LOG KCHSB-5**	**Plate** 1 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-8**
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-5	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 92.5 ft	**Coordinates (X/Y, Lat/Long):** 6033583.227 ft / 2113759.741 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-17-11 / 03-17-11	**Top of Boring Elevation:** 10.9 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			3	W O H			SC	**Clayey SAND** (SC): 0% gravel, 52% sand, 48% fines, gray, wet, rounded sand, (FILL)	VL	MP	6	26	33	93		48	
25	-14.1						CH	**FAT CLAY** (CH): 0% gravel, 0% sand, 100% fines, olive gray, moist, (BAY MUD)	VS	HP	50	77					0 PSI PUSH RECOVERY = 27"
			4										77 67 71 89	55 59 58 50			Su(TV) = 2.75 tsf CONSOL TXUU
							CL	**LEAN CLAY With Sand** (CL): 4% gravel, 9% sand, 87% fines, greenish black, wet, Trace Shell Fragments up to 1/4"	VS	LP-MP							
30	-19.1		5										58	67	96	87	0 PSI PUSH RECOVERY = 27" UC Su(TV) = 3.0 tsf
35	-24.1		N/A														NO RECOVERY ON SHELBY TUBE
			6 7	W O H					VS	LP-MP							

Project Number: 106454	**BORING LOG KCHSB-5**	**Plate** 2 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-8**
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-5	Location: Alameda Point, Alameda, CA	Drilling Method: Mud Rotary
Boring Total Depth: 92.5 ft	Coordinates (X/Y, Lat/Long): 6033583.227 ft / 2113759.741 ft	Drilling Equipment: Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	Datum/Coordinate System: NAD83/NAVD 88	Drilling Company: Gregg Drilling
Date Begin/End: 03-17-11 / 03-17-11	Top of Boring Elevation: 10.9 ft	Bit Size/Type: 4-inch
Surface Conditions: GRASS	Coordinate Data Source:	Hammer Type/Method: Auto Trip
WL Measurement Point: Ground Surface	Depth to Groundwater Initial/Time: 8.0 ft / 0.5 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: M.John	Depth to Groundwater Final/Time:	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CL	**LEAN CLAY With Sand** (CL): 4% gravel, 9% sand, 87% fines, greenish black, wet, Trace Shell Fragments up to 1/4" (continued)									
45	-34.1		8				SP	**Poorly Graded SAND** (SP): 0% gravel, 95% sand, 5% fines, gray, wet, rounded sand, fine to medium sand	L								500 PSI PUSH RECOVERY = 9"
50	-39.1		9	1 1 1			CL/CH	**Lean To FAT CLAY** (CL/CH): 0% gravel, 5% sand, 95% fines, gray, wet	VL VS	HP							
55	-44.1																

Project Number: 106454	BORING LOG KCHSB-5	Plate 3 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	A-8
Checked By: M.John		
File Name:		

Boring Number: KCHSB-5	Location: Alameda Point, Alameda, CA	Drilling Method: Mud Rotary
Boring Total Depth: 92.5 ft	Coordinates (X/Y, Lat/Long): 6033583.227 ft / 2113759.741 ft	Drilling Equipment: Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	Datum/Coordinate System: NAD83/NAVD 88	Drilling Company: Gregg Drilling
Date Begin/End: 03-17-11 / 03-17-11	Top of Boring Elevation: 10.9 ft	Bit Size/Type: 4-inch
Surface Conditions: GRASS	Coordinate Data Source:	Hammer Type/Method: Auto Trip
WL Measurement Point: Ground Surface	Depth to Groundwater Initial/Time: 8.0 ft / 0.5 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: M.John	Depth to Groundwater Final/Time:	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
																	0 PSI PUSH RECOVERY = 27"
			10				CL/CH	**Lean To FAT CLAY** (CL/CH): 0% gravel, 5% sand, 95% fines, gray, wet, Poorly Graded Sand in top of tube. Sand Lense. (continued) Greenish black	F	HP							Su(TV) = 3.75 tsf
65	-54.1																
70	-59.1								F	HP							0 PSI PUSH RECOVERY = 27"
			11														Su(TV) = 4.0 tsf
75	-64.1																

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

KCH

Project Number: 106454	BORING LOG KCHSB-5	Plate
Date: 06-15-11		4 of 5
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	A-8
Checked By: M.John		
File Name:		

Boring Number: KCHSB-5	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 92.5 ft	**Coordinates (X/Y, Lat/Long):** 6033583.227 ft / 2113759.741 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-17-11 / 03-17-11	**Top of Boring Elevation:** 10.9 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description (Field Soil Description & Classification)	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			12				CL/CH	**Lean To FAT CLAY** (CL/CH): 0% gravel, 5% sand, 95% fines, gray, wet, (continued)			19	39	27	94			RECOVERY = 26" CONSOL
							SP	**Poorly Graded SAND** (SP): 0% gravel, 5% sand, 95% fines, gray, wet, rounded sand	MD								
							CH	**FAT CLAY** (CH): 0% gravel, 0% sand, 100% fines, gray and greenish black, moist	H	HP							
85	-74.1																
90	-79.1												44	74			Su(TV) = 7.0 tsf
								Boring completed at a depth of 92.5 ft below existing site grade. NOTES: 1. Boring backfilled with neat cement grout. 2. Blow counts shown are raw, uncorrected values. 3. Depth to water measured at approximately 8 ft during drilling.									
95	-84.1																

Project Number: 106454	**BORING LOG KCHSB-5**	**Plate** 5 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-8**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-6	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 81.5 ft	**Coordinates (X/Y, Lat/Long):** 6033426.487 ft / 2113227.571 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-23-11 / 03-24-11	**Top of Boring Elevation:** 13.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
0							SC	**Clayey SAND** (SC): 0% gravel, 50% sand, 25% fines, moist, 25% landfill debris (LANDFILL)	MD	MP							Hollow Steem Auger (6") 0-19'
								Asphalt and metal at 1.5-2'									
								Fabric and wood at 2'-4'									MEC SCREENING EVERY 1' IN UPPER 10' WITH MG 230
								Plastic wood, soil, etc. 4' to 7'									RAD SCREENING ON ALL AUGERS/SAMPLES
5	8.4																
7							CH	**FAT CLAY** (CH): 0% gravel, 0% sand, 90% fines, dark greenish gray, wet, 10% debris (LANDFILL)	S	HP							
10	3.4			W O H					F	MP							2" RECOVERY, SAMPLE NOT RETAINED
15	-1.6																CASING SET 0-19', MUD ROTARY 19' TO BOTTOM OF HOLE

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

KCH

Project Number: 106454	**BORING LOG KCHSB-6**	**Plate** 1 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-9**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-6	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 81.5 ft	**Coordinates (X/Y, Lat/Long):** 6033426.487 ft / 2113227.571 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-23-11 / 03-24-11	**Top of Boring Elevation:** 13.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							SP	**Poorly Graded SAND** (SP): 0% gravel, 95% sand, 5% fines, gray, wet, rounded sand, trace shell fragments	MD						100	5	
			1														
													23	106			HARD PUSH LAST 6" TXUU
25	-11.6		2	2 4 6			CH	**Fat CLAY** (CH): 100% fines, olive gray, wet, (BAY MUD)	S	HP							
30	-16.6																200 PSI PUSH NO RECOVERY
							ML	**Sandy SILT** (ML): 0% gravel, 33% sand, 67% fines, olive gray, wet	VS	HP							
35	-21.6		3	W O H									36		100	67	

Project Number: 106454	**BORING LOG KCHSB-6**	**Plate** 2 of 5
Date: 06-15-11		
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**	**A-9**
Checked By: M.John		
File Name:		

Boring Number: KCHSB-6	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 81.5 ft	**Coordinates (X/Y, Lat/Long):** 6033426.487 ft / 2113227.571 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-23-11 / 03-24-11	**Top of Boring Elevation:** 13.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

Field Soil Description & Classification — **Laboratory**

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
											NP	NP			100	30	
							SM	**Silty SAND** (SM): 0% gravel, 70% sand, 30% fines, gray, wet	MD								
			4										23	104			TXUU CONSOL
													29	98			
							SP	**Poorly Graded SAND** (SP): 0% gravel, 98% sand, 2% fines, gray, wet, rounded sand	MD				27	99			
45	-31.6		5 6	7 15 16				Some silt	D								
50	-36.6		7 8	12 20 19				With silt	D				18	110		9	
55	-41.6																

KCH	**Project Number:** 106454	**BORING LOG KCHSB-6**	**Plate** 3 of 5
	Date: 06-15-11		**A-9**
	Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	
	Checked By: M.John		
	File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Boring Number: KCHSB-6	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 81.5 ft	**Coordinates (X/Y, Lat/Long):** 6033426.487 ft / 2113227.571 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-23-11 / 03-24-11	**Top of Boring Elevation:** 13.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			9 10	3 3 4			SP	**Poorly Graded SAND** (SP): gray, wet, rounded sand, (continued)									
65	-51.6																
70	-56.6		11 12	W O H			CH	**FAT CLAY** (CH): 0% gravel, 0% sand, 100% fines, olive, wet	F	HP							
75	-61.6																
							SP	**Poorly Graded SAND** (SP): 0% gravel, 100% sand, 0% fines, greenish gray, wet	VD								

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

Project Number: 106454	**BORING LOG KCHSB-6**	**Plate** 4 of 5
Date: 06-15-11		**A-9**
Entry By: A.Markey	**GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA**	
Checked By: M.John		
File Name:		

Boring Number: KCHSB-6	**Location:** Alameda Point, Alameda, CA	**Drilling Method:** Mud Rotary
Boring Total Depth: 81.5 ft	**Coordinates (X/Y, Lat/Long):** 6033426.487 ft / 2113227.571 ft	**Drilling Equipment:** Mobile B-80 Truck
Depth to Rock: No Rock was Encountered	**Datum/Coordinate System:** NAD83/NAVD 88	**Drilling Company:** Gregg Drilling
Date Begin/End: 03-23-11 / 03-24-11	**Top of Boring Elevation:** 13.4 ft	**Bit Size/Type:** 4-inch
Surface Conditions: GRASS	**Coordinate Data Source:**	**Hammer Type/Method:** Auto Trip
WL Measurement Point: Ground Surface	**Depth to Groundwater Initial/Time:** 8.0 ft / 0.5 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: M.John	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			13 14	12 24 38			SP	**Poorly Graded SAND** (SP): 0% gravel, 100% sand, 0% fines, greenish gray, wet, (continued)									
								Boring completed at a depth of 81.5 ft below existing site grade. NOTES: 1. Boring backfilled with neat cement grout. 2. Blow counts shown are raw, uncorrected values. 3. Depth to water measured at approximately 8 ft during drilling.									
85	-71.6																
90	-76.6																
95	-81.6																NOTES: 1. Boring backfilled with neat cement grout. 2. Blow counts shown are raw, uncorrected values. 3. Depth to water measured at approximately 8 ft during drilling.

KCH

Project Number: 106454	**BORING LOG KCHSB-6**	**Plate** 5 of 5
Date: 06-15-11		
Entry By: A.Markey	GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	**A-9**
Checked By: M.John		
File Name:		

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/16/11

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-1
(Sheet 1 of 3)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 471,492.67 Feet (CCS27 Zone 3)
Date Started: December 17, 2001	Easting: 1,472,681.90 Feet (CCS27 Zone 3)
Date Completed: December 17, 2001	Ground Surface Elevation: -17.40 Feet MSL, NGVD 29
Total Depth: 51.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
0–1				Mudline 17.4 feet below waterline			UNNAMED SAND/ FILL UNIT 0 to 51.5 feet: SANDY SILT: Low to medium plastic fines with fine sand, grey/black	-18
5	1250		095-02-001 3"x30" ss sleeve	ST sample 100% recovery easy push	ML			-22
6–7							SANDY SILT: Low to medium plastic fines with fine sand, grey/black	-24
10–11	1305	7 11 12	095-02-002 grab plastic bag	SPT sample 100% recovery on total drive			SAND: Fine to medium sand with low plastic fines, brown, loose to medium dense	-28
15–16	1340	6 4 4	095-02-003 2.5"x6" br. sleeve	MC sample 100% recovery on total drive	SP		Sand: Same as above, loose	-32

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19

Elevation scale: -18, -20, -22, -24, -26, -28, -30, -32, -34, -36

Notes: Boring Log Reviewed By: V. Richards 7/16/02
bgs = below ground surface
MSL = mean sea level
CCS27 = California Coordinate System 27
NGVD = National Geodetic Vertical Datum
SPT = Standard Penetration Test
MC = Modified California
ST = Shelby Tube
NA = Not Applicable
SWDIV = Southwest Division Naval Engineering Command
ss = stainless steel
br = brass
T.D. = Total Depth

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-1

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 471,492.67 Feet (CCS27 Zone 3)
Date Started: December 17, 2001	Easting: 1,472,681.90 Feet (CCS27 Zone 3)
Date Completed: December 17, 2001	Ground Surface Elevation: -17.40 Feet MSL, NGVD 29
Total Depth: 51.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
21	1400	11 14 14	095-02-004 grab plastic bag	SPT sample 100% recovery on total drive	SP		SAND: Fine to medium sand with low plastic fines, brown, loose, appears silt % decreasing	-38
22								
23								-40
24								-42
25–26	1405	10 27 35	095-02-005 2.5"x6" br. sleeve	MC sample 100% recovery on total drive			Sand: Same as above, loose	-44
27								
28								-46
29								
30–31	1420	9 16 23	095-02-006 grab plastic bag	SPT sample 100% recovery on total drive			SAND: Fine to medium sand with low plastic fines, brown, loose to medium dense, contains feldsic clast	-48
32								-50
33								
34								-52
35–36	1440	22 43 27	095-02-007	MC sample slid from sleeve and disturbed placed in bag				
37					ML		SANDY SILT: Low to medium plastic fines with fine to medium sand, brown, dense	-54
38								-56
39								

Notes: Boring Log Reviewed By: V. Richards 7/16/02
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MC = Modified California
ST = Shelby Tube
NA = Not Applicable
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ss = stainless steel
br = brass
T.D. = Total Depth

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-1

(Sheet 3 of 3)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 471,492.67 Feet (CCS27 Zone 3)
Date Started: December 17, 2001	Easting: 1,472,681.90 Feet (CCS27 Zone 3)
Date Completed: December 17, 2001	Ground Surface Elevation: -17.40 Feet MSL, NGVD 29
Total Depth: 51.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
41	1450	6 13 18	095-02-008 grab plastic bag	SPT sample 100% recovery on total drive	SP		SAND: Fine to medium sand with low plastic fines, brown, loose to medium dense, contains feldsic clast	-58
42								-60
43								
44								-62
45		11						
46	1505	15 16	095-02-009 2.5"x6" br. sleeve	MC sample 100% recovery on total drive	SP		Sand: Same as above	-64
47								
48								-66
49								
50		8						-68
51	1525	13 22	095-02-008 grab plastic bag	SPT sample 100% recovery on total drive			SAND: Fine to medium sand with low plastic fines, brown, loose to medium dense, contains feldsic clast	
52							Terminate borehole at 50 feet below mudline, sample to 51.5 feet below mudline	-70
53								
54								-72
55								
56								-74
57								
58								-76
59								

Notes: Boring Log Reviewed By: V. Richards 7/16/02
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ss = stainless steel
br = brass
T.D. = Total Depth

2384-SOIL LOG DO95.GPJ FSTRW_SA.GDT 8/8/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-5

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method:
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter:
Geologist/Engineer: D. Seaver	Northing: 473,552.55 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,470,910.90 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -9.50 Feet MSL, NGVD 29
Total Depth: 81.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
0				Mudline 9.50 feet below waterline			**YOUNG ?? BAY MUD 0 to 75.5 feet:**	-10
1							SILT: Medium plastic fines, black, trace fine sand, soft, non-cohesive	
2								-12
3								
4								-14
5	1020		095-02-019 3"X30" ss sleeve	ST sample 100% recovery easy push			SILT: Medium plastic fines, black, trace fine sand, soft, non-cohesive	
6								-16
7								
8					ML			-18
9								
10								-20
11								
12								-22
13								
14								-24
15	1035		095-02-020 3"X30" ss sleeve	ST sample 100% recovery easy push				
16							SANDY SILT: Medium plastic fines with fine sand, black, sand % increasing with depth	-26
17								
18					ML			-28
19								

Notes: Boring Log Reviewed By: V. Richards 7/17/02
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br = brass
T.D. = Total Depth

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-5

(Sheet 2 of 5)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method:
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter:
Geologist/Engineer: D. Seaver	Northing: 473,552.55 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,470,910.90 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -9.50 Feet MSL, NGVD 29
Total Depth: 81.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
	1040	0 0 0	095-02-021 2.5"x6" br. sleeve	MC sample 100% recovery on total drive easy push			SILT: Medium to high plastic fines, grey black, moderately cohesive, shell fragments	-30
21								
22								-32
23								
24								-34
25								
26								-36
27								
28								-38
29								
30		0			ML			
	1100	0 0	095-02-022 2.5"x6" br. sleeve	MC sample 100% recovery on total drive easy push			SILT: Low to medium plastic fines, trace fine sand, grey, shell fragments	-40
31								
32								-42
33								
34								-44
35								
36								-46
37								
38								-48
39								

Notes: Boring Log Reviewed By: V. Richards 7/17/02
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2384-SOIL LOG DO95.GPJ FSTRW_SA.GDT 8/8/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-5

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method:
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter:
Geologist/Engineer: D. Seaver	Northing: 473,552.55 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,470,910.90 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -9.50 Feet MSL, NGVD 29
Total Depth: 81.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
41							SILT: Same as above, based on drilling observations	-50
42								
43								-52
44								
45								-54
46								
47								-56
48								
49								-58
50	1110	0 0 0	095-02-023 2.5"x6" br. sleeve	MC sample 100% recovery on total drive easy push	ML		SILT: Low to medium plastic fines, trace fine sand, grey, shell fragments	-60
51								
52								-62
53								
54								-64
55								
56								-66
57								
58								-68
59								

Notes: Boring Log Reviewed By: V. Richards 7/17/02
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2384-SOIL LOG DO95.GPJ FSTRW_SA.GDT 8/6/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-5
(Sheet 4 of 5)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method:
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter:
Geologist/Engineer: D. Seaver	Northing: 473,552.55 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,470,910.90 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -9.50 Feet MSL, NGVD 29
Total Depth: 81.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
60.5					ML		SILT: Same as above based on drilling operations	-70
70–71.5	1130	0 0 0	095-02-024 2.5"x6" br. sleeve	MC sample 100% recovery on total drive easy push	ML		SILT: Low to medium plastic fines, trace fine sand, grey, shell fragments	-80
75–75.5	1200	9 14 12	095-02-025 2.5"x6" br. sleeve	MC sample 100% recovery on total drive	ML		SILT: Same as above	-84
75.5					SP		MERRITT SAND UNIT ??? 75.5 to 81.5 feet: SAND: Fine to medium sand, black	-85

Notes: Boring Log Reviewed By: V. Richards 7/17/02
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2384-SOIL LOG DO95.GPJ FSTRW_SA.GDT 6/8/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-5
(Sheet 5 of 5)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method:
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter:
Geologist/Engineer: D. Seaver	Northing: 473,552.55 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,470,910.90 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -9.50 Feet MSL, NGVD 29
Total Depth: 81.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
81	1220	6 6 7	095-02-026 2.5"x6" br. sleeve	MC sample 100% recovery on total drive	SP		SAND: Fine to medium sand, black	-90
82							Terminate borehole at 80 feet below mudline, sample to 81.5 feet below mudline	-92
83–99								-94, -96, -98, -100, -102, -104, -106, -108

Notes:
Boring Log Reviewed By: V. Richards 7/17/02
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ss = stainless steel
br = brass
T.D. = Total Depth

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

LOG OF BORING
B-2-6
(Sheet 1 of 4)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 474,556.76 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,471,014.80 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -13.20 Feet MSL, NGVD 29
Total Depth: 66.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
0–1				Mudline 13.20 feet below waterline			YOUNG ?? BAY MUD 0 to 75.5 feet: SILT: Medium plastic fines	-14
5			NA	At 5' ST 0% recovery Re-push 7'-9'				-18
7	1420		095-02-027 3"X30" ss sleeve	ST sample 100% recovery easy push			SILT: Medium plastic fines, light grey, trace fine sand, soft	-20
10					ML			
15	1430		095-02-028 3"X30" ss sleeve	ST sample 100% recovery easy push			SILT: Medium plastic fines, light grey/black, trace fine sand, soft, shell fragments	-28

Notes: Boring Log Reviewed By: V. Richards 7/17/02
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ss = stainless steel
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T.D. = Total Depth

2384-SOIL LOG DO95.GPJ FSTRW_SA.GDT 8/6/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-6

(Sheet 2 of 4)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 474,556.76 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,471,014.80 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -13.20 Feet MSL, NGVD 29
Total Depth: 66.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
21				Too soft for sampling rig is pushing through formation			SILT: Same as above based on drilling operations, very soft, unable to collect samples	-34
22								
23								-36
24								
25								-38
26								
27								-40
28								
29								-42
30				Drilling conditions the same no resistance	ML			
31							SILT: Same as above based on drilling operations, very soft, unable to collect samples	-44
32								
33								-46
34								
35								-48
36								
37								-50
38								
39							SILT: Medium plastic fines, light grey/black, trace fine sand, soft	-52

Notes: Boring Log Reviewed By: V. Richards 7/17/02
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MC = Modified California
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ss = stainless steel
br = brass
T.D. = Total Depth

2384-SOIL LOG DO95.GPJ FSTRW_SA.GDT 8/6/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-6

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 474,556.76 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,471,014.80 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -13.20 Feet MSL, NGVD 29
Total Depth: 66.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
					ML			
41		2						-54
	1450	1	095-02-029 2.5"x6" br. sleeve	MC sample 100% recovery on total drive			**MERRITT SAND UNIT ??? 75.5 to 81.5 feet:**	
42		0					SAND: Fine to medium sand, black, soft	
43								-56
44								
45								-58
46							SAND: Same as above based on drilling operation, soft and unable to collect sample	
47								-60
48								
49								-62
50		3						
	1510	4	095-02-030 2.5"x6" br. sleeve	MC sample 100% recovery on total drive	SP		SAND: Fine sand with <10% silt, grey/black, soft	
51		4						-64
52								
53								-66
54								
55		10						-68
	1520	12	095-02-031 2.5"x6" br. sleeve	MC sample 100% recovery on total drive			SAND: Fine to medium sand with trace silt, grey/black, soft	
56		12						
57								-70
58								
59								-72

Notes: Boring Log Reviewed By: V. Richards 7/17/02
bgs = below ground surface
MSL = mean sea level
CCS27 = California Coordinate System 27
NGVD = National Geodetic Vertical Datum

SPT = Standard Penetration Test
MC = Modified California
ST = Shelby Tube
NA = Not Applicable
SWDIV = Southwest Division Naval Engineering Command

ss = stainless steel
br = brass
T.D. = Total Depth

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF BORING B-2-6
(Sheet 4 of 4)

Client: SWDIV	Drilling Company: Gregg Drilling and Testing, Inc.
Project: CTO054 Alameda Point	Drilling Method: Mud Rotary.
Project Number: 1990.054D	Sampling Method: See Log
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: D. Seaver	Northing: 474,556.76 Feet (CCS27 Zone 3)
Date Started: December 19, 2001	Easting: 1,471,014.80 Feet (CCS27 Zone 3)
Date Completed: December 19, 2001	Ground Surface Elevation: -13.20 Feet MSL, NGVD 29
Total Depth: 66.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Blow Counts	Sample ID	Comments	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
61	1540	8, 13, 11	095-02-032 2.5"x6" br. sleeve	MC sample 100% recovery on total drive	SP		SAND: Fine to medium sand with trace silt, grey/black, soft	-74
62								
63								-76
64								
65								-78
66	1600	12, 13, 13	095-02-033 2.5"x6" br. sleeve	MC sample 100% recovery on total drive			SAND: Fine to medium sand with trace silt, grey/black, soft	
67							Terminate borehole at 65 feet below mudline, sample to 66.5 feet below mudline	-80
68								
69								-82
70								
71								-84
72								
73								-86
74								
75								-88
76								
77								-90
78								
79								-92

Notes: Boring Log Reviewed By: V. Richards 7/17/02
bgs = below ground surface
MSL = mean sea level
CCS27 = California Coordinate System 27
NGVD = National Geodetic Vertical Datum

SPT = Standard Penetration Test
MC = Modified California
ST = Shelby Tube
NA = Not Applicable
SWDIV = Southwest Division Naval Engineering Command

ss = stainless steel
br = brass
T.D. = Total Depth

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF UXO BORING B-2-7A

(Sheet 1 of 1)

Client: SWDIV	Drilling Company: Western Strata Exploration
Project: CTO054 Alameda Point	Drilling Method: Hollow-Stem Auger
Project Number: 1990.054D	Sampling Method: Not applicable (see log)
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: T. Lai	Northing: 471,897.59 Feet (CCS27 Zone 3)
Date Started: March 13, 2002	Easting: 1,472,721.18 Feet (CCS27 Zone 3)
Date Completed: March 13, 2002	Ground Surface Elevation: 8.53 Feet MSL, NGVD 29
Total Depth: 51.5 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Comments	Water Level	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
0–5	0750	Installed PVC at 4 feet - UXO cleared to 8 feet		SP-SM		Artificial Fill Sandy Silt / Silty Sand: olive brown	8
5–10	0812	Encountered refuse at 5 feet, dark gray sandy silt with wire and decomposing wood		R		Sand Silt: refuse present in form of telephone wire, decomposed wood and rags. Refuse zone approximately 5 to 10 feet bgs.	
8	0825	Installed PVC at 8 feet - UXO cleared to 12 feet	▼			Groundwater encountered at 8 feet bgs.	0
10–16	0840	Installed PVC at 12 feet - UXO cleared to 16 feet		SP		Poorly Graded Sand: fine grained, dark greenish grey (5BG 4/1)	-2
16–19						Boring terminated by field geologist at 16 feet No refuse encountered at total depth Groundwater encountered at approximately 8 feet Boring backfilled with bentonite grout	-8

Notes: Boring Log Reviewed By: V. Richards 7/30/02
bgs = below ground surface
MSL = mean sea level
CCS27 = California Coordinate System 27
NGVD = National Geodetic Vertical Datum
SWDIV = Southwest Division Naval Facilities Engineering Command

DO85 UXO BORINGS DO95UXO.GPJ FSTRW_SA.GDT 8/6/02

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF UXO BORING B-2-11
(Sheet 1 of 1)

Client: SWDIV	Drilling Company: Western Strata Exploration
Project: CTO054 Alameda Point	Drilling Method: Hollow-Stem Auger
Project Number: 1990.054D	Sampling Method: Not applicable (see log)
Location: Installation Restoration Site 2	Borehole Diameter: 8 in.
Geologist/Engineer: V. Richards	Northing: 474,454.47 Feet (CCS27 Zone 3)
Date Started: February 14, 2002	Easting: 1,471,417.73 Feet (CCS27 Zone 3)
Date Completed: February 14, 2002	Ground Surface Elevation: 7.66 Feet MSL, NGVD 29
Total Depth: 16.0 Feet bgs	Top of Casing Elevation: NA

Depth (ft.)	Time	Comments	Water Level	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation (ft.)
0	0742	Boring augered to 6-inches - UXO cleared					
1				GP		Asphalt Base Material slight hydrocarbon odor	
2	0752	UXO cleared at 2 feet					6
3						Sandy Silt: gray, wet, fine grain sand with minor amounts of wood and roots	
4	0817	Installed PVC at 4 feet - UXO cleared to 8 feet					4
5							
6			▼				
7						Groundwater encountered at approximately 6 feet bgs	
8	0828	Installed PVC at 8 feet - UXO cleared to 12 feet					0
9				ML		Fine gray sand / no refuse	
10							-2
11							
12	0846	Installed PVC at 12 feet - UXO cleared to 16 feet					-4
13						Wet, fine gray sand / no refuse	
14							-6
15							
16	0912	Installed PVC at 16 feet - UXO cleared to 20 feet					-8
17						Boring terminated by field geologist at 16 feet No refuse encountered in entire borehole - UXO cleared Groundwater encountered at approximately 6 feet bgs Boring backfilled with bentonite grout	
18							-10
19							
							-12

Notes: Boring Log Reviewed By: V. Richards 7/26/02
bgs = below ground surface
MSL = mean sea level
CCS27 = California Coordinate System 27
NGVD = National Geodetic Vertical Datum
SWDIV = Southwest Division Naval Facilities Engineering Command

FOSTER WHEELER ENVIRONMENTAL CORPORATION

LOG OF UXO BORING B-2-12

(Sheet 1 of 1)

Client: SWDIV	Drilling Company: Western Strata Exploration
Project: CTO054 Alameda Point	Drilling Method: Hollow-Stem Auger
Project Number: 1990.054D	Sampling Method: Not applicable (see log)
Location: Installation Restoration Site 2	Borehole Diameter: 4 in.
Geologist/Engineer: V. Richards	Northing: 473,453.12 Feet (CCS27 Zone 3)
Date Started: February 13, 2002	Easting: 1,471,403.97 Feet (CCS27 Zone 3)
Date Completed: February 13, 2002	Ground Surface Elevation: 4.57 Feet MSL, NGVD 29
Total Depth: 24.0 Feet bgs	Top of Casing Elevation: NA

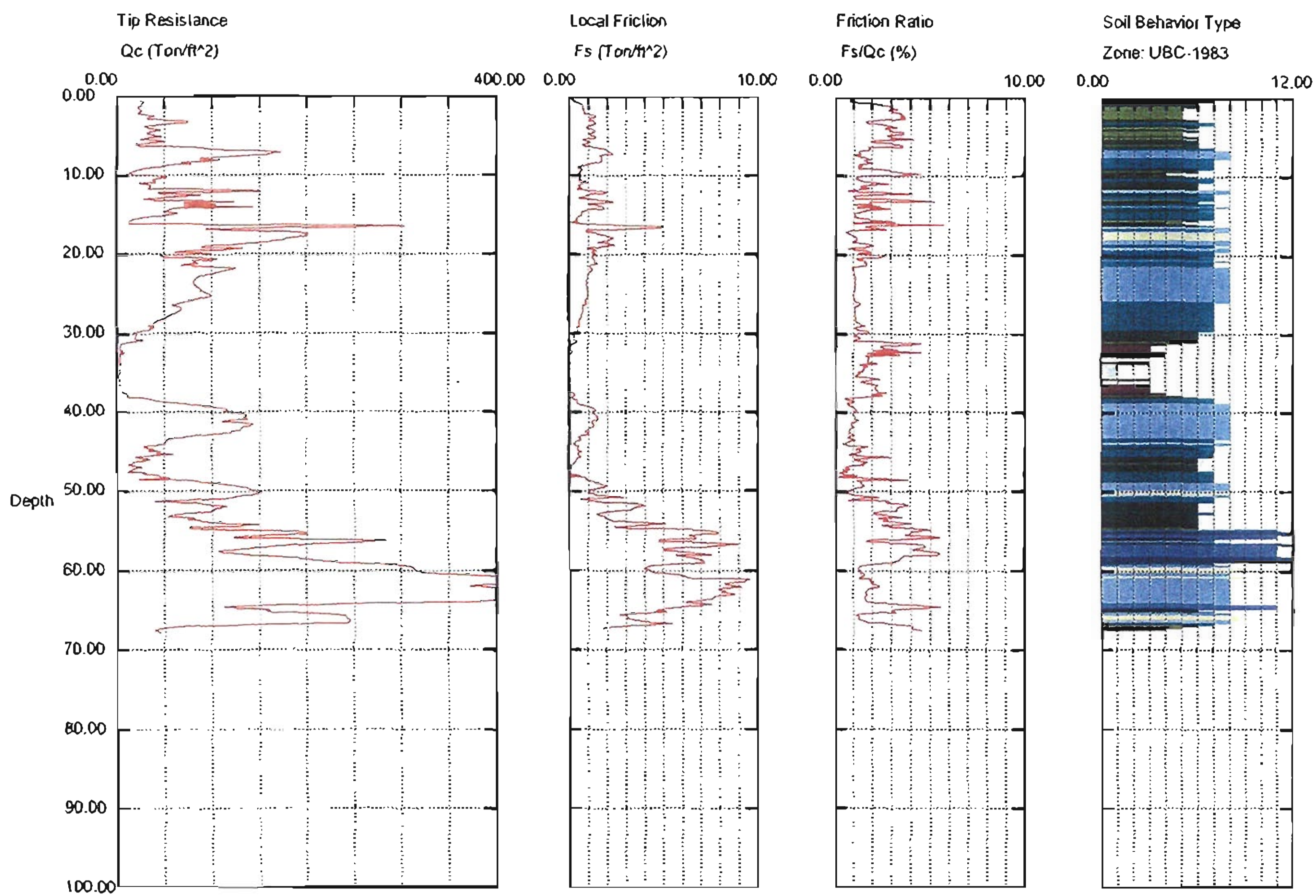
Depth (ft.)	Time	Comments	Water Level	USCS	LITHOLOGIC DESCRIPTION	Elevation (ft.)
0		Hand Auger 0feet to 4 feet bgs, UXO clear		SM	ARTIFICIAL FILL AND REFUSE 0 to 16 feet	4
1–3			▼ (3 ft)		REFUSE: Wood, concrete, wire and other construction debris in matrix of silty sand, soil dark blueish grey (5B 4/1), saturated at 3 feet bgs.	2
4	0814	Installed PVC at 4 feet - UXO cleared to 8 feet				0
7					REFUSE: Wood, concrete, wire and other construction debris in matrix of silty sand, soil dark blueish grey (5B 4/1)	-2
8	0821	Installed PVC at 8 feet - UXO cleared to 12 feet				-4
11					REFUSE: Wood, concrete, wire and other construction debris in matrix of silty sand, soil dark blueish grey (5B 4/1)	-6
12	0854	Installed PVC at 12 feet - UXO cleared to 16 feet				-8
16	0919	Installed PVC at 16 feet - UXO cleared to 20 feet				-12
17–18				SM	SILTY SAND: Fine sand with high plastic fines, dark blueish grey (5B 4/1)	-14
20	0957	Installed PVC at 20 feet - UXO cleared to 24 feet				-16
24		This UXO boring also utilized for the clearance of C-2-14				-20
26–28					Boring terminated by field geologist at 24 feet No refuse encountered at total depth Groundwater encountered at approximately 3 feet Boring backfilled with bentonite grout	-22
29						-24

Notes: Boring Log Reviewed By: V. Richards 8/6/02
bgs = below ground surface
MSL = mean sea level
CCS27 = California Coordinate System 27
NGVD = National Geodetic Vertical Datum
SWDIV = Southwest Division Naval Facilities Engineering Command

Hushmand Associates

Operator: ALAMEDA NAS #2
Sounding: SDF120
Cone Used: 408/GO-VO/R#4

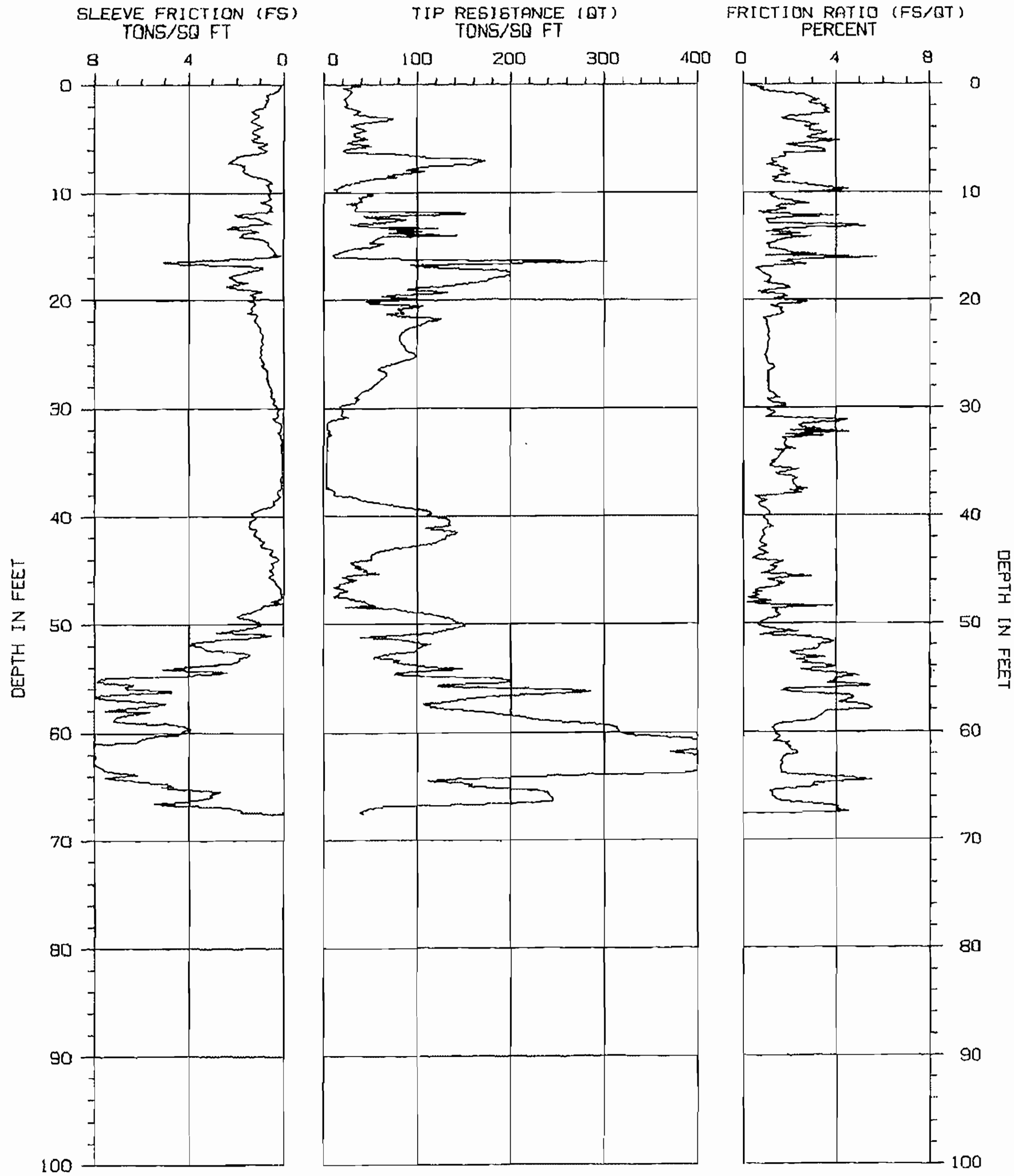
CPT Date/Time: 02-19-02 09:25
Location: CPT-01
Job Number: 010810



Maximum Depth = 67.75 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01

PROJECT NAME : ALAMEDA NAS #2

PROJECT NUMBER : 010810

CONE/RIG : 408/GO-VD/R#4

DATE/TIME: 02-19-02 09:25

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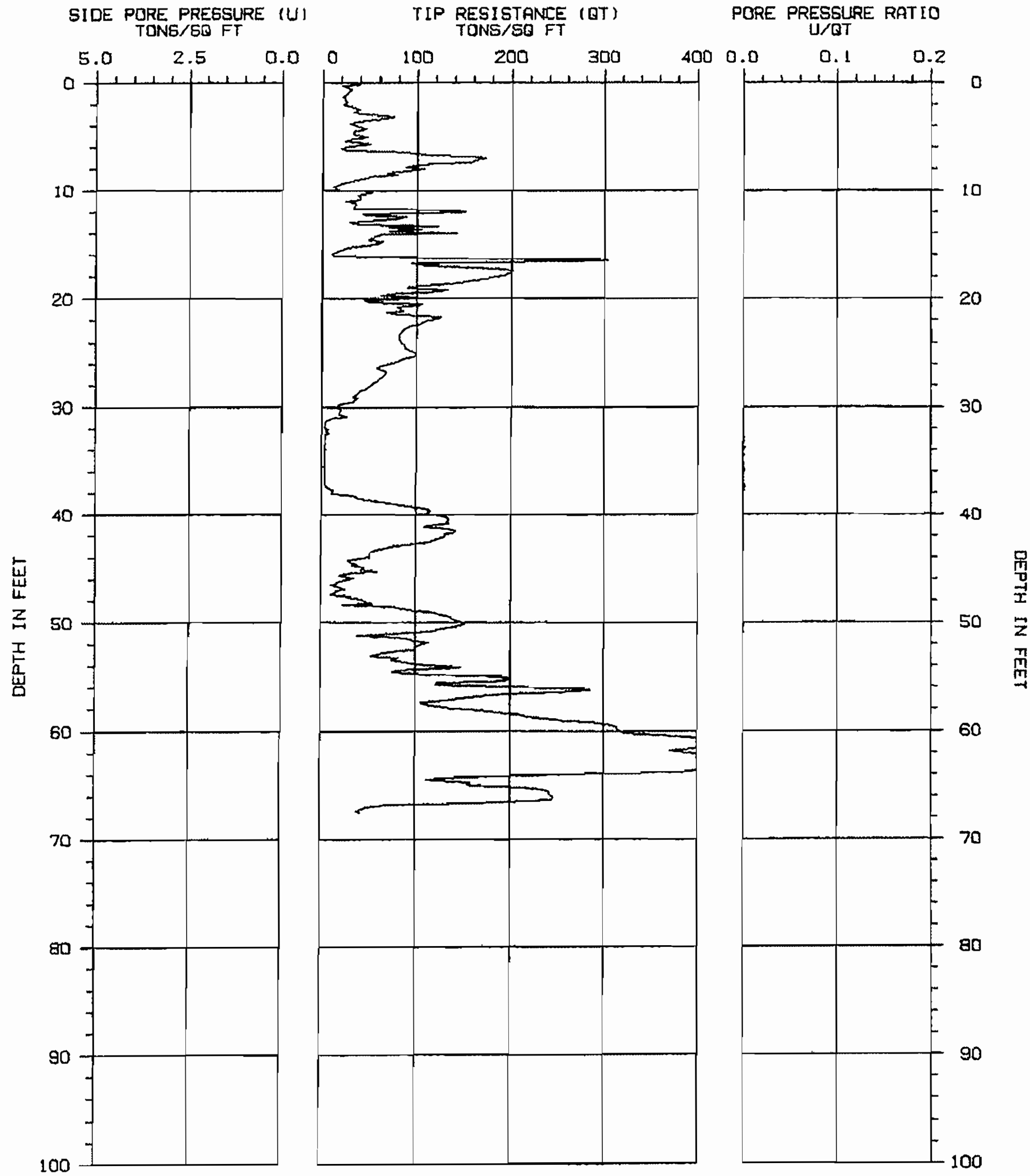


TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-01
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 408/GO-VO/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-19-02 09:25

CPT INTERPRETATIONS

SOUNDING : CPT-01
PROJECT : ALAMEDA NAS #2
DATE/TIME: 02-19-02 09:25

PROJECT No.: 010810
CONE/RIG : 408/GO-VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI [Degrees]
.150	.49	25.49	.78	SILTY SAND to SANDY SILT	8	14	37		
.300	.98	26.98	2.63	CLAYEY SILT to SILTY CLAY	13	22		1.8	
.450	1.48	23.33	3.30	CLAYEY SILT to SILTY CLAY	12	19		1.5	
.600	1.97	22.52	3.55	CLAY to SILTY CLAY	15	24		1.5	
.750	2.46	39.69	3.48	CLAYEY SILT to SILTY CLAY	20	32		2.6	
.900	2.95	51.86	2.08	SANDY SILT to CLAYEY SILT	21	33		3.4	
1.050	3.44	55.22	2.48	SANDY SILT to CLAYEY SILT	22	35		3.7	
1.200	3.94	32.89	2.68	CLAYEY SILT to SILTY CLAY	16	26		2.2	
1.350	4.43	36.80	3.61	CLAYEY SILT to SILTY CLAY	18	29		2.4	
1.500	4.92	40.66	2.78	SANDY SILT to CLAYEY SILT	16	26		2.7	
1.650	5.41	24.58	2.89	CLAYEY SILT to SILTY CLAY	12	20		1.6	
1.800	5.91	29.87	3.15	CLAYEY SILT to SILTY CLAY	15	24		2.0	
1.950	6.40	68.54	1.79	SILTY SAND to SANDY SILT	23	37	66		43.5
2.100	6.89	156.38	1.27	SAND to SILTY SAND	39	62	89		46.5
2.250	7.38	157.91	1.03	SAND to SILTY SAND	39	61	89		46.0
2.400	7.87	88.00	1.94	SILTY SAND to SANDY SILT	29	44	73		43.5
2.550	8.37	67.71	2.02	SILTY SAND to SANDY SILT	23	33	65		42.0
2.700	8.86	47.18	1.29	SILTY SAND to SANDY SILT	16	22	55		39.5
2.850	9.35	20.99	3.00	CLAYEY SILT to SILTY CLAY	10	14		1.4	
3.000	9.84	17.27	3.36	CLAY to SILTY CLAY	12	15		1.1	
3.150	10.33	45.29	1.24	SILTY SAND to SANDY SILT	15	20	52		39.0
3.300	10.83	40.62	2.36	SANDY SILT to CLAYEY SILT	16	21		2.7	
3.450	11.32	36.46	1.43	SILTY SAND to SANDY SILT	12	15	44		38.0
3.600	11.81	142.40	.70	SAND	28	35	83		44.0
3.750	12.30	46.10	2.56	SANDY SILT to CLAYEY SILT	18	22		3.0	
3.900	12.80	46.91	1.13	SILTY SAND to SANDY SILT	16	18	50		38.0
4.050	13.29	122.69	1.90	SILTY SAND to SANDY SILT	41	47	77		42.5
4.200	13.78	70.64	2.46	SANDY SILT to CLAYEY SILT	28	32		4.7	
4.350	14.27	55.90	1.91	SILTY SAND to SANDY SILT	19	21	53		38.5
4.500	14.76	63.22	1.04	SILTY SAND to SANDY SILT	21	23	56		38.5
4.650	15.26	33.48	1.28	SILTY SAND to SANDY SILT	11	12	38		36.0
4.800	15.75	14.21	3.17	CLAY to SILTY CLAY	9	10		.9	
4.950	16.24	105.99	2.72	SANDY SILT to CLAYEY SILT	42	45		6.2	
5.100	16.73	93.82	2.73	SANDY SILT to CLAYEY SILT	38	39		5.5	
5.250	17.22	182.58	.68	SAND	37	38	85		43.5
5.400	17.72	196.81	1.09	SAND	39	41	87		44.0
5.550	18.21	173.97	1.14	SAND to SILTY SAND	43	45	84		43.5
5.700	18.70	122.22	1.96	SILTY SAND to SANDY SILT	41	42	73		42.0
5.850	19.19	132.31	.69	SAND	26	27	75		42.0
6.000	19.69	62.18	1.93	SILTY SAND to SANDY SILT	21	21	54		38.0
6.150	20.18	46.23	2.75	SANDY SILT to CLAYEY SILT	18	19		3.0	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-01

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	100.21	1.36	SAND to SILTY SAND	25	25	67		40.0
6.450	21.16	85.32	1.76	SILTY SAND to SANDY SILT	28	28	62		39.0
6.600	21.65	125.64	.90	SAND to SILTY SAND	31	31	73		41.5
6.750	22.15	108.05	1.04	SAND to SILTY SAND	27	26	68		40.0
6.900	22.64	90.57	1.08	SAND to SILTY SAND	23	22	63		39.0
7.050	23.13	83.07	1.12	SAND to SILTY SAND	21	20	61		39.0
7.200	23.62	80.96	1.12	SAND to SILTY SAND	20	19	60		38.5
7.350	24.11	84.36	1.07	SAND to SILTY SAND	21	20	61		39.0
7.500	24.61	87.76	1.07	SAND to SILTY SAND	22	21	62		39.0
7.650	25.10	99.28	.96	SAND to SILTY SAND	25	23	65		39.5
7.800	25.59	84.66	1.07	SAND to SILTY SAND	21	20	60		38.5
7.950	26.08	69.68	1.32	SILTY SAND to SANDY SILT	23	22	55		38.0
8.100	26.57	63.71	1.10	SILTY SAND to SANDY SILT	21	20	52		38.0
8.250	27.07	65.56	1.08	SILTY SAND to SANDY SILT	22	20	52		38.0
8.400	27.56	59.55	1.09	SILTY SAND to SANDY SILT	20	18	50		37.5
8.550	28.05	51.99	1.12	SILTY SAND to SANDY SILT	17	16	46		36.5
8.700	28.54	41.32	1.21	SILTY SAND to SANDY SILT	14	12	39		35.5
8.850	29.04	33.18	1.63	SANDY SILT to CLAYEY SILT	13	12		2.5	
9.000	29.53	33.27	1.32	SILTY SAND to SANDY SILT	11	10	32		33.5
9.150	30.02	19.78	1.16	SANDY SILT to CLAYEY SILT	8	7		1.4	
9.300	30.51	18.80	1.38	SANDY SILT to CLAYEY SILT	8	7		1.4	
9.450	31.00	16.68	2.58	CLAYEY SILT to SILTY CLAY	8	7		1.0	
9.600	31.50	4.25	2.59	CLAY	4	4		.2	
9.750	31.99	3.91	3.32	CLAY	4	3		.2	
9.900	32.48	8.26	1.82	CLAYEY SILT to SILTY CLAY	4	4		.5	
10.050	32.97	3.82	1.83	SENSITIVE FINE GRAINED	2	2		.2	
10.200	33.46	3.91	1.79	SENSITIVE FINE GRAINED	2	2		.2	
10.350	33.96	5.10	1.37	SENSITIVE FINE GRAINED	3	2		.3	
10.500	34.45	3.70	1.62	SENSITIVE FINE GRAINED	2	2		.2	
10.650	34.94	3.99	1.25	SENSITIVE FINE GRAINED	2	2		.2	
10.800	35.43	3.44	1.16	SENSITIVE FINE GRAINED	2	1		.1	
10.950	35.93	3.59	1.95	SENSITIVE FINE GRAINED	2	2		.2	
11.100	36.42	3.89	2.06	CLAY	4	3		.1	
11.250	36.91	4.16	2.16	CLAY	4	3		.2	
11.400	37.40	4.72	2.33	CLAY	5	4		.2	
11.550	37.89	11.20	2.50	CLAYEY SILT to SILTY CLAY	6	5		.7	
11.700	38.39	36.92	.68	SILTY SAND to SANDY SILT	12	10	33		32.5
11.850	38.88	63.76	.64	SAND to SILTY SAND	16	13	48		36.5
12.000	39.37	102.34	.98	SAND to SILTY SAND	26	21	62		38.5
12.150	39.86	111.68	1.18	SAND to SILTY SAND	28	23	64		38.5
12.300	40.35	135.03	1.01	SAND to SILTY SAND	34	27	69		39.5
12.450	40.85	136.12	1.09	SAND to SILTY SAND	34	27	70		39.5
12.600	41.34	134.86	.85	SAND to SILTY SAND	34	27	69		39.0
12.750	41.83	131.02	.96	SAND to SILTY SAND	33	26	68		39.0
12.900	42.32	122.05	.71	SAND to SILTY SAND	31	24	66		39.0
13.050	42.81	90.67	1.01	SAND to SILTY SAND	23	18	57		38.0
13.200	43.31	57.49	.96	SILTY SAND to SANDY SILT	19	15	44		36.0
13.350	43.80	51.35	.55	SAND to SILTY SAND	13	10	41		35.0
13.500	44.29	28.91	1.76	SANDY SILT to CLAYEY SILT	12	9		2.1	
13.650	44.78	34.06	1.44	SANDY SILT to CLAYEY SILT	14	11		2.5	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-01

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	59.08	.76	SAND to SILTY SAND	15	11	45		36.0
13.950	45.77	27.62	1.59	SANDY SILT to CLAYEY SILT	11	9		2.0	
14.100	46.26	17.51	1.77	CLAYEY SILT to SILTY CLAY	9	7		1.2	
14.250	46.75	20.56	.68	SANDY SILT to CLAYEY SILT	8	6		1.8	
14.400	47.24	16.10	.43	SANDY SILT to CLAYEY SILT	6	5		1.3	
14.550	47.74	28.91	.48	SILTY SAND to SANDY SILT	10	7	24		30.5
14.700	48.23	55.11	1.52	SILTY SAND to SANDY SILT	18	14	42		35.0
14.850	48.72	85.66	1.46	SILTY SAND to SANDY SILT	29	22	55		37.0
15.000	49.21	123.77	1.59	SAND to SILTY SAND	31	23	65		38.5
15.150	49.70	139.24	.90	SAND to SILTY SAND	35	26	68		39.0
15.300	50.20	150.67	.71	SAND	30	23	70		39.0
15.450	50.69	120.59	2.36	SILTY SAND to SANDY SILT	40	30	64		38.5
15.600	51.18	39.45	2.89	CLAYEY SILT to SILTY CLAY	20	15		2.4	
15.750	51.67	99.60	3.86	CLAYEY SILT to SILTY CLAY	50	37		5.7	
15.900	52.17	102.04	3.28	SANDY SILT to CLAYEY SILT	41	30		5.8	
16.050	52.66	81.77	2.07	SILTY SAND to SANDY SILT	27	20	52		37.0
16.200	53.15	53.66	3.50	CLAYEY SILT to SILTY CLAY	27	20		3.0	
16.350	53.64	88.21	2.56	SANDY SILT to CLAYEY SILT	35	26		5.7	
16.500	54.13	148.27	3.43	SANDY SILT to CLAYEY SILT	59	43		8.5	
16.650	54.63	75.25	4.29	CLAYEY SILT to SILTY CLAY	38	27		4.2	
16.800	55.12	197.70	3.96	*SAND to CLAYEY SAND	99	71			
16.950	55.61	123.09	5.16	*VERY STIFF FINE GRAINED	100	89			
17.100	56.10	258.53	1.85	SAND to SILTY SAND	65	46	85		42.0
17.250	56.59	196.28	4.56	*VERY STIFF FINE GRAINED	100	100			
17.400	57.09	138.83	4.42	*VERY STIFF FINE GRAINED	100	99			
17.550	57.58	109.96	5.36	*VERY STIFF FINE GRAINED	100	78			
17.700	58.07	157.91	3.60	SANDY SILT to CLAYEY SILT	63	45		9.1	
17.850	58.56	207.31	3.41	*SAND to CLAYEY SAND	100	73			
18.000	59.06	262.01	2.48	SILTY SAND to SANDY SILT	87	61	84		42.0
18.150	59.55	312.43	1.29	SAND	62	44	89		42.5
18.300	60.04	317.04	1.37	SAND	63	44	90		42.5
18.450	60.53	377.52	1.58	SAND to SILTY SAND	94	66	95		43.5
18.600	61.02	489.86	1.95	SAND to SILTY SAND	100	85	100		44.5
18.750	61.52	421.75	1.96	SAND to SILTY SAND	100	73	98		44.0
18.900	62.01	389.65	2.34	SAND to SILTY SAND	97	67	95		43.5
19.050	62.50	482.75	1.71	SAND to SILTY SAND	100	83	100		44.0
19.200	62.99	509.07	1.72	SAND to SILTY SAND	100	87	100		44.5
19.350	63.48	467.68	1.62	SAND to SILTY SAND	100	80	100		44.0
19.500	63.98	302.42	2.04	SAND to SILTY SAND	76	52	88		42.0
19.650	64.47	112.22	5.52	*VERY STIFF FINE GRAINED	100	76			
19.800	64.96	156.11	2.99	SANDY SILT to CLAYEY SILT	62	42		9.0	
19.950	65.45	234.44	1.13	SAND	47	32	80		40.5
20.100	65.94	242.51	1.25	SAND	49	33	81		40.5
20.250	66.44	243.06	1.78	SAND to SILTY SAND	61	41	81		40.5
20.400	66.93	68.88	4.07	CLAYEY SILT to SILTY CLAY	34	23		3.8	
20.550	67.42	39.26	4.51	CLAY to SILTY CLAY	26	17		2.1	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

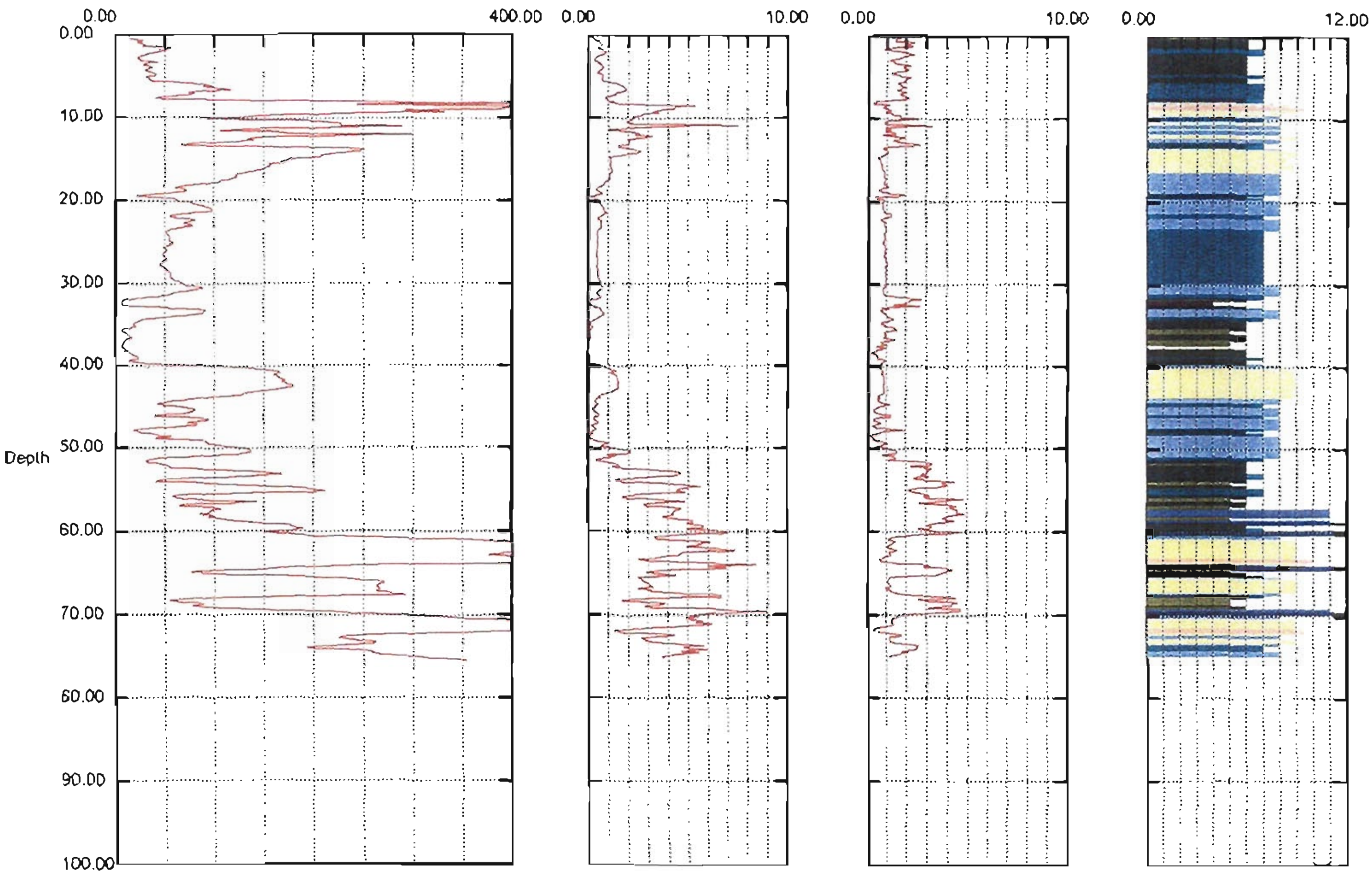
HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

Hushmand Associates

Operator: ALAMEDA NAS #2
Sounding: SDF121
Cone Used: 408/GO-VD/R#4

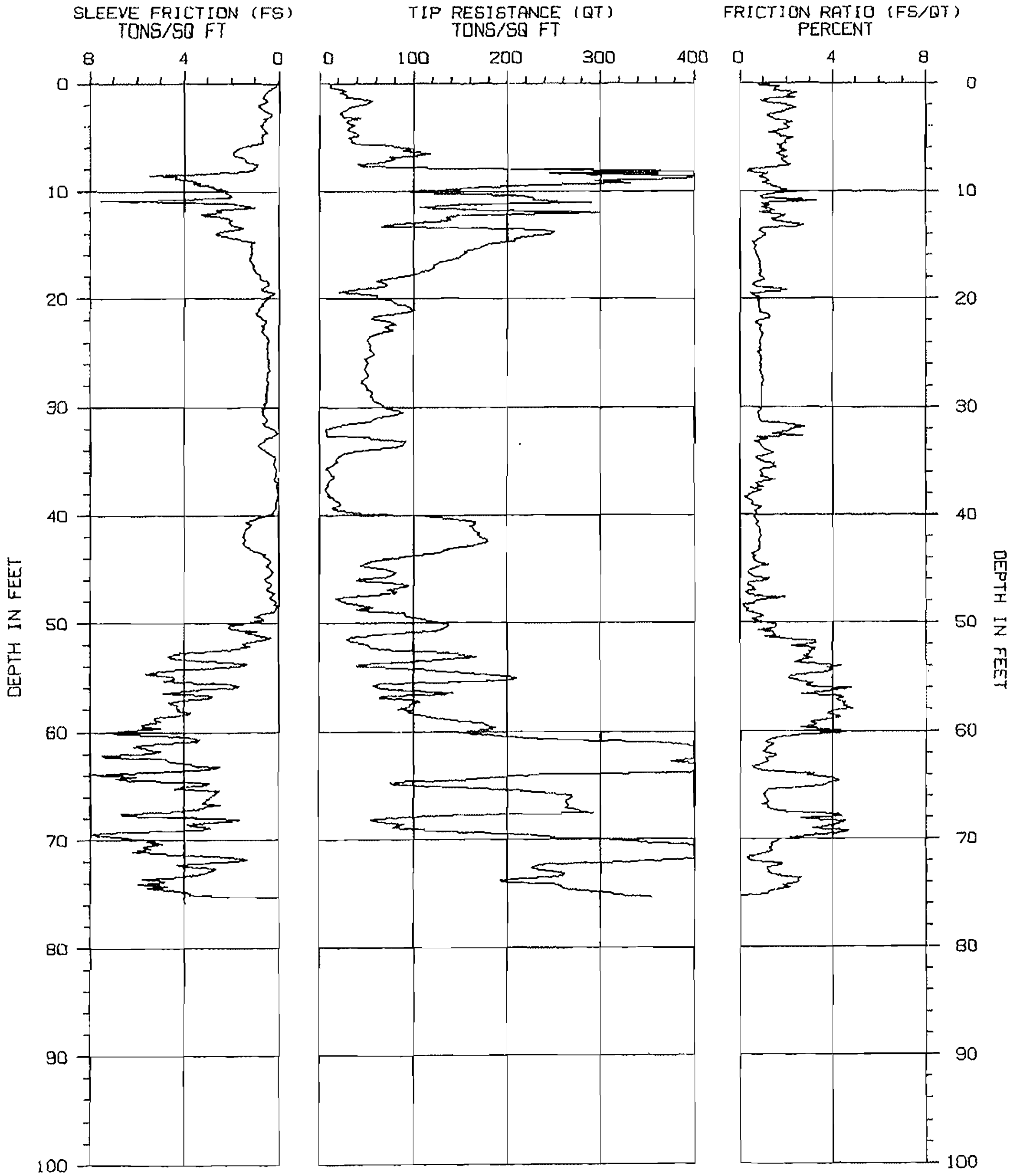
CPT Date/Time: 02-19-02 10:49
Location: CPT-02
Job Number: 010810



Maximum Depth = 75.46 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-02
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 408/GO-VD/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-19-02 10:49

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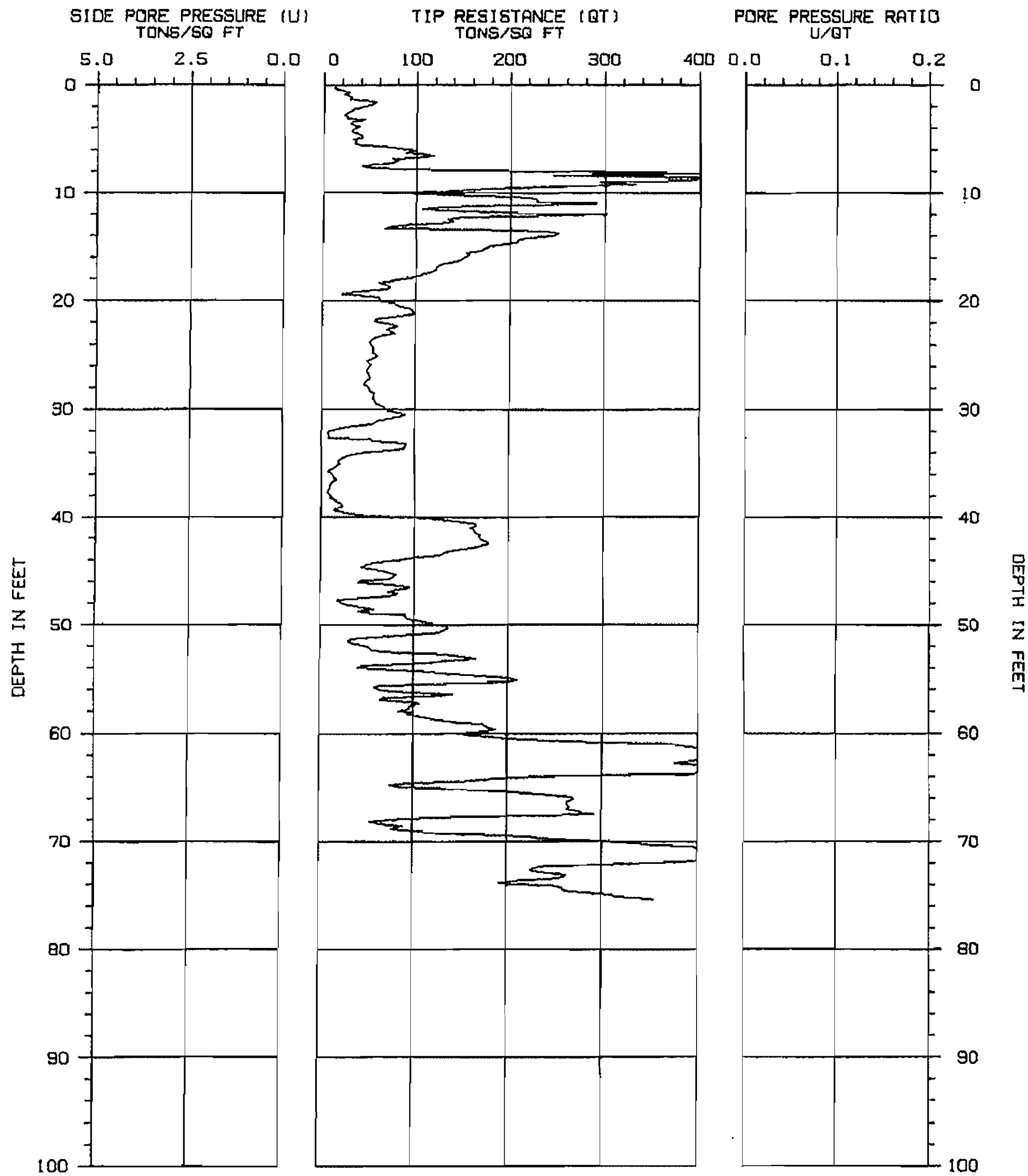


TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-02
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 408/GO-VO/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-19-02 10:49

HFA

CPT INTERPRETATIONS

SOUNDING : CPT-02
PROJECT : ALAMEDA NAS #2
DATE/TIME: 02-19-02 10:49

PROJECT No.: 010810
CONE/RIG : 408/GO-VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	19.48	1.54	SANDY SILT to CLAYEY SILT	8	12		1.6	
.300	.98	26.81	2.20	SANDY SILT to CLAYEY SILT	11	17		1.8	
.450	1.48	43.13	1.34	SILTY SAND to SANDY SILT	14	23	52		47.5
.600	1.97	45.00	1.91	SANDY SILT to CLAYEY SILT	18	29		3.0	
.750	2.46	29.68	2.02	SANDY SILT to CLAYEY SILT	12	19		2.4	
.900	2.95	25.62	1.17	SANDY SILT to CLAYEY SILT	10	16		2.0	
1.050	3.44	31.31	1.63	SANDY SILT to CLAYEY SILT	13	20		2.5	
1.200	3.94	37.65	1.97	SANDY SILT to CLAYEY SILT	15	24		2.5	
1.350	4.43	33.59	1.52	SANDY SILT to CLAYEY SILT	13	21		2.7	
1.500	4.92	40.43	1.76	SANDY SILT to CLAYEY SILT	16	26		3.2	
1.650	5.41	34.01	1.94	SANDY SILT to CLAYEY SILT	14	22		2.7	
1.800	5.91	82.66	1.79	SILTY SAND to SANDY SILT	28	44	71		44.5
1.950	6.40	103.82	1.84	SILTY SAND to SANDY SILT	35	55	77		45.0
2.100	6.89	75.04	2.05	SILTY SAND to SANDY SILT	25	40	68		43.5
2.250	7.38	58.78	2.01	SILTY SAND to SANDY SILT	20	30	61		42.0
2.400	7.87	136.88	.77	SAND	27	41	85		45.5
2.550	8.37	245.06	1.18	SAND	49	71	100		47.5
2.700	8.86	389.03	1.12	SAND	78	100	100		49.0
2.850	9.35	276.14	1.30	SAND	55	75	100		47.5
3.000	9.84	126.51	1.79	SILTY SAND to SANDY SILT	42	56	82		44.0
3.150	10.33	199.91	.99	SAND	40	52	94		46.0
3.300	10.83	227.68	3.32	*SAND to CLAYEY SAND	100	100			
3.450	11.32	129.23	1.24	SAND to SILTY SAND	32	40	80		43.5
3.600	11.81	175.18	1.50	SAND to SILTY SAND	44	53	89		44.5
3.750	12.30	149.63	1.98	SILTY SAND to SANDY SILT	50	59	83		44.0
3.900	12.80	124.66	1.67	SILTY SAND to SANDY SILT	42	48	78		43.0
4.050	13.29	66.88	2.39	SANDY SILT to CLAYEY SILT	27	31		4.4	
4.200	13.78	251.22	.97	SAND	50	56	97		45.5
4.350	14.27	217.06	.96	SAND	43	48	92		45.0
4.500	14.76	195.32	.53	SAND	39	42	89		44.5
4.650	15.26	173.53	.66	SAND	35	37	85		43.5
4.800	15.75	156.57	.71	SAND	31	33	82		43.0
4.950	16.24	147.42	.80	SAND	29	31	80		43.0
5.100	16.73	124.77	.87	SAND to SILTY SAND	31	33	75		42.0
5.250	17.22	119.76	.90	SAND to SILTY SAND	30	31	73		42.0
5.400	17.72	104.46	.82	SAND to SILTY SAND	26	27	69		40.5
5.550	18.21	68.88	1.06	SILTY SAND to SANDY SILT	23	24	57		38.5
5.700	18.70	72.42	.58	SAND to SILTY SAND	18	18	58		38.5
5.850	19.19	35.76	2.01	SANDY SILT to CLAYEY SILT	14	15		2.3	
6.000	19.69	60.87	.61	SAND to SILTY SAND	15	15	53		38.0
6.150	20.18	76.95	.75	SAND to SILTY SAND	19	19	59		39.0

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-02

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	90.78	.80	SAND to SILTY SAND	23	23	64		39.5
6.450	21.16	98.30	.85	SAND to SILTY SAND	25	24	66		39.5
6.600	21.65	57.93	1.29	SILTY SAND to SANDY SILT	19	19	51		38.0
6.750	22.15	74.99	.68	SAND to SILTY SAND	19	18	58		38.5
6.900	22.64	69.51	.92	SAND to SILTY SAND	17	17	56		38.5
7.050	23.13	68.77	.97	SAND to SILTY SAND	17	17	55		38.0
7.200	23.62	52.07	.90	SILTY SAND to SANDY SILT	17	17	47		37.0
7.350	24.11	53.58	.88	SILTY SAND to SANDY SILT	18	17	48		37.0
7.500	24.61	54.22	.87	SILTY SAND to SANDY SILT	18	17	48		37.0
7.650	25.10	59.04	.85	SAND to SILTY SAND	15	14	50		37.5
7.800	25.59	48.18	.93	SILTY SAND to SANDY SILT	16	15	44		36.5
7.950	26.08	50.65	.95	SILTY SAND to SANDY SILT	17	16	45		36.5
8.100	26.57	48.84	.84	SILTY SAND to SANDY SILT	16	15	44		36.5
8.250	27.07	51.86	.93	SILTY SAND to SANDY SILT	17	16	46		36.5
8.400	27.56	45.72	1.05	SILTY SAND to SANDY SILT	15	14	42		36.0
8.550	28.05	50.50	.97	SILTY SAND to SANDY SILT	17	15	45		36.5
8.700	28.54	55.41	.90	SILTY SAND to SANDY SILT	18	17	47		37.0
8.850	29.04	55.02	.95	SILTY SAND to SANDY SILT	18	17	47		37.0
9.000	29.53	59.40	.93	SILTY SAND to SANDY SILT	20	18	49		37.0
9.150	30.02	68.81	.93	SAND to SILTY SAND	17	15	53		38.0
9.300	30.51	89.04	.75	SAND to SILTY SAND	22	20	60		38.5
9.450	31.00	62.50	.82	SAND to SILTY SAND	16	14	50		37.0
9.600	31.50	43.81	1.55	SILTY SAND to SANDY SILT	15	13	40		35.5
9.750	31.99	9.58	2.19	CLAYEY SILT to SILTY CLAY	5	4		.6	
9.900	32.48	7.80	1.41	CLAYEY SILT to SILTY CLAY	4	3		.5	
10.050	32.97	54.64	1.17	SILTY SAND to SANDY SILT	18	16	45		36.5
10.200	33.46	89.40	.88	SAND to SILTY SAND	22	19	59		38.5
10.350	33.96	57.17	1.07	SILTY SAND to SANDY SILT	19	16	47		36.5
10.500	34.45	23.20	1.12	SANDY SILT to CLAYEY SILT	9	8		1.7	
10.650	34.94	18.14	.94	SANDY SILT to CLAYEY SILT	7	6		1.3	
10.800	35.43	13.28	1.43	CLAYEY SILT to SILTY CLAY	7	6		.9	
10.950	35.93	10.56	.85	CLAYEY SILT to SILTY CLAY	5	4		.8	
11.100	36.42	16.17	.87	SANDY SILT to CLAYEY SILT	6	5		1.4	
11.250	36.91	10.39	1.06	CLAYEY SILT to SILTY CLAY	5	4		.8	
11.400	37.40	7.92	1.01	SENSITIVE FINE GRAINED	4	3		.6	
11.550	37.89	9.14	.66	SENSITIVE FINE GRAINED	5	4		.7	
11.700	38.39	15.83	.19	SANDY SILT to CLAYEY SILT	6	5		1.4	
11.850	38.88	23.07	.56	SILTY SAND to SANDY SILT	8	6	19		30.0
12.000	39.37	13.66	.88	SANDY SILT to CLAYEY SILT	5	4		1.1	
12.150	39.86	50.44	.75	SILTY SAND to SANDY SILT	17	14	41		35.5
12.300	40.35	142.91	.71	SAND	29	23	71		39.5
12.450	40.85	166.11	.69	SAND	33	27	75		40.5
12.600	41.34	164.48	.87	SAND	33	26	75		40.5
12.750	41.83	167.64	.87	SAND	34	27	75		40.5
12.900	42.32	177.37	.81	SAND	35	28	77		41.0
13.050	42.81	162.40	.84	SAND	32	26	74		40.0
13.200	43.31	130.85	.80	SAND to SILTY SAND	33	26	68		39.0
13.350	43.80	93.69	.67	SAND to SILTY SAND	23	18	58		38.0
13.500	44.29	56.36	.62	SAND to SILTY SAND	14	11	44		36.0
13.650	44.78	50.07	.84	SILTY SAND to SANDY SILT	17	13	40		34.5

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-02

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	81.01	.31	SAND to SILTY SAND	20	16	54		37.0
13.950	45.77	70.04	.73	SAND to SILTY SAND	18	14	49		36.5
14.100	46.26	75.72	.41	SAND to SILTY SAND	19	15	52		37.0
14.250	46.75	82.22	.61	SAND to SILTY SAND	21	16	54		37.0
14.400	47.24	80.33	.22	SAND to SILTY SAND	20	15	53		37.0
14.550	47.74	18.08	1.94	CLAYEY SILT to SILTY CLAY	9	7		1.2	
14.700	48.23	38.62	.60	SILTY SAND to SANDY SILT	13	10	32		32.0
14.850	48.72	40.73	.37	SILTY SAND to SANDY SILT	14	10	33		32.0
15.000	49.21	91.40	.90	SAND to SILTY SAND	23	17	56		37.5
15.150	49.70	111.37	.54	SAND	22	17	62		38.0
15.300	50.20	136.35	1.51	SAND to SILTY SAND	34	25	68		39.0
15.450	50.69	122.33	.76	SAND to SILTY SAND	31	23	64		38.5
15.600	51.18	43.87	1.50	SILTY SAND to SANDY SILT	15	11	35		32.5
15.750	51.67	33.27	3.22	CLAYEY SILT to SILTY CLAY	17	12		2.0	
15.900	52.17	53.83	2.25	SANDY SILT to CLAYEY SILT	22	16		3.4	
16.050	52.66	118.97	3.00	SANDY SILT to CLAYEY SILT	48	35		6.8	
16.200	53.15	167.05	2.76	SILTY SAND to SANDY SILT	56	41	73		39.5
16.350	53.64	65.80	2.39	SANDY SILT to CLAYEY SILT	26	19		4.2	
16.500	54.13	81.67	3.75	CLAYEY SILT to SILTY CLAY	41	30		4.6	
16.650	54.63	157.36	3.54	SANDY SILT to CLAYEY SILT	63	46		9.1	
16.800	55.12	210.26	2.10	SILTY SAND to SANDY SILT	70	51	79		40.5
16.950	55.61	64.20	3.15	SANDY SILT to CLAYEY SILT	26	18		3.6	
17.100	56.10	67.47	4.82	*VERY STIFF FINE GRAINED	67	48			
17.250	56.59	116.23	2.68	SILTY SAND to SANDY SILT	39	28	62		38.0
17.400	57.09	97.79	4.16	CLAYEY SILT to SILTY CLAY	49	35		5.6	
17.550	57.58	95.24	4.48	*VERY STIFF FINE GRAINED	95	68			
17.700	58.07	99.53	4.27	CLAYEY SILT to SILTY CLAY	50	35		5.7	
17.850	58.56	111.58	4.07	CLAYEY SILT to SILTY CLAY	56	39		6.4	
18.000	59.06	150.71	3.30	SANDY SILT to CLAYEY SILT	60	42		8.7	
18.150	59.55	181.64	3.15	SANDY SILT to CLAYEY SILT	73	51		10.5	
18.300	60.04	150.12	4.67	*VERY STIFF FINE GRAINED	100	100			
18.450	60.53	199.13	1.97	SAND to SILTY SAND	50	35	76		39.5
18.600	61.02	360.01	1.12	SAND	72	50	93		43.0
18.750	61.52	455.81	1.23	SAND	91	63	100		44.0
18.900	62.01	504.88	1.17	SAND	100	70	100		44.5
19.050	62.50	422.84	1.12	SAND	85	58	98		44.0
19.200	62.99	400.49	.94	SAND	80	55	96		43.5
19.350	63.48	454.13	.66	GRAVELLY SAND to SAND	76	52	99		44.0
19.500	63.98	264.94	3.17	*SAND to CLAYEY SAND	100	90			
19.650	64.47	150.99	4.13	*VERY STIFF FINE GRAINED	100	100			
19.800	64.96	87.51	3.71	CLAYEY SILT to SILTY CLAY	44	30		4.9	
19.950	65.45	206.56	1.20	SAND to SILTY SAND	52	35	77		39.5
20.100	65.94	268.83	1.04	SAND	54	36	84		41.5
20.250	66.44	262.71	1.18	SAND	53	35	83		41.0
20.400	66.93	265.67	1.15	SAND	53	36	83		41.5
20.550	67.42	279.37	1.72	SAND to SILTY SAND	70	47	85		41.5
20.700	67.91	91.65	4.41	*VERY STIFF FINE GRAINED	92	61			
20.850	68.41	64.86	4.52	CLAY to SILTY CLAY	43	29		3.6	
21.000	68.90	78.18	3.66	CLAYEY SILT to SILTY CLAY	39	26		4.4	
21.150	69.39	161.46	4.65	*VERY STIFF FINE GRAINED	100	100			

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-02

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
21.300	69.88	272.46	2.18	SILTY SAND to SANDY SILT	91	60	84		41.0
21.450	70.37	355.11	1.39	SAND	71	47	91		42.5
21.600	70.87	429.78	1.26	SAND	86	56	97		43.5
21.750	71.36	440.74	.98	SAND	88	58	97		43.5
21.900	71.85	419.82	.31	GRAVELLY SAND to SAND	70	46	96		43.0
22.050	72.34	243.40	1.77	SAND to SILTY SAND	61	40	80		40.0
22.200	72.83	234.42	1.19	SAND	47	30	79		40.0
22.350	73.33	259.63	1.45	SAND to SILTY SAND	65	42	82		40.5
22.500	73.82	192.33	2.49	SILTY SAND to SANDY SILT	64	41	73		39.0
22.650	74.31	258.68	1.81	SAND to SILTY SAND	65	42	82		40.5
22.800	74.80	281.92	1.49	SAND to SILTY SAND	70	45	84		41.0
22.950	75.30	351.92	*****		0	0			.0

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

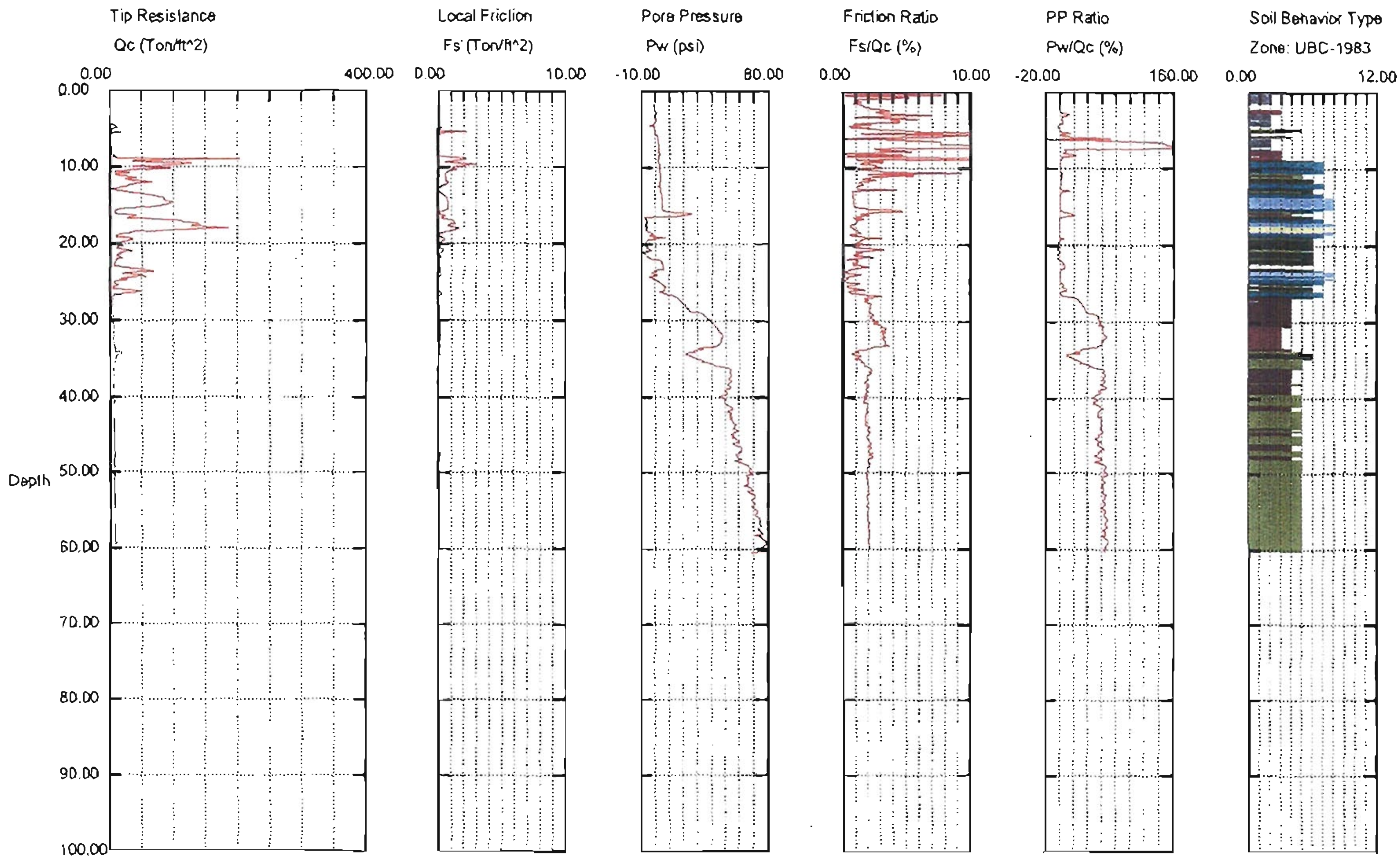
HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

Hushmand Associates

Operator: ALAMEDA NAS #2
Sounding: SDF138
Cone Used: 472/GO-VO/R#4

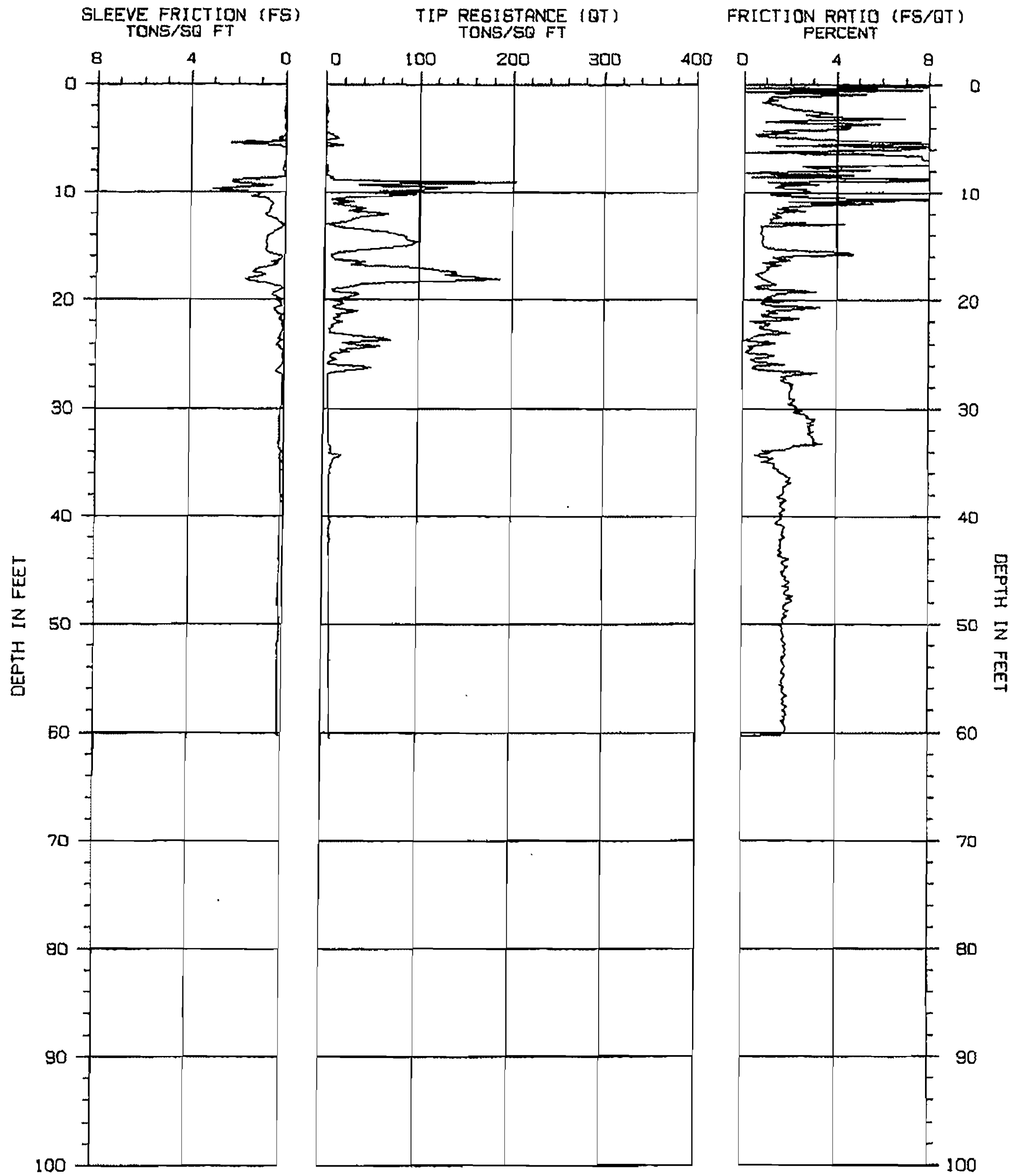
CPT Date/Time: 02-22-02 09:56
Location: CPT-11E
Job Number: 010810



Maximum Depth = 60.53 feet

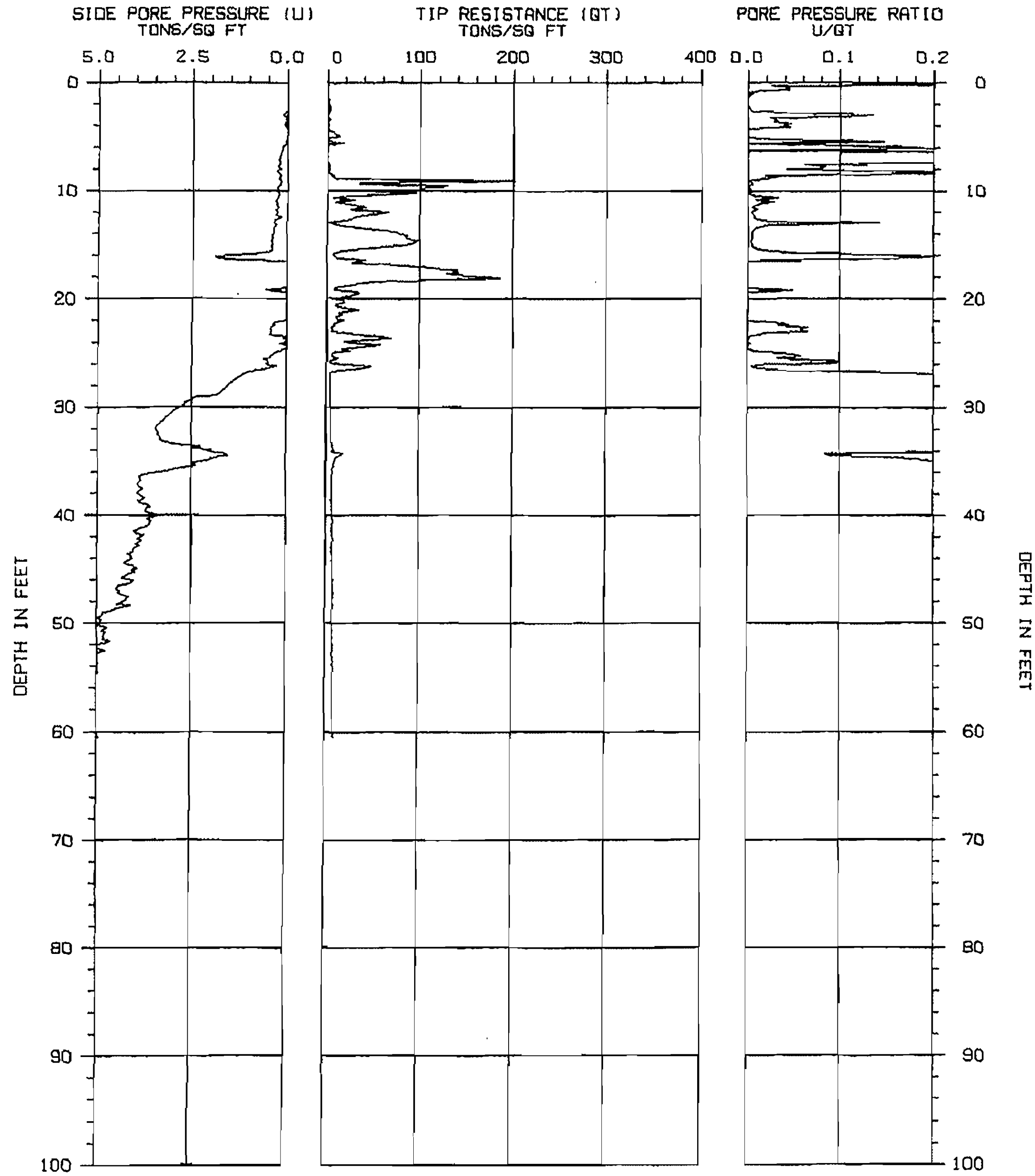
Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

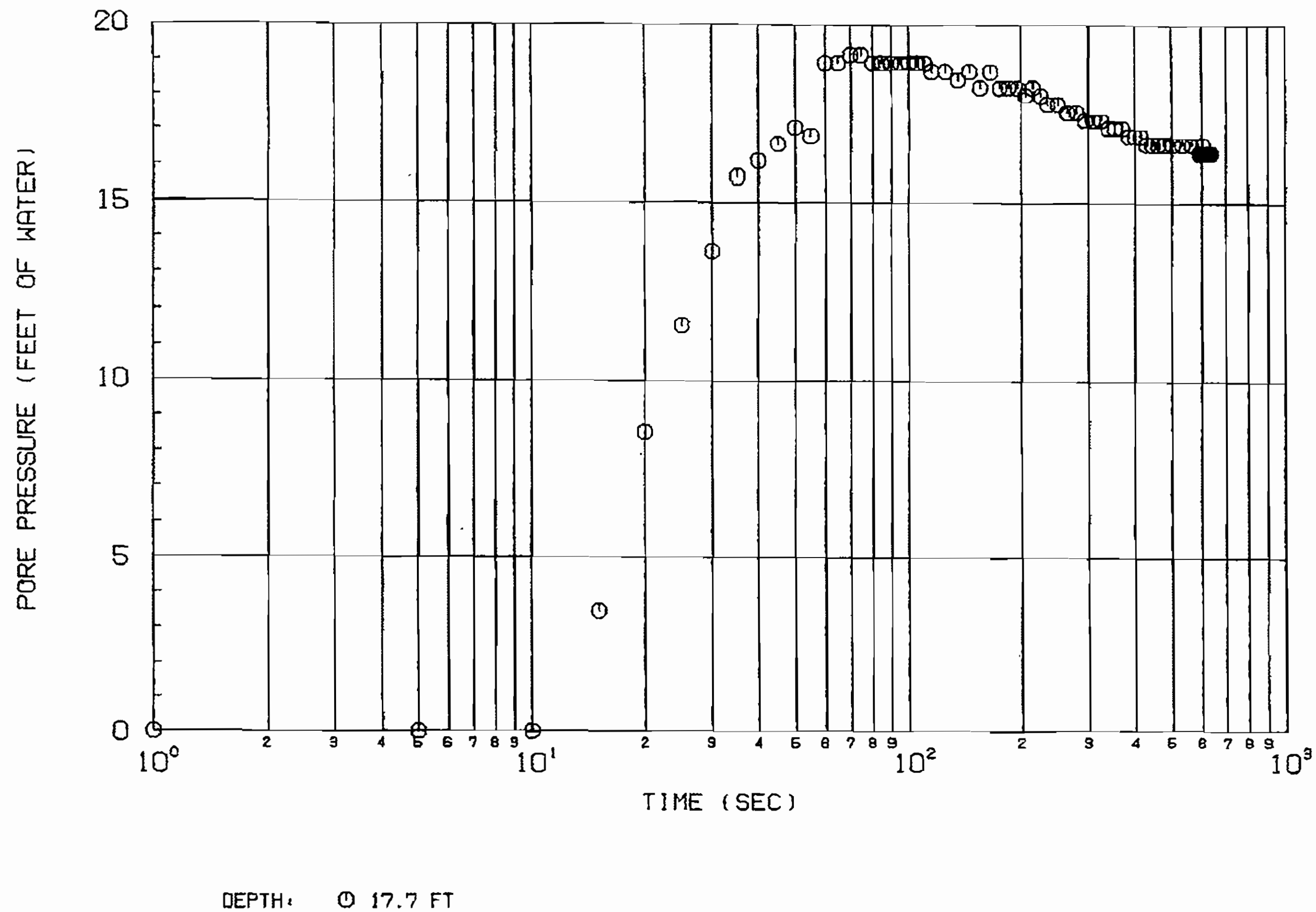
CONE PENETRATION TEST		SOUNDING NUMBER: CPT-11E
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 472/GO-VO/R#4	HFA
PROJECT NUMBER : 010810	DATE/TIME: 02-22-02 09:56	



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST		SOUNDING NUMBER: CPT-11E
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 472/CO-VO/R#4	HFA
PROJECT NUMBER : 010810	DATE/TIME: 02-22-02 09:56	

PORE PRESSURE DISSIPATION CURVES



SIDE-SENSING PIEZOMETRIC CPT	SOUNDING NUMBER: CPT-11E
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 472/DO-VO/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-22-02 09:56

****
*
CPT INTERPRETATIONS

SOUNDING : CPT-11E　　PROJECT No.: 010810
PROJECT : ALAMEDA NAS #2　　CONE/RIG : 472/GO-VO/R#4
DATE/TIME: 02-22-02 09:56

****

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	.13	7.69	ORGANIC MATERIAL	0	0		.0	
.300	.98	.25	4.00	ORGANIC MATERIAL	0	0		.0	
.450	1.48	1.38	1.45	SENSITIVE FINE GRAINED	1	1		.1	
.600	1.97	1.76	1.70	SENSITIVE FINE GRAINED	1	1		.2	
.750	2.46	2.17	3.23	CLAY	2	3		.2	
.900	2.95	.91	3.30	ORGANIC MATERIAL	1	1		.1	
1.050	3.44	2.12	.94	SENSITIVE FINE GRAINED	1	2		.2	
1.200	3.94	1.32	4.55	ORGANIC MATERIAL	1	2		.1	
1.350	4.43	.89	2.25	ORGANIC MATERIAL	1	1		.1	
1.500	4.92	13.28	2.26	CLAYEY SILT to SILTY CLAY	7	11		1.0	
1.650	5.41	.30	*****	ORGANIC MATERIAL	0	0		.0	
1.800	5.91	.81	7.41	ORGANIC MATERIAL	1	1		.0	
1.950	6.40	.21	4.76	ORGANIC MATERIAL	0	0		.0	
2.100	6.89	.13	7.69	ORGANIC MATERIAL	0	0		.0	
2.250	7.38	.17	23.53	ORGANIC MATERIAL	0	0		.0	
2.400	7.87	2.40	5.42	CLAY	2	4		.1	
2.550	8.37	1.06	4.72	ORGANIC MATERIAL	1	2		.1	
2.700	8.86	11.62	18.93	CLAY	12	16		.7	
2.850	9.35	35.73	1.60	SANDY SILT to CLAYEY SILT	14	19		2.8	
3.000	9.84	76.27	2.53	SANDY SILT to CLAYEY SILT	31	41		5.0	
3.150	10.33	60.46	2.33	SANDY SILT to CLAYEY SILT	24	31		4.0	
3.300	10.83	30.17	1.99	SANDY SILT to CLAYEY SILT	12	15		2.4	
3.450	11.32	29.08	2.10	SANDY SILT to CLAYEY SILT	12	14		1.9	
3.600	11.81	36.31	1.79	SANDY SILT to CLAYEY SILT	15	18		2.9	
3.750	12.30	38.75	1.60	SANDY SILT to CLAYEY SILT	16	18		3.0	
3.900	12.80	14.11	1.13	SANDY SILT to CLAYEY SILT	6	7		1.1	
4.050	13.29	23.33	.81	SILTY SAND to SANDY SILT	8	9	29		34.5
4.200	13.78	72.10	.76	SAND to SILTY SAND	18	20	61		39.5
4.350	14.27	85.89	.86	SAND to SILTY SAND	21	24	65		40.0
4.500	14.76	95.79	.86	SAND to SILTY SAND	24	26	68		41.0
4.650	15.26	65.92	1.18	SILTY SAND to SANDY SILT	22	24	57		38.5
4.800	15.75	9.33	4.72	CLAY	9	10		.6	
4.950	16.24	11.90	2.02	CLAYEY SILT to SILTY CLAY	6	6		.9	
5.100	16.73	27.81	1.62	SANDY SILT to CLAYEY SILT	11	12		2.1	
5.250	17.22	115.83	1.04	SAND to SILTY SAND	29	30	72		41.5
5.400	17.72	128.51	.61	SAND	26	27	75		42.0
5.550	18.21	124.37	1.14	SAND to SILTY SAND	31	32	74		42.0
5.700	18.70	30.44	.56	SILTY SAND to SANDY SILT	10	10	33		35.0
5.850	19.19	10.90	3.12	CLAY to SILTY CLAY	7	7		.7	
6.000	19.69	28.87	1.18	SILTY SAND to SANDY SILT	10	10	32		34.0
6.150	20.18	18.80	.85	SANDY SILT to CLAYEY SILT	8	8		1.4	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-11E

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	10.90	3.30	CLAY to SILTY CLAY	7	7		.6	
6.450	21.16	21.95	1.46	SANDY SILT to CLAYEY SILT	9	9		1.7	
6.600	21.65	9.90	2.42	CLAY to SILTY CLAY	7	6		.7	
6.750	22.15	11.13	1.17	CLAYEY SILT to SILTY CLAY	6	5		.8	
6.900	22.64	6.44	.78	SENSITIVE FINE GRAINED	3	3		.5	
7.050	23.13	16.87	1.13	SANDY SILT to CLAYEY SILT	7	7		1.2	
7.200	23.62	69.94	.10	SAND to SILTY SAND	17	17	55		38.0
7.350	24.11	39.26	.74	SILTY SAND to SANDY SILT	13	12	39		36.0
7.500	24.61	18.10	.22	SILTY SAND to SANDY SILT	6	6	16		30.5
7.650	25.10	6.80	1.32	SENSITIVE FINE GRAINED	3	3		.5	
7.800	25.59	10.09	.40	SENSITIVE FINE GRAINED	5	5		.9	
7.950	26.08	23.41	.60	SILTY SAND to SANDY SILT	8	7	23		31.5
8.100	26.57	17.14	1.98	CLAYEY SILT to SILTY CLAY	9	8		1.2	
8.250	27.07	4.83	1.66	SENSITIVE FINE GRAINED	2	2		.3	
8.400	27.56	4.76	1.89	CLAY to SILTY CLAY	3	3		.3	
8.550	28.05	4.81	2.08	CLAY	5	4		.3	
8.700	28.54	4.98	2.01	CLAY to SILTY CLAY	3	3		.3	
8.850	29.04	5.00	2.00	CLAY to SILTY CLAY	3	3		.3	
9.000	29.53	5.11	1.96	CLAY to SILTY CLAY	3	3		.3	
9.150	30.02	5.57	2.15	CLAY to SILTY CLAY	4	3		.3	
9.300	30.51	5.41	2.59	CLAY	5	5		.3	
9.450	31.00	5.80	3.10	CLAY	6	5		.3	
9.600	31.50	5.92	3.04	CLAY	6	5		.3	
9.750	31.99	5.94	2.86	CLAY	6	5		.3	
9.900	32.48	6.16	2.92	CLAY	6	5		.3	
10.050	32.97	6.25	3.04	CLAY	6	5		.3	
10.200	33.46	7.81	2.18	CLAY to SILTY CLAY	5	4		.5	
10.350	33.96	9.80	.92	CLAYEY SILT to SILTY CLAY	5	4		.8	
10.500	34.45	17.26	.87	SANDY SILT to CLAYEY SILT	7	6		1.2	
10.650	34.94	10.45	.86	CLAYEY SILT to SILTY CLAY	5	4		.8	
10.800	35.43	8.87	1.35	CLAYEY SILT to SILTY CLAY	4	4		.5	
10.950	35.93	8.16	1.59	CLAYEY SILT to SILTY CLAY	4	3		.5	
11.100	36.42	6.85	2.04	CLAY to SILTY CLAY	5	4		.4	
11.250	36.91	6.87	2.04	CLAY to SILTY CLAY	5	4		.4	
11.400	37.40	6.91	1.74	CLAY to SILTY CLAY	5	4		.4	
11.550	37.89	6.89	1.74	CLAY to SILTY CLAY	5	4		.4	
11.700	38.39	6.63	1.81	CLAY to SILTY CLAY	4	4		.4	
11.850	38.88	7.06	1.70	CLAY to SILTY CLAY	5	4		.4	
12.000	39.37	7.13	1.82	CLAY to SILTY CLAY	5	4		.4	
12.150	39.86	7.46	1.74	CLAY to SILTY CLAY	5	4		.4	
12.300	40.35	7.76	1.55	CLAYEY SILT to SILTY CLAY	4	3		.4	
12.450	40.85	7.54	1.72	CLAYEY SILT to SILTY CLAY	4	3		.4	
12.600	41.34	6.94	1.73	CLAY to SILTY CLAY	5	4		.4	
12.750	41.83	7.53	1.73	CLAY to SILTY CLAY	5	4		.4	
12.900	42.32	7.91	1.64	CLAYEY SILT to SILTY CLAY	4	3		.4	
13.050	42.81	7.33	1.64	CLAYEY SILT to SILTY CLAY	4	3		.4	
13.200	43.31	7.62	1.71	CLAYEY SILT to SILTY CLAY	4	3		.4	
13.350	43.80	7.82	1.79	CLAYEY SILT to SILTY CLAY	4	3		.4	
13.500	44.29	7.56	1.72	CLAYEY SILT to SILTY CLAY	4	3		.4	
13.650	44.78	8.04	1.87	CLAYEY SILT to SILTY CLAY	4	3		.4	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-11E

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	8.69	1.73	CLAYEY SILT to SILTY CLAY	4	3		.5	
13.950	45.77	8.18	1.83	CLAYEY SILT to SILTY CLAY	4	3		.4	
14.100	46.26	8.10	1.97	CLAY to SILTY CLAY	5	4		.4	
14.250	46.75	7.90	2.03	CLAY to SILTY CLAY	5	4		.4	
14.400	47.24	8.81	1.82	CLAYEY SILT to SILTY CLAY	4	3		.5	
14.550	47.74	8.55	2.11	CLAY to SILTY CLAY	6	4		.5	
14.700	48.23	8.84	1.81	CLAYEY SILT to SILTY CLAY	4	3		.5	
14.850	48.72	8.12	1.97	CLAY to SILTY CLAY	5	4		.4	
15.000	49.21	8.37	1.91	CLAYEY SILT to SILTY CLAY	4	3		.4	
15.150	49.70	8.60	1.74	CLAYEY SILT to SILTY CLAY	4	3		.5	
15.300	50.20	8.26	1.70	CLAYEY SILT to SILTY CLAY	4	3		.4	
15.450	50.69	8.70	1.72	CLAYEY SILT to SILTY CLAY	4	3		.5	
15.600	51.18	8.31	1.80	CLAYEY SILT to SILTY CLAY	4	3		.4	
15.750	51.67	8.65	1.85	CLAYEY SILT to SILTY CLAY	4	3		.5	
15.900	52.17	8.82	1.81	CLAYEY SILT to SILTY CLAY	4	3		.5	
16.050	52.66	8.65	1.85	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.200	53.15	8.94	1.79	CLAYEY SILT to SILTY CLAY	4	3		.5	
16.350	53.64	9.00	1.78	CLAYEY SILT to SILTY CLAY	5	3		.5	
16.500	54.13	9.06	1.77	CLAYEY SILT to SILTY CLAY	5	3		.5	
16.650	54.63	9.02	1.88	CLAYEY SILT to SILTY CLAY	5	3		.5	
16.800	55.12	9.11	1.76	CLAYEY SILT to SILTY CLAY	5	3		.5	
16.950	55.61	9.00	1.67	CLAYEY SILT to SILTY CLAY	4	3		.5	
17.100	56.10	8.84	1.81	CLAYEY SILT to SILTY CLAY	4	3		.4	
17.250	56.59	9.21	1.95	CLAYEY SILT to SILTY CLAY	5	3		.5	
17.400	57.09	9.19	1.85	CLAYEY SILT to SILTY CLAY	5	3		.5	
17.550	57.58	9.23	1.95	CLAYEY SILT to SILTY CLAY	5	3		.5	
17.700	58.07	9.49	1.90	CLAYEY SILT to SILTY CLAY	5	3		.5	
17.850	58.56	9.55	1.78	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.000	59.06	9.32	1.82	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.150	59.55	9.68	1.86	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.300	60.04	9.81	1.84	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.450	60.53	10.02	*****		0	0			

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

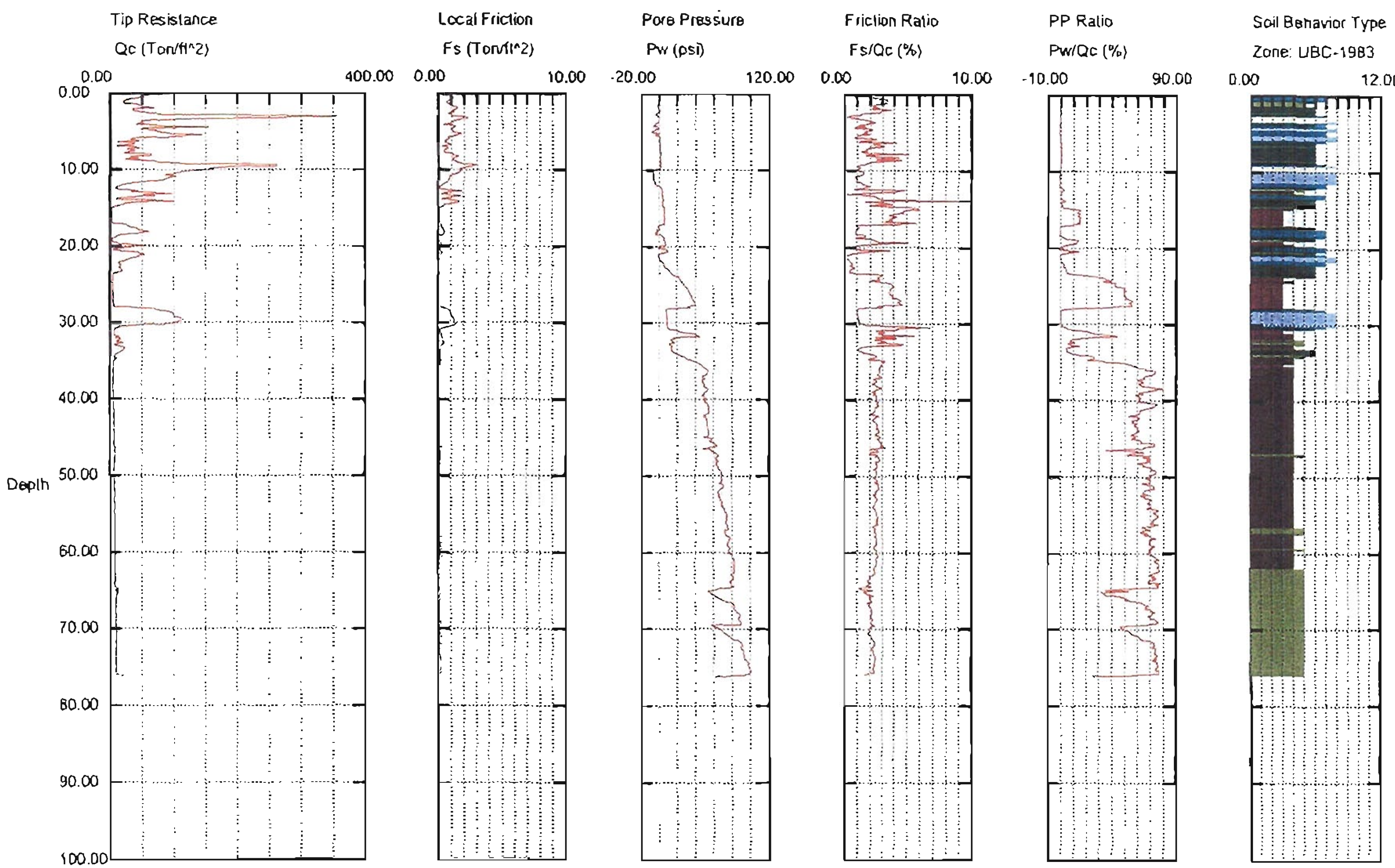
HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

Hushman(\ssociates

Operator: ALAMEDA NAS #2
Sounding: SDF134
Cone Used: 472/GO-VO/R#4

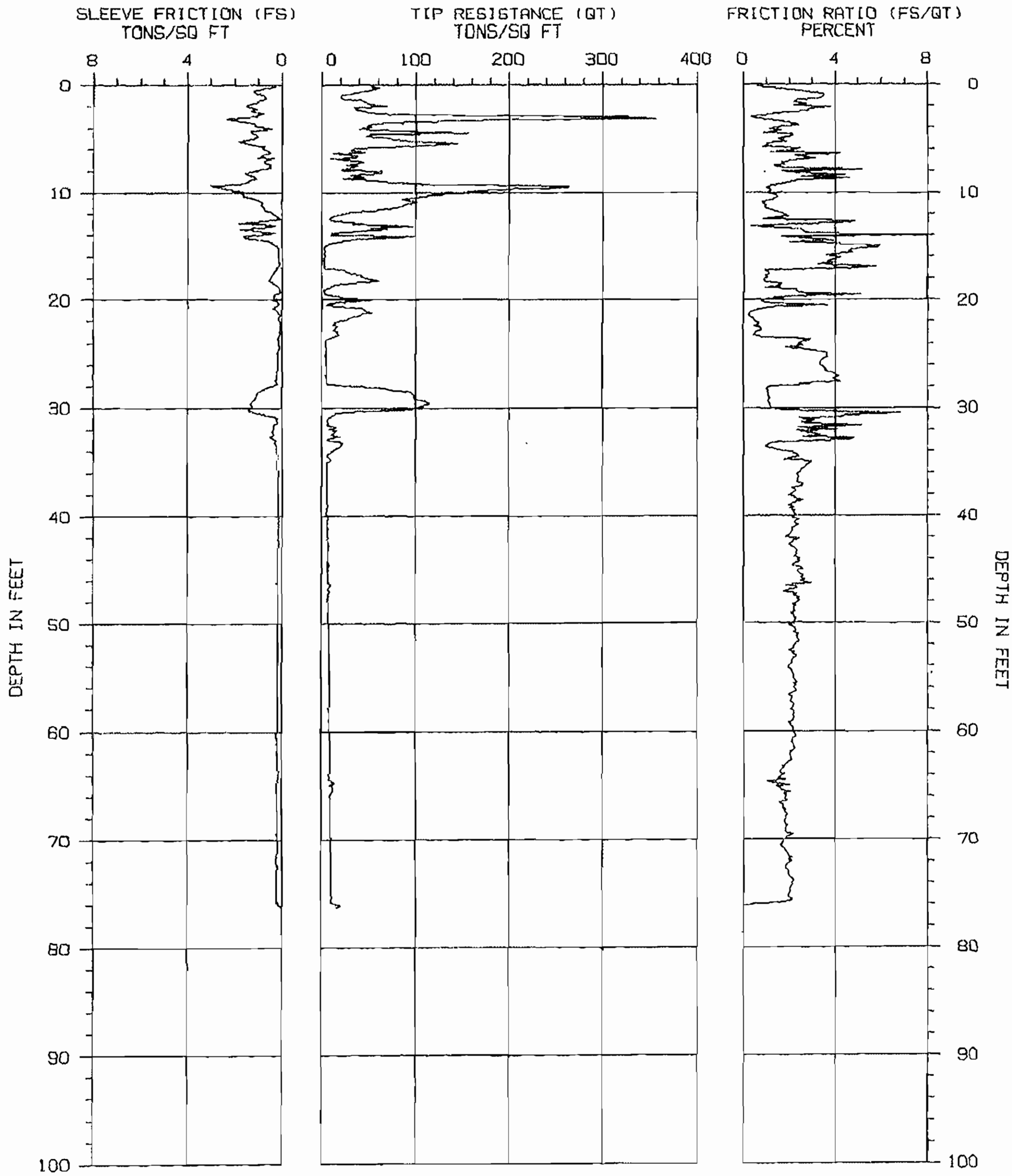
CPT Date/Time: 02-21-02 14:34
Location: CPT-12A
Job Number: 010810



Maximum Depth = 76.28 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-12A

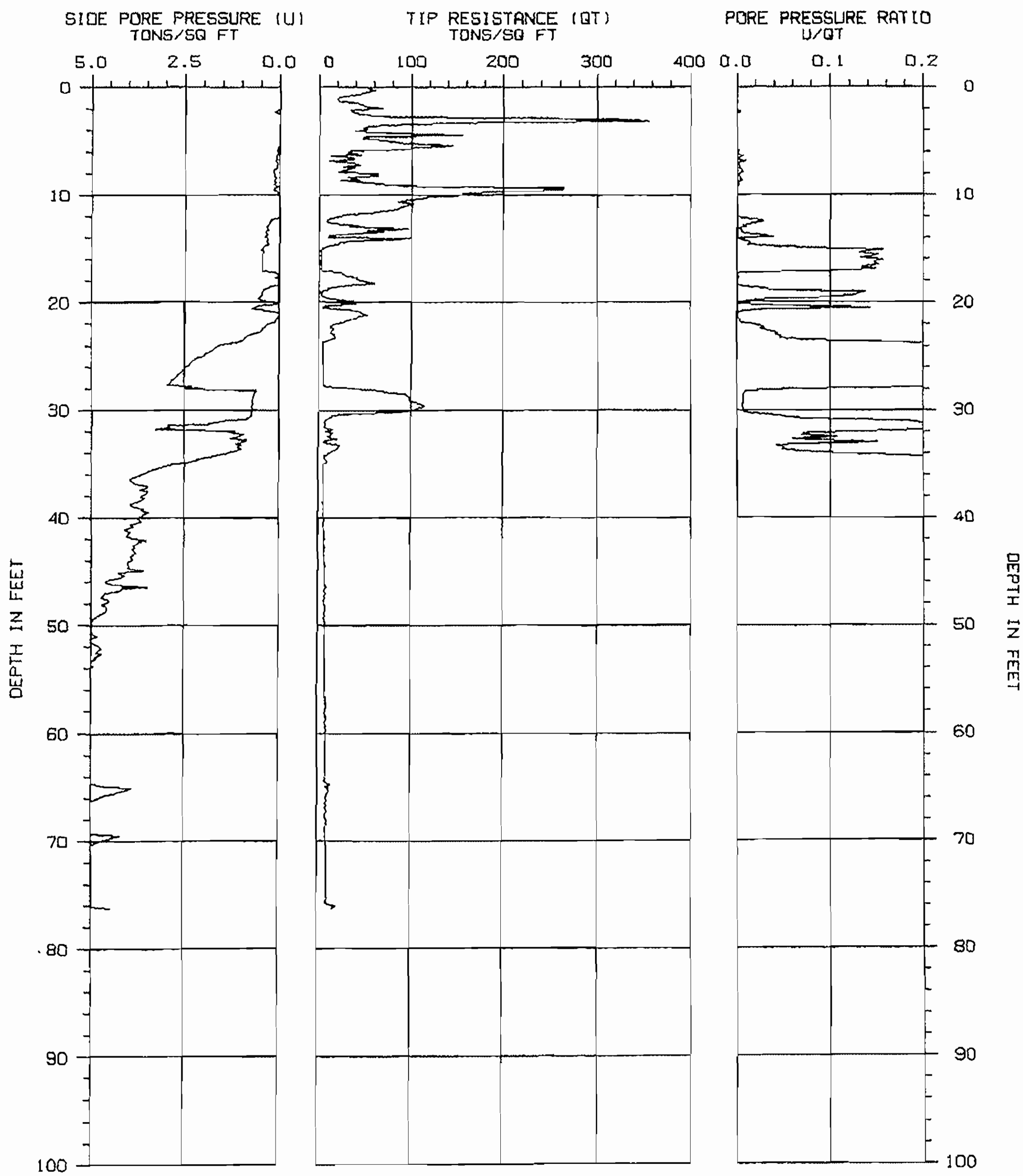
PROJECT NAME : ALAMEDA NAS #2

PROJECT NUMBER : 010810

CONE/RIG : 472/GO-VO/R#4

DATE/TIME: 02-21-02 14:34

HFA



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-12A
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 472/GO-VD/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-21-02 14:34

HFA

CPT INTERPRETATIONS

SOUNDING : CPT-12A
PROJECT : ALAMEDA NAS #2
DATE/TIME: 02-21-02 14:34

PROJECT No.: 010810
CONE/RIG : 472/GO-VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	51.94	2.09	SANDY SILT to CLAYEY SILT	21	33		3.5	
.300	.98	22.67	3.52	CLAYEY SILT to SILTY CLAY	11	18		1.5	
.450	1.48	41.68	2.32	SANDY SILT to CLAYEY SILT	17	27		2.8	
.600	1.97	68.88	2.18	SILTY SAND to SANDY SILT	23	37	66		48.0
.750	2.46	45.19	2.82	SANDY SILT to CLAYEY SILT	18	29		3.0	
.900	2.95	317.59	.34	GRAVELLY SAND to SAND	53	85	100		
1.050	3.44	99.51	1.64	SILTY SAND to SANDY SILT	33	53	76		47.5
1.200	3.94	52.62	1.74	SILTY SAND to SANDY SILT	18	28	58		44.5
1.350	4.43	155.41	.84	SAND	31	50	89		48.0
1.500	4.92	70.81	1.61	SILTY SAND to SANDY SILT	24	38	66		44.5
1.650	5.41	144.25	1.06	SAND to SILTY SAND	36	58	87		47.0
1.800	5.91	35.18	2.45	SANDY SILT to CLAYEY SILT	14	23		2.3	
1.950	6.40	12.53	4.19	CLAY	13	20		.8	
2.100	6.89	10.81	3.12	CLAY to SILTY CLAY	7	11		.7	
2.250	7.38	26.68	1.77	SANDY SILT to CLAYEY SILT	11	16		2.1	
2.400	7.87	21.65	5.16	CLAY	22	32		1.2	
2.550	8.37	31.27	4.39	CLAY to SILTY CLAY	21	30		1.8	
2.700	8.86	55.85	2.43	SANDY SILT to CLAYEY SILT	22	31		3.7	
2.850	9.35	262.84	1.15	SAND	53	72	100		47.0
3.000	9.84	155.79	1.06	SAND to SILTY SAND	39	52	88		45.0
3.150	10.33	110.09	1.49	SAND to SILTY SAND	28	36	77		43.5
3.300	10.83	101.74	.83	SAND to SILTY SAND	25	32	74		43.0
3.450	11.32	84.58	.95	SAND to SILTY SAND	21	26	68		42.0
3.600	11.81	32.89	1.42	SANDY SILT to CLAYEY SILT	13	16		2.6	
3.750	12.30	10.58	1.54	CLAYEY SILT to SILTY CLAY	5	6		.8	
3.900	12.80	43.96	4.16	CLAYEY SILT to SILTY CLAY	22	26		2.5	
4.050	13.29	52.98	1.66	SILTY SAND to SANDY SILT	18	20	53		38.5
4.200	13.78	11.24	2.91	CLAY to SILTY CLAY	7	8		.7	
4.350	14.27	57.93	2.69	SANDY SILT to CLAYEY SILT	23	26		3.8	
4.500	14.76	12.41	3.65	CLAY	12	13		.8	
4.650	15.26	2.97	5.04	CLAY	3	3		.1	
4.800	15.75	3.23	3.98	CLAY	3	3		.2	
4.950	16.24	3.04	3.93	CLAY	3	3		.1	
5.100	16.73	3.38	3.23	CLAY	3	4		.2	
5.250	17.22	25.07	.93	SILTY SAND to SANDY SILT	8	9	28		33.5
5.400	17.72	42.40	.94	SILTY SAND to SANDY SILT	14	15	43		37.0
5.550	18.21	61.40	.91	SILTY SAND to SANDY SILT	20	21	54		38.0
5.700	18.70	10.52	1.57	CLAYEY SILT to SILTY CLAY	5	5		.8	
5.850	19.19	3.38	2.34	CLAY	3	3		.2	
6.000	19.69	14.89	1.97	CLAYEY SILT to SILTY CLAY	7	7		1.1	
6.150	20.18	29.87	.78	SILTY SAND to SANDY SILT	10	10	32		34.5

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-12A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	17.99	1.48	SANDY SILT to CLAYEY SILT	7	7		1.3	
6.450	21.16	53.79	.26	SAND to SILTY SAND	13	13	49		37.5
6.600	21.65	30.83	.42	SILTY SAND to SANDY SILT	10	10	33		34.5
6.750	22.15	14.09	.67	SANDY SILT to CLAYEY SILT	6	5		1.3	
6.900	22.64	14.53	.76	SANDY SILT to CLAYEY SILT	6	6		1.3	
7.050	23.13	17.40	.50	SANDY SILT to CLAYEY SILT	7	7		1.6	
7.200	23.62	6.09	2.90	CLAY	6	6		.4	
7.350	24.11	4.89	2.38	CLAY	5	5		.3	
7.500	24.61	4.55	2.79	CLAY	5	4		.3	
7.650	25.10	4.99	3.61	CLAY	5	5		.2	
7.800	25.59	4.92	3.41	CLAY	5	5		.2	
7.950	26.08	5.44	3.36	CLAY	5	5		.3	
8.100	26.57	5.64	3.57	CLAY	6	5		.3	
8.250	27.07	5.42	4.12	CLAY	5	5		.3	
8.400	27.56	5.76	4.25	CLAY	6	5		.3	
8.550	28.05	39.85	1.11	SILTY SAND to SANDY SILT	13	12	38		35.5
8.700	28.54	94.62	1.05	SAND to SILTY SAND	24	21	63		39.0
8.850	29.04	98.70	1.11	SAND to SILTY SAND	25	22	64		39.0
9.000	29.53	114.49	1.13	SAND to SILTY SAND	29	26	68		39.5
9.150	30.02	101.23	1.26	SAND to SILTY SAND	25	23	64		39.0
9.300	30.51	15.06	6.83	CLAY	15	13		.9	
9.450	31.00	7.41	2.41	CLAY to SILTY CLAY	5	4		.4	
9.600	31.50	7.59	2.86	CLAY	8	7		.5	
9.750	31.99	8.56	4.09	CLAY	9	7		.4	
9.900	32.48	10.21	3.35	CLAY to SILTY CLAY	7	6		.6	
10.050	32.97	6.22	4.52	CLAY	6	5		.3	
10.200	33.46	21.28	1.05	SANDY SILT to CLAYEY SILT	9	7		1.5	
10.350	33.96	13.80	1.48	CLAYEY SILT to SILTY CLAY	7	6		.9	
10.500	34.45	7.62	2.40	CLAY to SILTY CLAY	5	4		.5	
10.650	34.94	7.80	2.96	CLAY	8	7		.5	
10.800	35.43	6.38	2.70	CLAY	6	5		.3	
10.950	35.93	6.14	2.48	CLAY	6	5		.3	
11.100	36.42	6.11	2.41	CLAY to SILTY CLAY	4	3		.3	
11.250	36.91	6.52	2.31	CLAY to SILTY CLAY	4	4		.4	
11.400	37.40	6.81	2.08	CLAY to SILTY CLAY	5	4		.4	
11.550	37.89	6.45	2.13	CLAY to SILTY CLAY	4	4		.3	
11.700	38.39	5.68	2.25	CLAY to SILTY CLAY	4	3		.3	
11.850	38.88	6.61	2.19	CLAY to SILTY CLAY	4	4		.3	
12.000	39.37	6.90	2.03	CLAY to SILTY CLAY	5	4		.4	
12.150	39.86	6.63	2.29	CLAY to SILTY CLAY	4	4		.3	
12.300	40.35	5.96	2.42	CLAY to SILTY CLAY	4	3		.3	
12.450	40.85	6.06	2.39	CLAY to SILTY CLAY	4	3		.3	
12.600	41.34	7.14	2.12	CLAY to SILTY CLAY	5	4		.4	
12.750	41.83	7.57	1.96	CLAY to SILTY CLAY	5	4		.4	
12.900	42.32	6.73	2.18	CLAY to SILTY CLAY	4	4		.3	
13.050	42.81	7.45	2.04	CLAY to SILTY CLAY	5	4		.4	
13.200	43.31	7.23	2.31	CLAY to SILTY CLAY	5	4		.4	
13.350	43.80	7.28	2.24	CLAY to SILTY CLAY	5	4		.4	
13.500	44.29	7.70	2.45	CLAY to SILTY CLAY	5	4		.4	
13.650	44.78	7.56	2.47	CLAY to SILTY CLAY	5	4		.4	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-12A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	7.48	2.42	CLAY to SILTY CLAY	5	4		.4	
13.950	45.77	6.89	2.51	CLAY to SILTY CLAY	5	4		.3	
14.100	46.26	7.72	2.95	CLAY	8	6		.4	
14.250	46.75	7.30	2.32	CLAY to SILTY CLAY	5	4		.4	
14.400	47.24	7.62	2.31	CLAY to SILTY CLAY	5	4		.4	
14.550	47.74	7.57	2.33	CLAY to SILTY CLAY	5	4		.4	
14.700	48.23	8.55	2.14	CLAY to SILTY CLAY	6	4		.5	
14.850	48.72	7.59	2.20	CLAY to SILTY CLAY	5	4		.4	
15.000	49.21	7.47	2.20	CLAY to SILTY CLAY	5	4		.4	
15.150	49.70	7.95	2.25	CLAY to SILTY CLAY	5	4		.4	
15.300	50.20	8.46	1.99	CLAYEY SILT to SILTY CLAY	4	3		.4	
15.450	50.69	8.23	2.29	CLAY to SILTY CLAY	5	4		.4	
15.600	51.18	8.05	2.32	CLAY to SILTY CLAY	5	4		.4	
15.750	51.67	8.17	2.41	CLAY to SILTY CLAY	5	4		.4	
15.900	52.17	8.27	2.12	CLAY to SILTY CLAY	6	4		.4	
16.050	52.66	8.06	2.23	CLAY to SILTY CLAY	5	4		.4	
16.200	53.15	7.92	2.28	CLAY to SILTY CLAY	5	4		.4	
16.350	53.64	8.07	2.11	CLAY to SILTY CLAY	5	4		.4	
16.500	54.13	8.41	1.95	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.650	54.63	8.18	2.14	CLAY to SILTY CLAY	5	4		.4	
16.800	55.12	8.15	2.20	CLAY to SILTY CLAY	5	4		.4	
16.950	55.61	8.55	2.18	CLAY to SILTY CLAY	6	4		.4	
17.100	56.10	8.44	2.22	CLAY to SILTY CLAY	6	4		.4	
17.250	56.59	9.57	1.95	CLAYEY SILT to SILTY CLAY	5	3		.5	
17.400	57.09	9.06	2.05	CLAYEY SILT to SILTY CLAY	5	3		.5	
17.550	57.58	9.08	2.19	CLAY to SILTY CLAY	6	4		.5	
17.700	58.07	8.66	2.15	CLAY to SILTY CLAY	6	4		.4	
17.850	58.56	9.00	2.16	CLAY to SILTY CLAY	6	4		.5	
18.000	59.06	8.42	2.14	CLAY to SILTY CLAY	6	4		.4	
18.150	59.55	9.13	2.06	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.300	60.04	9.31	2.13	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.450	60.53	8.95	2.28	CLAY to SILTY CLAY	6	4		.4	
18.600	61.02	9.25	2.11	CLAYEY SILT to SILTY CLAY	5	3		.5	
18.750	61.52	9.03	2.19	CLAY to SILTY CLAY	6	4		.4	
18.900	62.01	8.94	2.05	CLAYEY SILT to SILTY CLAY	4	3		.4	
19.050	62.50	9.09	2.07	CLAYEY SILT to SILTY CLAY	5	3		.4	
19.200	62.99	8.86	1.94	CLAYEY SILT to SILTY CLAY	4	3		.4	
19.350	63.48	9.34	1.72	CLAYEY SILT to SILTY CLAY	5	3		.5	
19.500	63.98	8.31	1.78	CLAYEY SILT to SILTY CLAY	4	3		.4	
19.650.	64.47	8.98	1.84	CLAYEY SILT to SILTY CLAY	4	3		.4	
19.800	64.96	9.47	2.03	CLAYEY SILT to SILTY CLAY	5	3		.5	
19.950	65.45	12.70	1.64	CLAYEY SILT to SILTY CLAY	6	4		.7	
20.100	65.94	9.88	1.86	CLAYEY SILT to SILTY CLAY	5	3		.5	
20.250	66.44	9.60	1.90	CLAYEY SILT to SILTY CLAY	5	3		.5	
20.400	66.93	9.82	1.72	CLAYEY SILT to SILTY CLAY	5	3		.5	
20.550	67.42	9.56	1.81	CLAYEY SILT to SILTY CLAY	5	3		.5	
20.700	67.91	10.02	1.84	CLAYEY SILT to SILTY CLAY	5	3		.5	
20.850	68.41	10.34	1.80	CLAYEY SILT to SILTY CLAY	5	3		.5	
21.000	68.90	9.76	1.84	CLAYEY SILT to SILTY CLAY	5	3		.5	
21.150	69.39	10.86	1.84	CLAYEY SILT to SILTY CLAY	5	4		.5	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-12A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
21.300	69.88	10.40	1.83	CLAYEY SILT to SILTY CLAY	5	3		.5	
21.450	70.37	10.23	1.72	CLAYEY SILT to SILTY CLAY	5	3		.5	
21.600	70.87	10.10	1.80	CLAYEY SILT to SILTY CLAY	5	3		.5	
21.750	71.36	10.28	1.94	CLAYEY SILT to SILTY CLAY	5	3		.5	
21.900	71.85	10.35	1.99	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.050	72.34	10.25	1.92	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.200	72.83	10.42	1.94	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.350	73.33	10.19	1.96	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.500	73.82	10.50	2.18	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.650	74.31	10.72	2.09	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.800	74.80	10.73	2.03	CLAYEY SILT to SILTY CLAY	5	3		.5	
22.950	75.30	11.14	1.95	CLAYEY SILT to SILTY CLAY	6	4		.5	
23.100	75.79	10.76	1.75	CLAYEY SILT to SILTY CLAY	5	3		.5	
23.250	76.28	17.55	*****		0	0			42.5

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

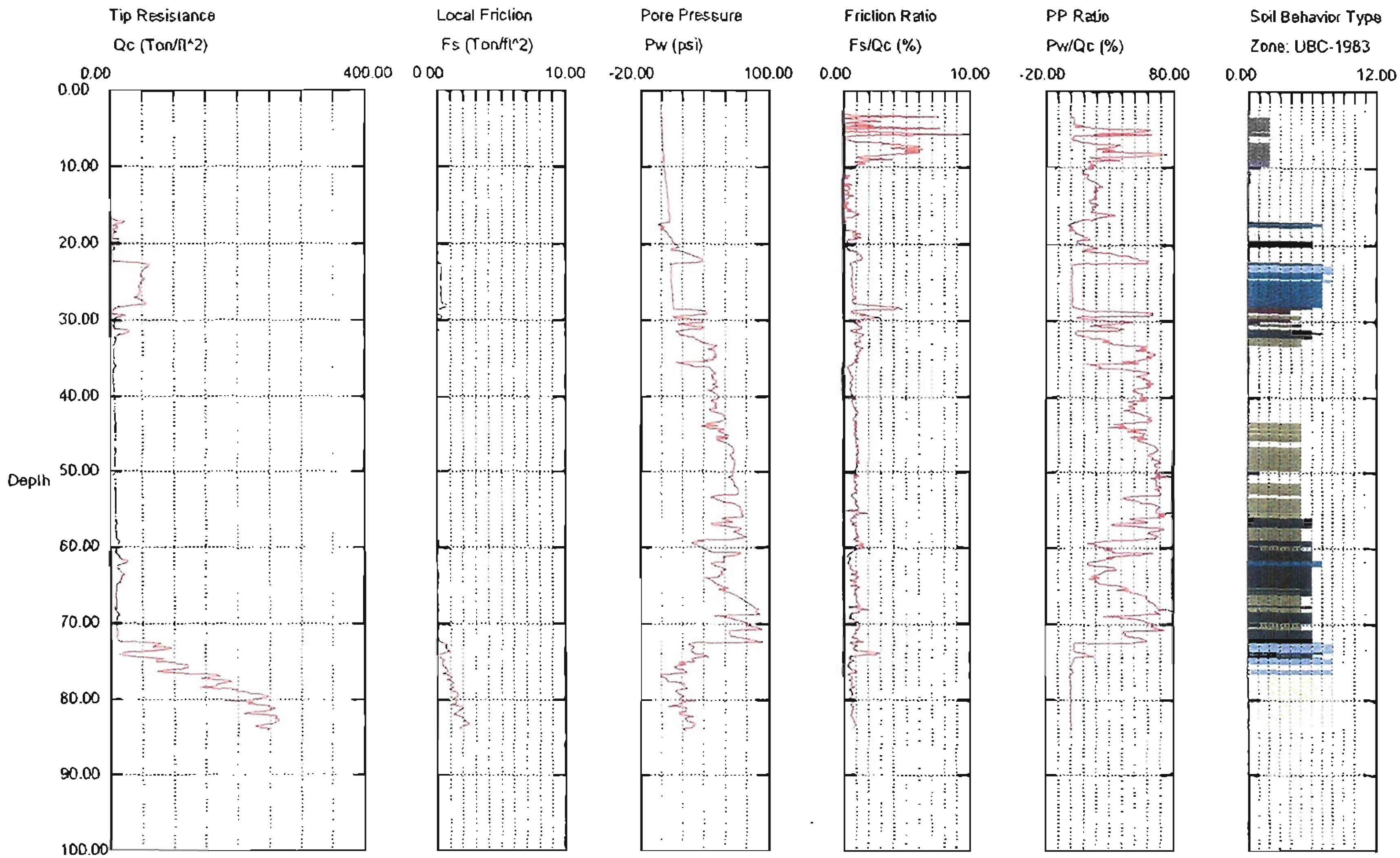
HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

Hushmand Associates

Operator: Alameda NAS#2
Sounding: SDF137
Cone Used: 472/GO-VO/R#4

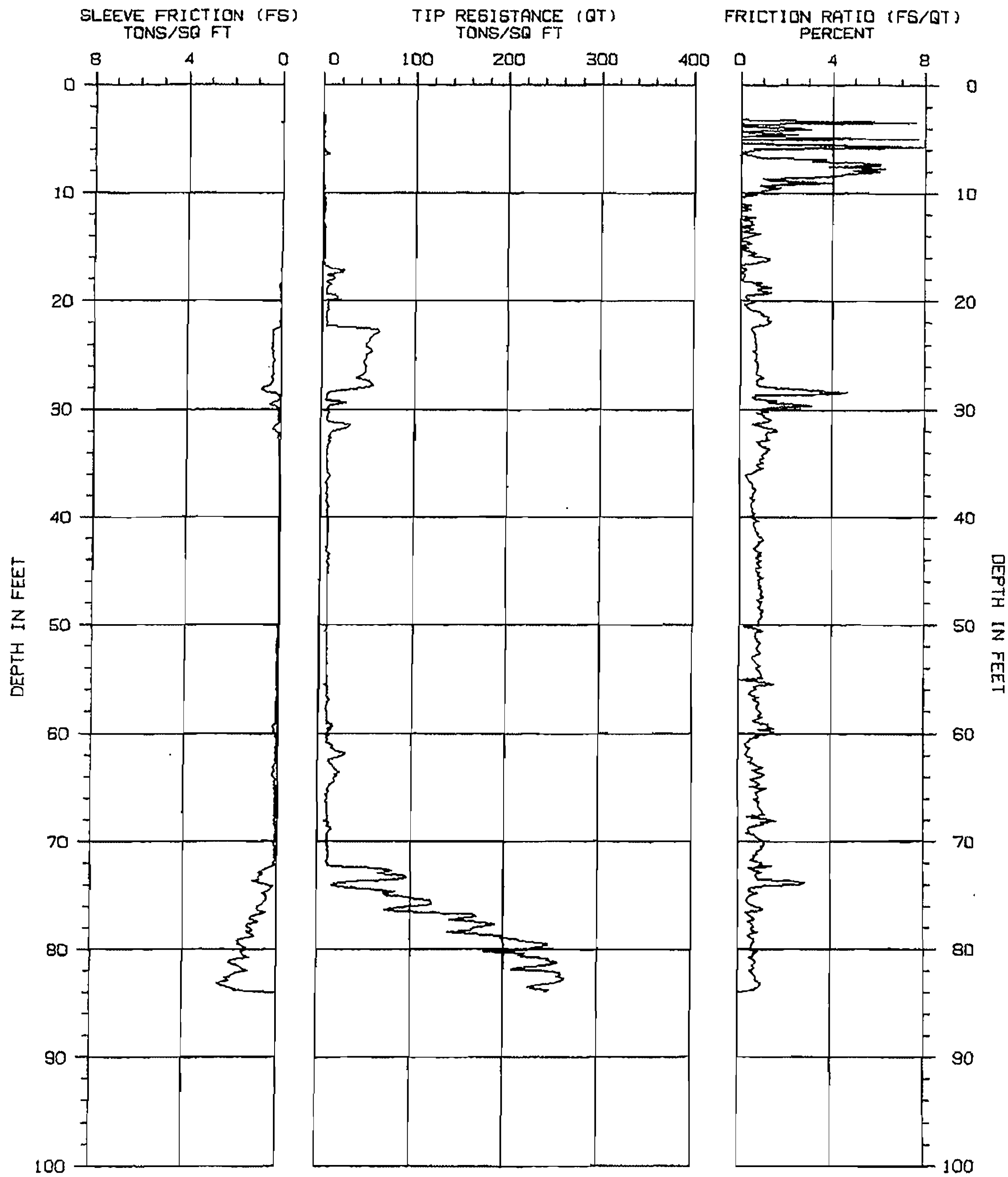
CPT Date/Time: 02-22-02 07:28
Location: CPT-13Seis
Job Number: 010810



Maximum Depth = 84.15 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-13SEIS

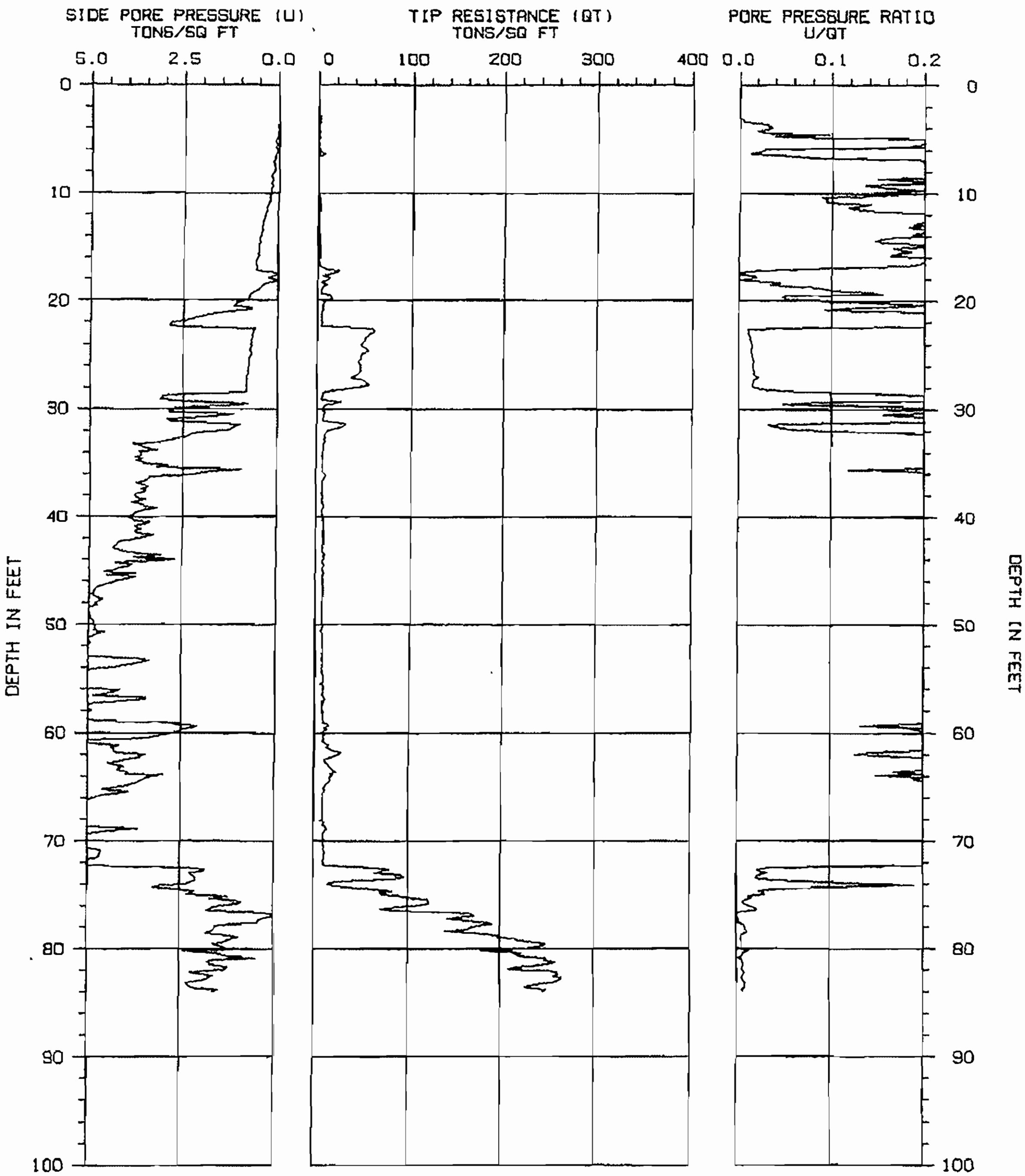
PROJECT NAME : ALAMEDA NAS#2

PROJECT NUMBER : 010810

CONE/RIG : 472/GO-VD/R#4

DATE/TIME: 02-22-02 07:28

HFA



TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-13SEIS
PROJECT NAME : ALAMEDA NAS#2	CONE/RIG : 472/GO-VO/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-22-02 07:28

HFA

CPT INTERPRETATIONS

SOUNDING : CPT-13Seis　　PROJECT No.: 010810
PROJECT : Alameda NAS#2　　CONE/RIG : 472/GO-VO/R#4
DATE/TIME: 02-22-02 07:28

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	.10	.00		0	0			
.300	.98	.10	.00		0	0			
.450	1.48	.10	.00		0	0			
.600	1.97	.13	.00		0	0			
.750	2.46	.11	.00		0	0			
.900	2.95	1.74	.00		0	0			
1.050	3.44	1.32	7.58	ORGANIC MATERIAL	1	2		.1	
1.200	3.94	.65	1.54	ORGANIC MATERIAL	1	1		.0	
1.350	4.43	.84	1.19	ORGANIC MATERIAL	1	1		.1	
1.500	4.92	.13	7.69	ORGANIC MATERIAL	0	0		.0	
1.650	5.41	.14	.00		0	0			
1.800	5.91	2.04	.98	SENSITIVE FINE GRAINED	1	2		.2	
1.950	6.40	6.54	.15	SENSITIVE FINE GRAINED	3	5		.6	
2.100	6.89	.54	3.70	ORGANIC MATERIAL	1	1		.0	
2.250	7.38	.33	6.06	ORGANIC MATERIAL	0	1		.0	
2.400	7.87	.41	4.88	ORGANIC MATERIAL	0	1		.0	
2.550	8.37	.24	4.17	ORGANIC MATERIAL	0	0		.0	
2.700	8.86	.71	1.41	ORGANIC MATERIAL	1	1		.0	
2.850	9.35	1.14	.88	SENSITIVE FINE GRAINED	1	1		.1	
3.000	9.84	1.24	.81	SENSITIVE FINE GRAINED	1	1		.1	
3.150	10.33	2.41	.00		0	0			
3.300	10.83	2.71	.00		0	0			37.0
3.450	11.32	2.51	.00		0	0			38.5
3.600	11.81	1.71	.00		0	0			39.0
3.750	12.30	1.61	.62	SENSITIVE FINE GRAINED	1	1		.1	
3.900	12.80	2.11	.47	SENSITIVE FINE GRAINED	1	1		.1	
4.050	13.29	2.03	.49	SENSITIVE FINE GRAINED	1	1		.1	
4.200	13.78	2.31	.87	SENSITIVE FINE GRAINED	1	1		.2	
4.350	14.27	3.04	.00		0	0			39.0
4.500	14.76	2.21	.45	SENSITIVE FINE GRAINED	1	1		.1	
4.650	15.26	2.95	.00		0	0			38.0
4.800	15.75	3.02	.33	SENSITIVE FINE GRAINED	2	2		.2	
4.950	16.24	1.61	1.24	SENSITIVE FINE GRAINED	1	1		.1	
5.100	16.73	3.11	.00		0	0			38.0
5.250	17.22	23.74	.21	SILTY SAND to SANDY SILT	8	8	27		33.0
5.400	17.72	5.62	.18	SENSITIVE FINE GRAINED	3	3		.5	
5.550	18.21	5.21	.19	SENSITIVE FINE GRAINED	3	3		.4	
5.700	18.70	6.00	1.33	SENSITIVE FINE GRAINED	3	3		.5	
5.850	19.19	4.41	1.36	SENSITIVE FINE GRAINED	2	2		.3	
6.000	19.69	15.91	.25	SANDY SILT to CLAYEY SILT	6	6		1.5	
6.150	20.18	7.15	.56	SENSITIVE FINE GRAINED	4	4		.6	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-13Seis

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	5.64	.35	SENSITIVE FINE GRAINED	3	3		.4	
6.450	21.16	4.93	1.02	SENSITIVE FINE GRAINED	2	2		.4	
6.600	21.65	5.07	1.18	SENSITIVE FINE GRAINED	3	2		.4	
6.750	22.15	5.21	1.15	SENSITIVE FINE GRAINED	3	3		.4	
6.900	22.64	59.54	.52	SAND to SILTY SAND	15	14	51		38.0
7.050	23.13	55.64	.66	SAND to SILTY SAND	14	13	49		37.5
7.200	23.62	51.33	.66	SILTY SAND to SANDY SILT	17	16	47		37.0
7.350	24.11	47.74	.71	SILTY SAND to SANDY SILT	16	15	44		36.5
7.500	24.61	54.33	.61	SAND to SILTY SAND	14	13	48		37.0
7.650	25.10	47.52	.72	SILTY SAND to SANDY SILT	16	15	44		36.5
7.800	25.59	44.82	.74	SILTY SAND to SANDY SILT	15	14	42		36.5
7.950	26.08	47.34	.80	SILTY SAND to SANDY SILT	16	15	43		36.5
8.100	26.57	46.12	.74	SILTY SAND to SANDY SILT	15	14	43		36.5
8.250	27.07	37.33	1.02	SILTY SAND to SANDY SILT	12	11	36		35.0
8.400	27.56	52.94	.76	SILTY SAND to SANDY SILT	18	16	46		37.0
8.550	28.05	44.02	1.84	SANDY SILT to CLAYEY SILT	18	16		2.8	
8.700	28.54	6.84	4.09	CLAY	7	6		.3	
8.850	29.04	5.34	.75	SENSITIVE FINE GRAINED	3	2		.4	
9.000	29.53	16.14	2.73	CLAYEY SILT to SILTY CLAY	8	7		1.0	
9.150	30.02	6.71	.89	SENSITIVE FINE GRAINED	3	3		.5	
9.300	30.51	7.44	1.08	SENSITIVE FINE GRAINED	4	3		.6	
9.450	31.00	7.50	1.33	CLAYEY SILT to SILTY CLAY	4	3		.6	
9.600	31.50	30.54	.75	SILTY SAND to SANDY SILT	10	9	29		32.5
9.750	31.99	14.26	1.61	CLAYEY SILT to SILTY CLAY	7	6		1.0	
9.900	32.48	8.37	1.20	CLAYEY SILT to SILTY CLAY	4	4		.6	
10.050	32.97	9.30	.75	SENSITIVE FINE GRAINED	5	4		.7	
10.200	33.46	7.37	1.09	SENSITIVE FINE GRAINED	4	3		.5	
10.350	33.96	6.64	1.21	SENSITIVE FINE GRAINED	3	3		.5	
10.500	34.45	6.49	1.08	SENSITIVE FINE GRAINED	3	3		.5	
10.650	34.94	6.70	1.04	SENSITIVE FINE GRAINED	3	3		.5	
10.800	35.43	6.69	1.05	SENSITIVE FINE GRAINED	3	3		.5	
10.950	35.93	8.63	.58	SENSITIVE FINE GRAINED	4	4		.7	
11.100	36.42	7.69	.39	SENSITIVE FINE GRAINED	4	3		.6	
11.250	36.91	6.89	.58	SENSITIVE FINE GRAINED	3	3		.5	
11.400	37.40	6.86	.73	SENSITIVE FINE GRAINED	3	3		.5	
11.550	37.89	6.79	.59	SENSITIVE FINE GRAINED	3	3		.5	
11.700	38.39	6.46	.62	SENSITIVE FINE GRAINED	3	3		.4	
11.850	38.88	7.73	.52	SENSITIVE FINE GRAINED	4	3		.5	
12.000	39.37	7.35	.54	SENSITIVE FINE GRAINED	4	3		.5	
12.150	39.86	7.72	.52	SENSITIVE FINE GRAINED	4	3		.5	
12.300	40.35	7.10	.84	SENSITIVE FINE GRAINED	4	3		.5	
12.450	40.85	7.89	.63	SENSITIVE FINE GRAINED	4	3		.6	
12.600	41.34	8.25	.73	SENSITIVE FINE GRAINED	4	3		.6	
12.750	41.83	7.71	.91	SENSITIVE FINE GRAINED	4	3		.5	
12.900	42.32	8.10	.86	SENSITIVE FINE GRAINED	4	3		.6	
13.050	42.81	8.01	.75	SENSITIVE FINE GRAINED	4	3		.6	
13.200	43.31	8.57	.93	SENSITIVE FINE GRAINED	4	3		.6	
13.350	43.80	9.45	.74	SENSITIVE FINE GRAINED	5	4		.7	
13.500	44.29	7.99	.75	SENSITIVE FINE GRAINED	4	3		.5	
13.650	44.78	8.00	.75	SENSITIVE FINE GRAINED	4	3		.5	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-13Seis

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	8.63	.81	SENSITIVE FINE GRAINED	4	3		.6	
13.950	45.77	8.12	.86	SENSITIVE FINE GRAINED	4	3		.5	
14.100	46.26	8.08	.87	SENSITIVE FINE GRAINED	4	3		.5	
14.250	46.75	8.06	.99	SENSITIVE FINE GRAINED	4	3		.5	
14.400	47.24	8.45	.95	SENSITIVE FINE GRAINED	4	3		.6	
14.550	47.74	8.46	.83	SENSITIVE FINE GRAINED	4	3		.6	
14.700	48.23	8.45	.95	SENSITIVE FINE GRAINED	4	3		.6	
14.850	48.72	8.18	1.10	SENSITIVE FINE GRAINED	4	3		.5	
15.000	49.21	8.26	.97	SENSITIVE FINE GRAINED	4	3		.5	
15.150	49.70	8.19	.85	SENSITIVE FINE GRAINED	4	3		.5	
15.300	50.20	7.86	.25	SENSITIVE FINE GRAINED	4	3		.5	
15.450	50.69	8.11	.74	SENSITIVE FINE GRAINED	4	3		.5	
15.600	51.18	8.32	.72	SENSITIVE FINE GRAINED	4	3		.5	
15.750	51.67	8.34	.96	SENSITIVE FINE GRAINED	4	3		.5	
15.900	52.17	8.89	.79	SENSITIVE FINE GRAINED	4	3		.6	
16.050	52.66	8.58	.93	SENSITIVE FINE GRAINED	4	3		.6	
16.200	53.15	8.60	.58	SENSITIVE FINE GRAINED	4	3		.6	
16.350	53.64	8.35	.84	SENSITIVE FINE GRAINED	4	3		.5	
16.500	54.13	8.54	.82	SENSITIVE FINE GRAINED	4	3		.5	
16.650	54.63	8.91	1.01	CLAYEY SILT to SILTY CLAY	4	3		.6	
16.800	55.12	9.37	.11	SENSITIVE FINE GRAINED	5	3		.6	
16.950	55.61	9.02	.89	SENSITIVE FINE GRAINED	5	3		.6	
17.100	56.10	9.66	.62	SENSITIVE FINE GRAINED	5	3		.6	
17.250	56.59	9.04	.66	SENSITIVE FINE GRAINED	5	3		.6	
17.400	57.09	9.34	.86	CLAYEY SILT to SILTY CLAY	5	3		.6	
17.550	57.58	8.39	.83	SENSITIVE FINE GRAINED	4	3		.5	
17.700	58.07	9.49	.95	CLAYEY SILT to SILTY CLAY	5	3		.6	
17.850	58.56	9.65	1.04	CLAYEY SILT to SILTY CLAY	5	3		.6	
18.000	59.06	9.47	1.06	CLAYEY SILT to SILTY CLAY	5	3		.6	
18.150	59.55	10.89	1.56	CLAYEY SILT to SILTY CLAY	5	4		.6	
18.300	60.04	8.57	1.40	CLAYEY SILT to SILTY CLAY	4	3		.4	
18.450	60.53	10.84	.55	SANDY SILT to CLAYEY SILT	4	3		.7	
18.600	61.02	12.96	.31	SANDY SILT to CLAYEY SILT	5	4		.9	
18.750	61.52	16.72	.48	SANDY SILT to CLAYEY SILT	7	5		1.3	
18.900	62.01	27.20	.33	SILTY SAND to SANDY SILT	9	6	19		29.5
19.050	62.50	12.03	.58	SANDY SILT to CLAYEY SILT	5	3		.8	
19.200	62.99	15.98	.75	SANDY SILT to CLAYEY SILT	6	4		1.2	
19.350	63.48	20.66	.63	SILTY SAND to SANDY SILT	7	5	11		29.0
19.500	63.98	19.97	1.05	SANDY SILT to CLAYEY SILT	8	5		1.3	
19.650	64.47	17.10	.82	SANDY SILT to CLAYEY SILT	7	5		1.3	
19.800	64.96	11.03	.54	SANDY SILT to CLAYEY SILT	4	3		.7	
19.950	65.45	11.30	.80	SANDY SILT to CLAYEY SILT	5	3		.8	
20.100	65.94	10.04	.90	CLAYEY SILT to SILTY CLAY	5	3		.6	
20.250	66.44	9.91	.91	CLAYEY SILT to SILTY CLAY	5	3		.6	
20.400	66.93	10.41	.96	CLAYEY SILT to SILTY CLAY	5	3		.7	
20.550	67.42	10.36	1.06	CLAYEY SILT to SILTY CLAY	5	3		.6	
20.700	67.91	10.45	1.15	CLAYEY SILT to SILTY CLAY	5	3		.7	
20.850	68.41	10.77	1.11	CLAYEY SILT to SILTY CLAY	5	4		.7	
21.000	68.90	14.60	.41	SANDY SILT to CLAYEY SILT	6	4		1.1	
21.150	69.39	9.94	.70	CLAYEY SILT to SILTY CLAY	5	3		.6	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-13Seis

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
21.300	69.88	10.08	1.09	CLAYEY SILT to SILTY CLAY	5	3		.6	
21.450	70.37	10.88	1.10	CLAYEY SILT to SILTY CLAY	5	4		.7	
21.600	70.87	11.93	.84	SANDY SILT to CLAYEY SILT	5	3		.8	
21.750	71.36	11.81	.68	SANDY SILT to CLAYEY SILT	5	3		.8	
21.900	71.85	10.88	.83	CLAYEY SILT to SILTY CLAY	5	4		.7	
22.050	72.34	15.04	1.46	SANDY SILT to CLAYEY SILT	6	4		.9	
22.200	72.83	71.21	1.05	SAND to SILTY SAND	18	12	45		34.5
22.350	73.33	96.19	.80	SAND to SILTY SAND	24	16	53		36.5
22.500	73.82	24.36	2.91	CLAYEY SILT to SILTY CLAY	12	8		1.3	
22.650	74.31	33.93	.59	SILTY SAND to SANDY SILT	11	7	23		30.0
22.800	74.80	71.39	.84	SAND to SILTY SAND	18	11	45		34.0
22.950	75.30	105.63	.43	SAND	21	14	56		36.5
23.100	75.79	121.92	.50	SAND	24	16	60		37.5
23.250	76.28	72.90	1.11	SILTY SAND to SANDY SILT	24	15	45		34.0
23.400	76.77	167.79	.47	SAND	34	21	69		38.5
23.550	77.26	142.83	.73	SAND	29	18	64		38.0
23.700	77.76	190.90	.64	SAND	38	24	72		38.5
23.850	78.25	164.01	.63	SAND	33	21	68		38.0
24.000	78.74	199.33	.46	SAND	40	25	73		39.0
24.150	79.23	220.43	.73	SAND	44	28	76		39.0
24.300	79.72	246.47	.58	SAND	49	31	79		39.5
24.450	80.22	179.34	.84	SAND	36	22	70		38.5
24.600	80.71	229.13	.50	SAND	46	28	77		39.5
24.750	81.20	258.67	.77	SAND	52	32	80		40.0
24.900	81.69	217.70	.70	SAND	44	27	75		39.0
25.050	82.19	261.09	.64	SAND	52	32	81		40.0
25.200	82.68	264.99	.82	SAND	53	33	81		40.0
25.350	83.17	254.35	.97	SAND	51	31	80		39.5
25.500	83.66	235.25	.73	SAND	47	29	77		39.5

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

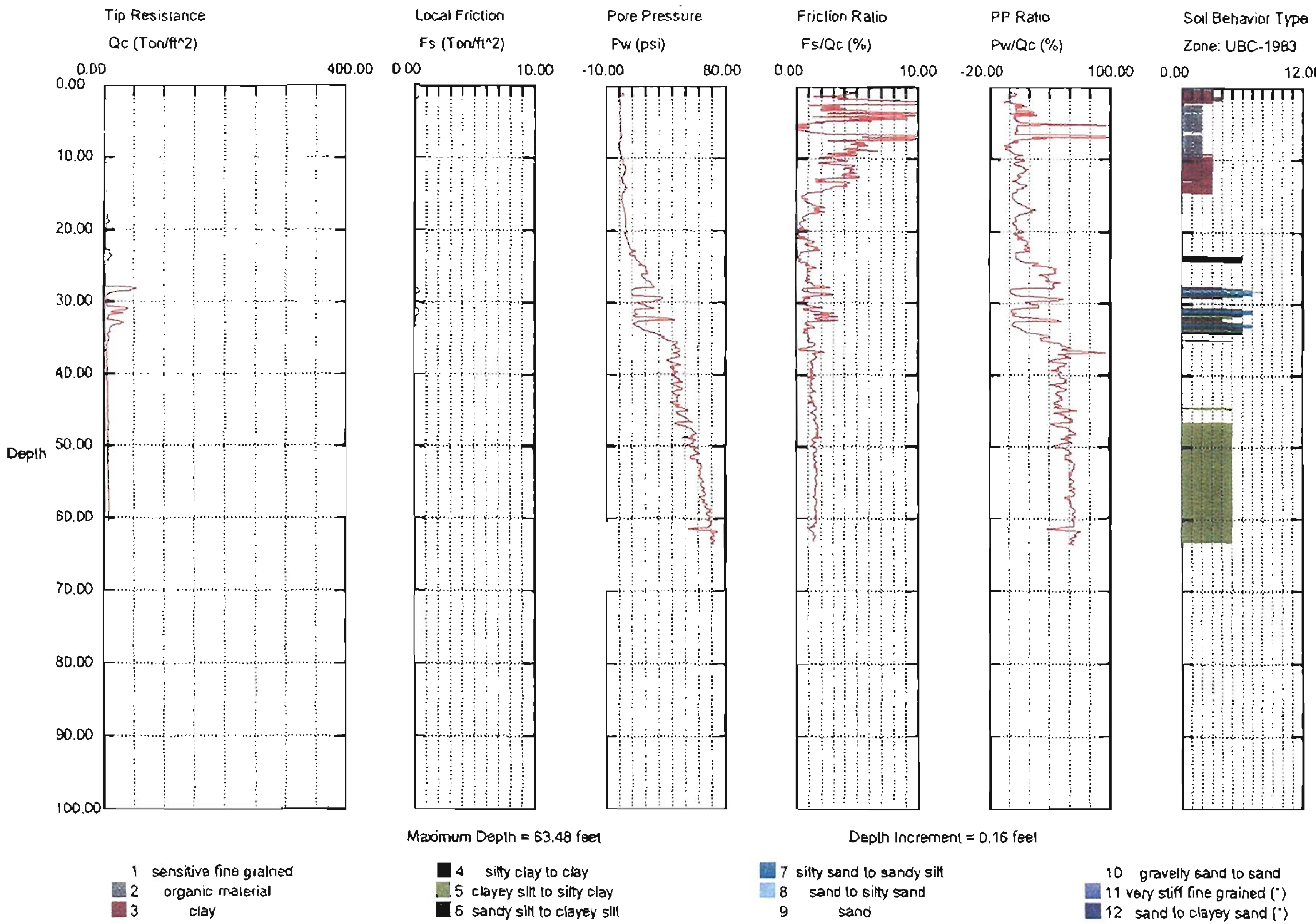
HOLGUIN, FAHAN & ASSOCIATES, INC.

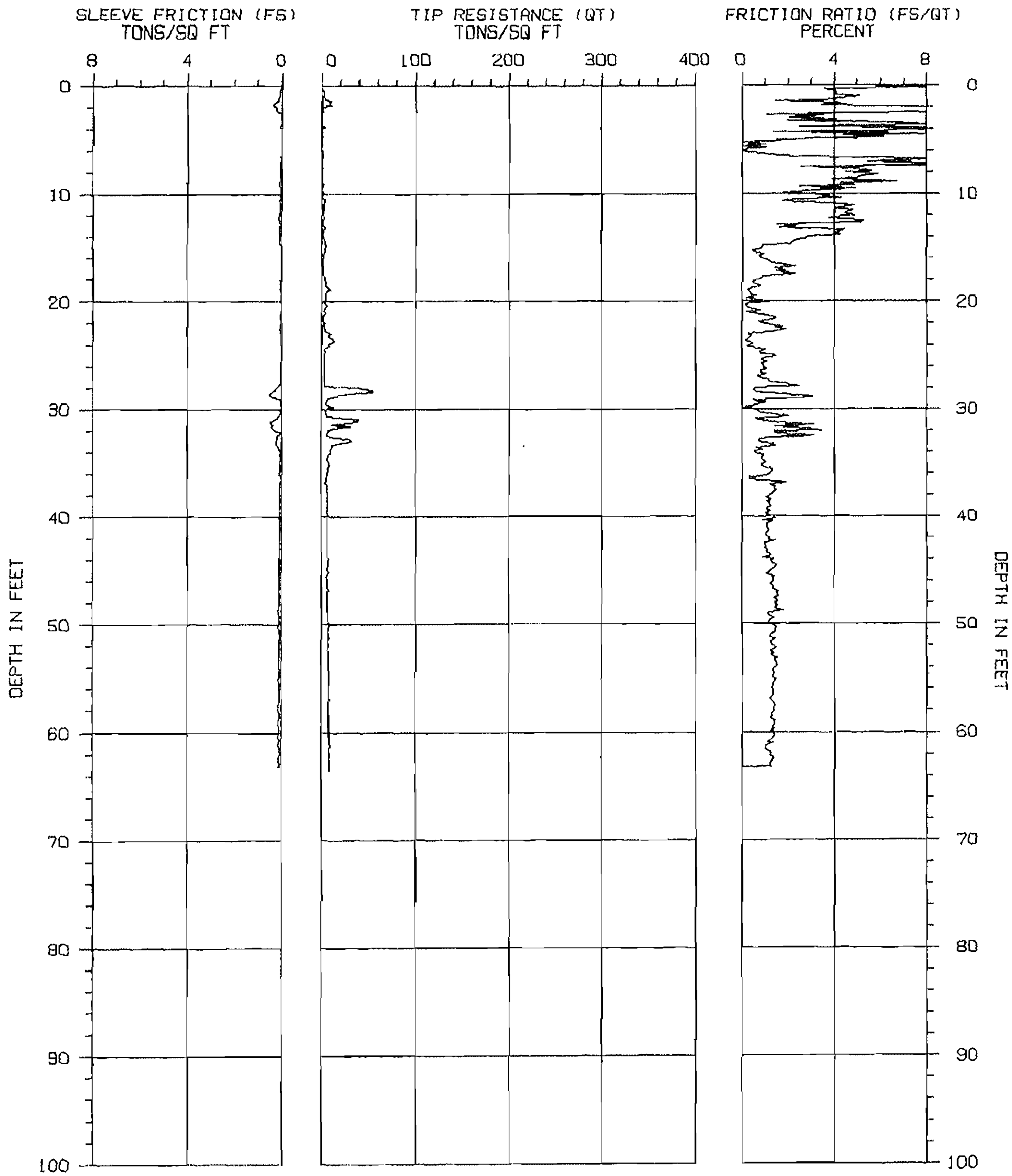
Interpretations based on: Robertson and Campanella, 1989.

Hushman(Associates

Operator: ALAMEDA NAS #2
Sounding: SDF139
Cone Used: 472/GO-VO/R#4

CPT Date/Time: 02-22-02 12:25
Location: CPT-14
Job Number: 010810





TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-14

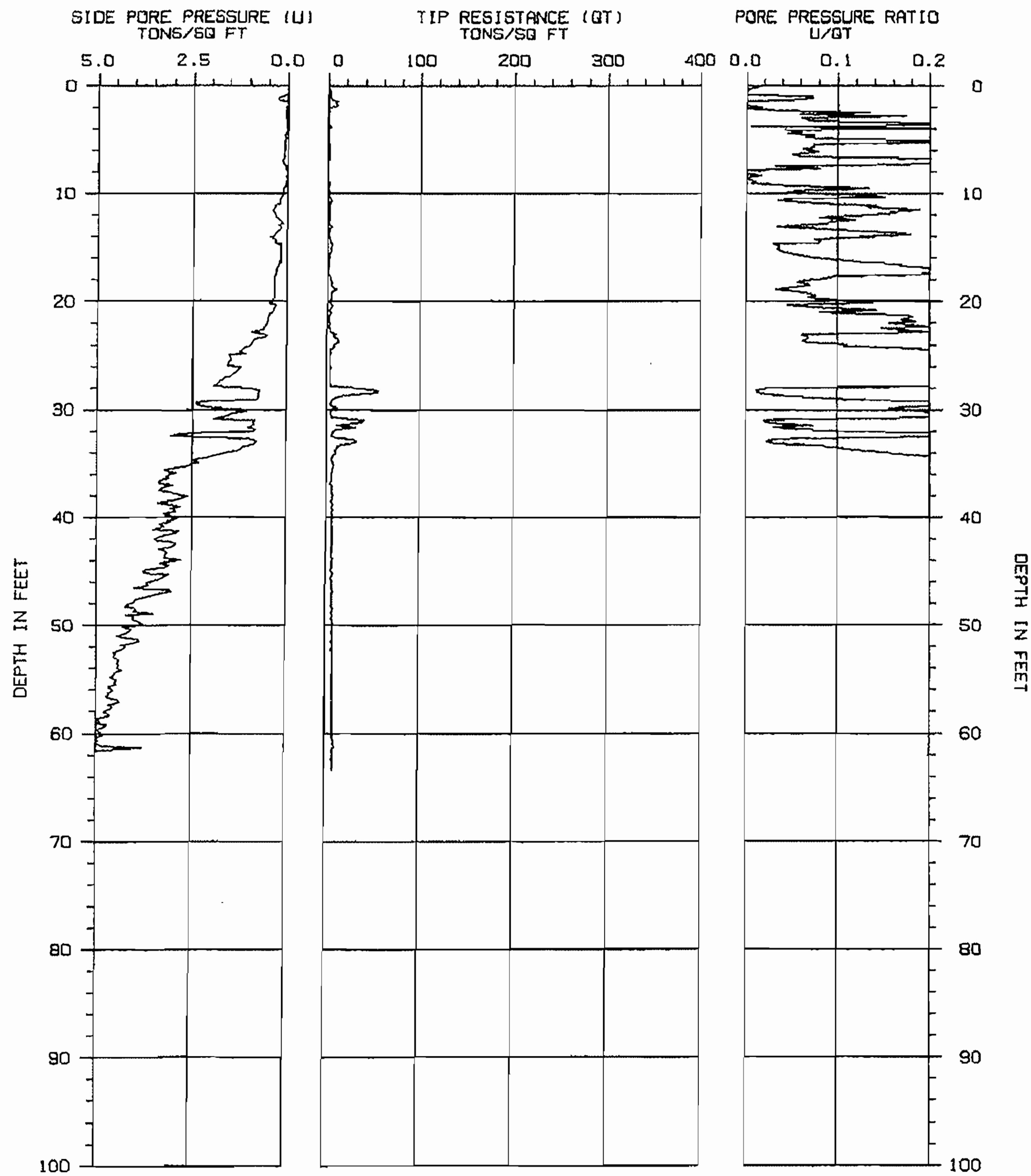
PROJECT NAME : ALAMEDA NAS #2

PROJECT NUMBER : 010810

CONE/RIG : 472/GO-VO/R#4

DATE/TIME: 02-22-02 12:25

HFA

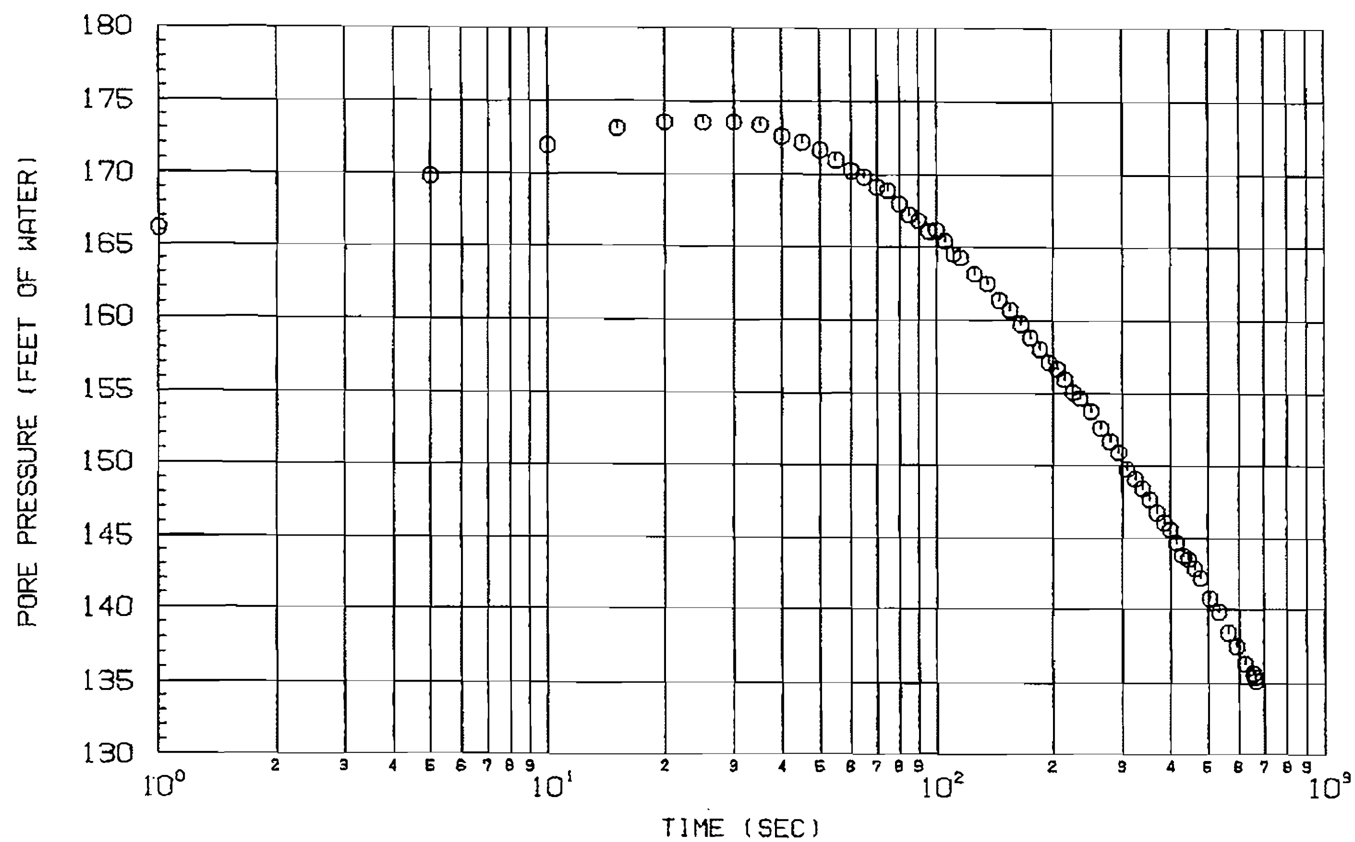


TIP RESISTANCE CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-14
PROJECT NAME : ALAMEDA NAS #2	CONE/RIG : 472/GO-VO/R#4
PROJECT NUMBER : 010810	DATE/TIME: 02-22-02 12:25

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: 63.6 FT

SIDE-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-14

PROJECT NAME : ALAMEDA NAS #2

PROJECT NUMBER : 010810

CONE/RIG : 472/GO-VB/R#4

DATE/TIME: 02-22-02 12:25

CPT INTERPRETATIONS

SOUNDING : CPT-14
PROJECT : ALAMEDA NAS #2
DATE/TIME: 02-22-02 12:25

PROJECT No.: 010810
CONE/RIG : 472/GO-VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	2.72	4.04	CLAY	3	4		.2	
.300	.98	2.15	5.12	CLAY	2	3		.1	
.450	1.48	10.52	1.43	CLAYEY SILT to SILTY CLAY	5	8		.8	
.600	1.97	2.59	8.49	ORGANIC MATERIAL	3	4		.2	
.750	2.46	.38	10.53	ORGANIC MATERIAL	0	1		.0	
.900	2.95	.49	2.04	ORGANIC MATERIAL	0	1		.0	
1.050	3.44	.15	6.67	ORGANIC MATERIAL	0	0		.0	
1.200	3.94	.13	23.08	ORGANIC MATERIAL	0	0		.0	
1.350	4.43	.66	9.09	ORGANIC MATERIAL	1	1		.0	
1.500	4.92	.66	1.52	ORGANIC MATERIAL	1	1		.0	
1.650	5.41	.98	1.02	ORGANIC MATERIAL	1	2		.1	
1.800	5.91	1.13	.00		0	0			
1.950	6.40	1.74	1.15	SENSITIVE FINE GRAINED	1	1		.1	
2.100	6.89	.04	50.00	ORGANIC MATERIAL	0	0		.0	
2.250	7.38	.42	9.52	ORGANIC MATERIAL	0	1		.0	
2.400	7.87	.89	5.62	ORGANIC MATERIAL	1	1		.0	
2.550	8.37	.98	5.10	ORGANIC MATERIAL	1	1		.0	
2.700	8.86	1.64	6.71	ORGANIC MATERIAL	2	2		.1	
2.850	9.35	1.21	2.48	ORGANIC MATERIAL	1	2		.1	
3.000	9.84	2.78	1.80	SENSITIVE FINE GRAINED	1	2		.2	
3.150	10.33	1.17	4.27	ORGANIC MATERIAL	1	2		.1	
3.300	10.83	3.02	3.64	CLAY	3	4		.2	
3.450	11.32	2.51	3.98	CLAY	3	3		.1	
3.600	11.81	2.02	4.46	CLAY	2	2		.1	
3.750	12.30	3.17	3.79	CLAY	3	4		.2	
3.900	12.80	1.30	1.54	SENSITIVE FINE GRAINED	1	1		.1	
4.050	13.29	2.02	4.46	CLAY	2	2		.1	
4.200	13.78	1.87	4.28	CLAY	2	2		.1	
4.350	14.27	3.91	2.30	CLAY	4	4		.2	
4.500	14.76	5.61	.89	SENSITIVE FINE GRAINED	3	3		.5	
4.650	15.26	4.38	.46	SENSITIVE FINE GRAINED	2	2		.4	
4.800	15.75	2.78	.72	SENSITIVE FINE GRAINED	1	1		.2	
4.950	16.24	1.64	1.22	SENSITIVE FINE GRAINED	1	1		.1	
5.100	16.73	1.30	2.31	SENSITIVE FINE GRAINED	1	1		.0	
5.250	17.22	1.36	1.47	SENSITIVE FINE GRAINED	1	1		.0	
5.400	17.72	3.34	.90	SENSITIVE FINE GRAINED	2	2		.2	
5.550	18.21	5.97	.50	SENSITIVE FINE GRAINED	3	3		.5	
5.700	18.70	6.86	.44	SENSITIVE FINE GRAINED	3	4		.6	
5.850	19.19	5.14	.39	SENSITIVE FINE GRAINED	3	3		.4	
6.000	19.69	5.23	.19	SENSITIVE FINE GRAINED	3	3		.4	
6.150	20.18	3.48	.29	SENSITIVE FINE GRAINED	2	2		.2	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-14

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	3.85	.26	SENSITIVE FINE GRAINED	2	2		.3	
6.450	21.16	3.57	.84	SENSITIVE FINE GRAINED	2	2		.2	
6.600	21.65	3.04	1.32	SENSITIVE FINE GRAINED	2	1		.2	
6.750	22.15	3.06	1.31	SENSITIVE FINE GRAINED	2	1		.2	
6.900	22.64	3.76	1.86	SENSITIVE FINE GRAINED	2	2		.2	
7.050	23.13	8.56	.35	SENSITIVE FINE GRAINED	4	4		.7	
7.200	23.62	14.06	.14	SANDY SILT to CLAYEY SILT	6	5		1.3	
7.350	24.11	9.11	.22	SENSITIVE FINE GRAINED	5	4		.8	
7.500	24.61	5.19	.77	SENSITIVE FINE GRAINED	3	2		.4	
7.650	25.10	3.37	1.48	SENSITIVE FINE GRAINED	2	2		.2	
7.800	25.59	3.66	1.09	SENSITIVE FINE GRAINED	2	2		.2	
7.950	26.08	4.40	.91	SENSITIVE FINE GRAINED	2	2		.3	
8.100	26.57	3.67	.82	SENSITIVE FINE GRAINED	2	2		.2	
8.250	27.07	3.58	.84	SENSITIVE FINE GRAINED	2	2		.2	
8.400	27.56	4.52	1.33	SENSITIVE FINE GRAINED	2	2		.3	
8.550	28.05	36.50	.60	SILTY SAND to SANDY SILT	12	11	35		34.5
8.700	28.54	42.36	1.13	SILTY SAND to SANDY SILT	14	13	40		36.0
8.850	29.04	6.69	1.49	CLAY to SILTY CLAY	4	4		.4	
9.000	29.53	5.21	.58	SENSITIVE FINE GRAINED	3	2		.4	
9.150	30.02	5.37	.56	SENSITIVE FINE GRAINED	3	2		.4	
9.300	30.51	5.48	1.46	SENSITIVE FINE GRAINED	3	2		.4	
9.450	31.00	40.56	.71	SILTY SAND to SANDY SILT	14	12	38		35.0
9.600	31.50	11.62	3.10	CLAY to SILTY CLAY	8	7		.7	
9.750	31.99	7.56	3.44	CLAY	8	7		.4	
9.900	32.48	6.45	3.10	CLAY	6	6		.3	
10.050	32.97	32.44	.74	SILTY SAND to SANDY SILT	11	9	31		32.5
10.200	33.46	12.04	1.41	CLAYEY SILT to SILTY CLAY	6	5		.8	
10.350	33.96	9.95	.60	SENSITIVE FINE GRAINED	5	4		.8	
10.500	34.45	6.75	.89	SENSITIVE FINE GRAINED	3	3		.5	
10.650	34.94	7.87	1.02	SENSITIVE FINE GRAINED	4	3		.6	
10.800	35.43	7.21	.97	SENSITIVE FINE GRAINED	4	3		.5	
10.950	35.93	6.29	1.27	SENSITIVE FINE GRAINED	3	3		.4	
11.100	36.42	6.50	.31	SENSITIVE FINE GRAINED	3	3		.4	
11.250	36.91	4.14	1.93	SENSITIVE FINE GRAINED	2	2		.2	
11.400	37.40	6.54	1.38	SENSITIVE FINE GRAINED	3	3		.4	
11.550	37.89	7.00	1.29	SENSITIVE FINE GRAINED	3	3		.5	
11.700	38.39	5.62	1.25	SENSITIVE FINE GRAINED	3	2		.3	
11.850	38.88	6.79	1.18	SENSITIVE FINE GRAINED	3	3		.5	
12.000	39.37	7.54	1.06	SENSITIVE FINE GRAINED	4	3		.5	
12.150	39.86	6.78	1.18	SENSITIVE FINE GRAINED	3	3		.4	
12.300	40.35	6.70	.89	SENSITIVE FINE GRAINED	3	3		.4	
12.450	40.85	6.50	1.08	SENSITIVE FINE GRAINED	3	3		.4	
12.600	41.34	7.59	1.19	SENSITIVE FINE GRAINED	4	3		.5	
12.750	41.83	6.65	1.05	SENSITIVE FINE GRAINED	3	3		.4	
12.900	42.32	6.97	1.44	CLAYEY SILT to SILTY CLAY	3	3		.4	
13.050	42.81	6.83	1.02	SENSITIVE FINE GRAINED	3	3		.4	
13.200	43.31	6.51	1.08	SENSITIVE FINE GRAINED	3	3		.4	
13.350	43.80	7.84	.89	SENSITIVE FINE GRAINED	4	3		.5	
13.500	44.29	7.01	1.28	SENSITIVE FINE GRAINED	4	3		.4	
13.650	44.78	6.44	1.40	SENSITIVE FINE GRAINED	3	3		.4	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-14

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	7.57	1.06	SENSITIVE FINE GRAINED	4	3		.5	
13.950	45.77	6.67	1.35	SENSITIVE FINE GRAINED	3	3		.4	
14.100	46.26	6.71	1.19	SENSITIVE FINE GRAINED	3	3		.4	
14.250	46.75	8.06	1.37	CLAYEY SILT to SILTY CLAY	4	3		.4	
14.400	47.24	7.22	1.52	CLAYEY SILT to SILTY CLAY	4	3		.4	
14.550	47.74	7.46	1.47	CLAYEY SILT to SILTY CLAY	4	3		.4	
14.700	48.23	7.19	1.53	CLAYEY SILT to SILTY CLAY	4	3		.4	
14.850	48.72	7.26	1.79	CLAY to SILTY CLAY	5	4		.4	
15.000	49.21	7.58	1.19	SENSITIVE FINE GRAINED	4	3		.5	
15.150	49.70	8.43	1.19	CLAYEY SILT to SILTY CLAY	4	3		.6	
15.300	50.20	8.35	1.44	CLAYEY SILT to SILTY CLAY	4	3		.4	
15.450	50.69	7.74	1.42	CLAYEY SILT to SILTY CLAY	4	3		.4	
15.600	51.18	8.17	1.22	CLAYEY SILT to SILTY CLAY	4	3		.5	
15.750	51.67	8.00	1.25	CLAYEY SILT to SILTY CLAY	4	3		.5	
15.900	52.17	7.50	1.47	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.050	52.66	7.90	1.39	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.200	53.15	7.98	1.50	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.350	53.64	8.23	1.46	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.500	54.13	8.08	1.36	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.650	54.63	7.95	1.38	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.800	55.12	8.18	1.47	CLAYEY SILT to SILTY CLAY	4	3		.4	
16.950	55.61	8.01	1.37	CLAYEY SILT to SILTY CLAY	4	3		.4	
17.100	56.10	8.14	1.35	CLAYEY SILT to SILTY CLAY	4	3		.4	
17.250	56.59	8.25	1.33	CLAYEY SILT to SILTY CLAY	4	3		.4	
17.400	57.09	8.56	1.29	CLAYEY SILT to SILTY CLAY	4	3		.5	
17.550	57.58	8.37	1.43	CLAYEY SILT to SILTY CLAY	4	3		.4	
17.700	58.07	8.76	1.37	CLAYEY SILT to SILTY CLAY	4	3		.4	
17.850	58.56	8.41	1.31	CLAYEY SILT to SILTY CLAY	4	3		.4	
18.000	59.06	8.74	1.37	CLAYEY SILT to SILTY CLAY	4	3		.4	
18.150	59.55	8.55	1.29	CLAYEY SILT to SILTY CLAY	4	3		.5	
18.300	60.04	8.57	1.40	CLAYEY SILT to SILTY CLAY	4	3		.4	
18.450	60.53	8.82	1.36	CLAYEY SILT to SILTY CLAY	4	3		.4	
18.600	61.02	8.83	1.36	CLAYEY SILT to SILTY CLAY	4	3		.4	
18.750	61.52	8.62	1.04	CLAYEY SILT to SILTY CLAY	4	3		.5	
18.900	62.01	8.75	1.26	CLAYEY SILT to SILTY CLAY	4	3		.5	
19.050	62.50	9.07	1.32	CLAYEY SILT to SILTY CLAY	5	3		.4	
19.200	62.99	9.07	1.21	CLAYEY SILT to SILTY CLAY	5	3		.5	

TIP RESISTANCE CORRECTED FOR END AREA EFFECT
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 15.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

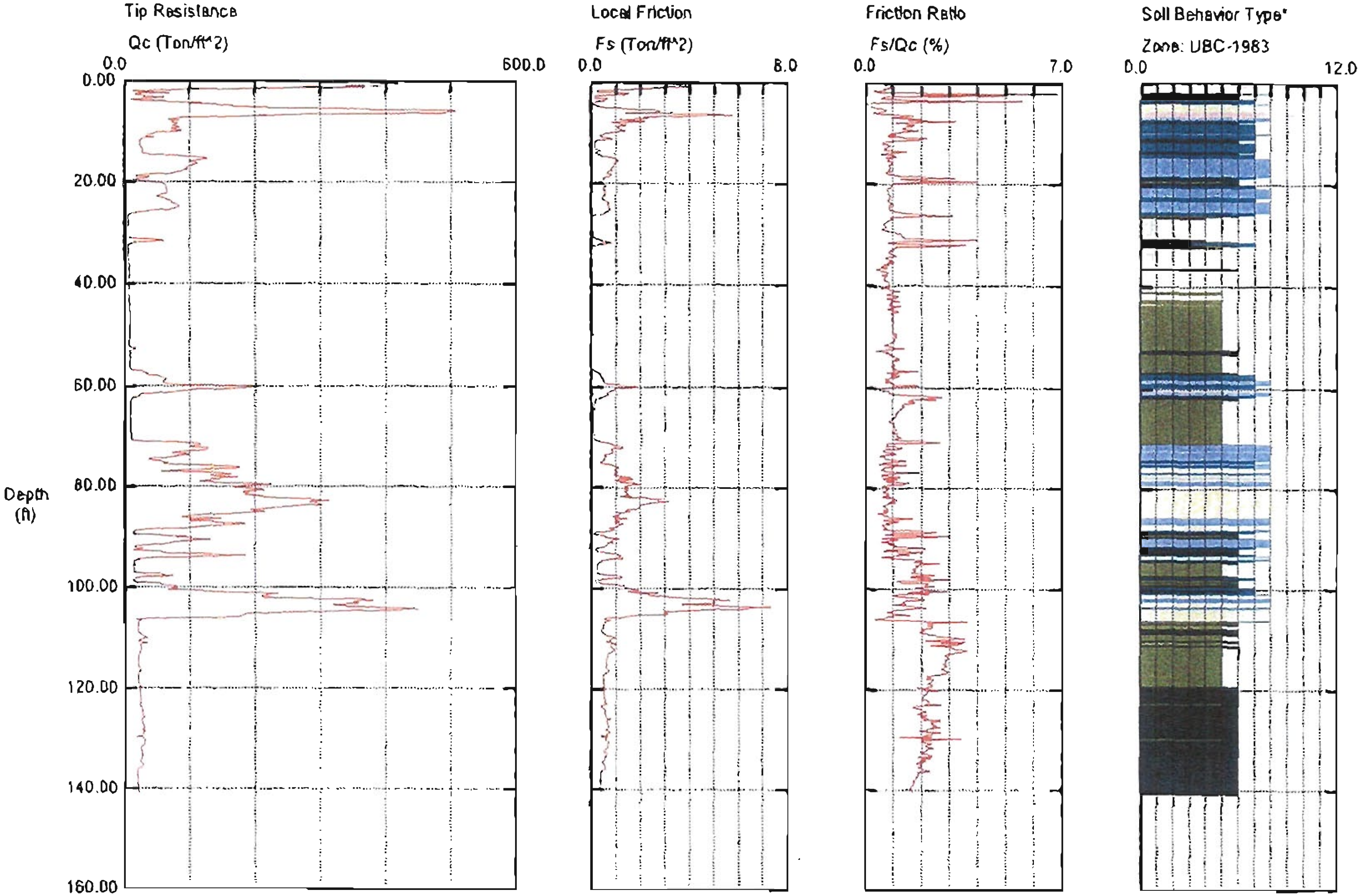
HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

HUSHMAND ASSOC.

Operator: 705/BH-VO/R#3
Sounding: SDF126
Cone Used: ALAMEDA

CPT Date/Time: 03-12-02 10:17
Location: CPT-15A
Job Number: 010810



Maximum Depth = 141.08 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

CPT INTERPRETATIONS

SOUNDING : CPT-15A
PROJECT : 705/BH-VO/R#3
DATE/TIME: 03-12-02 10:17

PROJECT No.: 010810
CONE/RIG : ALAMEDA

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	470.32	.66	GRAVELLY SAND to SAND	78	100	100		
.300	.98	337.96	.95	SAND	68	100	100		
.450	1.48	175.50	.57	SAND	35	56	92		
.600	1.97	14.02	1.80	CLAYEY SILT to SILTY CLAY	7	11		1.1	
.750	2.46	22.92	4.99	CLAY	23	37		1.3	
.900	2.95	32.42	.64	SILTY SAND to SANDY SILT	11	17	44		45.0
1.050	3.44	49.95	1.24	SILTY SAND to SANDY SILT	17	27	56		46.0
1.200	3.94	44.13	.53	SILTY SAND to SANDY SILT	15	24	53		45.0
1.350	4.43	97.64	.12	SAND	20	31	76		48.0
1.500	4.92	167.81	.33	SAND	34	54	91		49.5
1.650	5.41	332.52	.78	SAND	67	100	100		
1.800	5.91	508.64	.51	GRAVELLY SAND to SAND	85	100	100		
1.950	6.40	374.08	1.55	SAND to SILTY SAND	94	100	100		
2.100	6.89	218.40	.99	SAND	44	70	99		
2.250	7.38	74.89	1.54	SILTY SAND to SANDY SILT	25	40	68		46.0
2.400	7.87	75.08	1.11	SAND to SILTY SAND	19	30	68		46.0
2.550	8.37	82.58	1.75	SILTY SAND to SANDY SILT	28	44	71		46.0
2.700	8.86	73.93	1.42	SILTY SAND to SANDY SILT	25	39	68		45.5
2.850	9.35	71.76	1.66	SILTY SAND to SANDY SILT	24	38	67		45.5
3.000	9.84	87.19	1.24	SAND to SILTY SAND	22	35	72		46.0
3.150	10.33	46.10	.82	SILTY SAND to SANDY SILT	15	25	54		43.5
3.300	10.83	33.23	1.44	SANDY SILT to CLAYEY SILT	13	21		2.6	
3.450	11.32	31.38	1.94	SANDY SILT to CLAYEY SILT	13	20		2.5	
3.600	11.81	23.69	.63	SILTY SAND to SANDY SILT	8	13	35		39.5
3.750	12.30	24.79	.82	SILTY SAND to SANDY SILT	8	13	36		39.5
3.900	12.80	25.39	.78	SILTY SAND to SANDY SILT	8	14	37		39.5
4.050	13.29	26.85	.72	SILTY SAND to SANDY SILT	9	14	39		40.0
4.200	13.78	28.81	1.11	SILTY SAND to SANDY SILT	10	15	41		40.0
4.350	14.27	28.49	1.04	SILTY SAND to SANDY SILT	9	15	40		40.0
4.500	14.76	82.15	.77	SAND to SILTY SAND	21	33	71		45.0
4.650	15.26	124.37	.81	SAND to SILTY SAND	31	50	83		46.5
4.800	15.75	108.24	.97	SAND to SILTY SAND	27	43	79		46.0
4.950	16.24	108.75	.90	SAND to SILTY SAND	27	43	79		46.0
5.100	16.73	102.17	.90	SAND to SILTY SAND	26	41	77		46.0
5.250	17.22	96.00	.83	SAND to SILTY SAND	24	38	75		45.5
5.400	17.72	89.61	.78	SAND to SILTY SAND	22	36	73		45.0
5.550	18.21	76.40	1.05	SAND to SILTY SAND	19	31	69		44.5
5.700	18.70	23.71	2.96	CLAYEY SILT to SILTY CLAY	12	19		1.5	
5.850	19.19	33.33	1.64	SANDY SILT to CLAYEY SILT	13	21		2.6	
6.000	19.69	16.34	1.94	CLAYEY SILT to SILTY CLAY	8	13		1.2	
6.150	20.18	46.67	.93	SILTY SAND to SANDY SILT	16	25	54		42.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 80 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-15A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	64.12	.92	SAND to SILTY SAND	16	26	64		43.5
6.450	21.16	64.01	.77	SAND to SILTY SAND	16	26	64		43.5
6.600	21.65	66.28	.85	SAND to SILTY SAND	17	27	65		43.5
6.750	22.15	65.86	.85	SAND to SILTY SAND	16	26	64		43.5
6.900	22.64	56.94	.88	SILTY SAND to SANDY SILT	19	30	60		42.5
7.050	23.13	58.13	.81	SAND to SILTY SAND	15	23	61		42.5
7.200	23.62	69.58	.95	SAND to SILTY SAND	17	28	66		43.5
7.350	24.11	72.64	.91	SAND to SILTY SAND	18	29	67		43.5
7.500	24.61	83.88	.89	SAND to SILTY SAND	21	34	71		44.0
7.650	25.10	78.37	.92	SAND to SILTY SAND	20	31	69		44.0
7.800	25.59	54.81	1.26	SILTY SAND to SANDY SILT	18	29	59		42.0
7.950	26.08	20.74	2.52	CLAYEY SILT to SILTY CLAY	10	17		1.3	
8.100	26.57	6.82	.91	SENSITIVE FINE GRAINED	3	5		.6	
8.250	27.07	5.93	.86	SENSITIVE FINE GRAINED	3	5		.5	
8.400	27.56	5.65	.76	SENSITIVE FINE GRAINED	3	4		.5	
8.550	28.05	5.76	.69	SENSITIVE FINE GRAINED	3	5		.5	
8.700	28.54	5.69	.74	SENSITIVE FINE GRAINED	3	4		.5	
8.850	29.04	6.84	.64	SENSITIVE FINE GRAINED	3	5		.6	
9.000	29.53	6.33	1.07	SENSITIVE FINE GRAINED	3	5		.5	
9.150	30.02	6.39	1.30	SENSITIVE FINE GRAINED	3	5		.5	
9.300	30.51	6.63	1.34	SENSITIVE FINE GRAINED	3	5		.5	
9.450	31.00	6.44	4.01	CLAY	6	10		.3	
9.600	31.50	58.00	.80	SAND to SILTY SAND	14	22	61		42.0
9.750	31.99	18.86	3.57	CLAY to SILTY CLAY	13	19		1.2	
9.900	32.48	6.54	1.15	SENSITIVE FINE GRAINED	3	5		.5	
10.050	32.97	7.71	.92	SENSITIVE FINE GRAINED	4	6		.6	
10.200	33.46	6.80	.88	SENSITIVE FINE GRAINED	3	5		.5	
10.350	33.96	6.76	1.01	SENSITIVE FINE GRAINED	3	5		.5	
10.500	34.45	6.46	.74	SENSITIVE FINE GRAINED	3	5		.5	
10.650	34.94	6.76	.96	SENSITIVE FINE GRAINED	3	5		.5	
10.800	35.43	7.14	1.05	SENSITIVE FINE GRAINED	4	5		.6	
10.950	35.93	6.25	.86	SENSITIVE FINE GRAINED	3	5		.5	
11.100	36.42	7.71	.79	SENSITIVE FINE GRAINED	4	6		.6	
11.250	36.91	6.99	.49	SENSITIVE FINE GRAINED	3	5		.6	
11.400	37.40	7.69	.85	SENSITIVE FINE GRAINED	4	6		.6	
11.550	37.89	7.92	.61	SENSITIVE FINE GRAINED	4	6		.6	
11.700	38.39	6.63	.74	SENSITIVE FINE GRAINED	3	5		.5	
11.850	38.88	7.46	.67	SENSITIVE FINE GRAINED	4	5		.6	
12.000	39.37	7.10	.87	SENSITIVE FINE GRAINED	4	5		.6	
12.150	39.86	7.27	.85	SENSITIVE FINE GRAINED	4	5		.6	
12.300	40.35	7.20	.57	SENSITIVE FINE GRAINED	4	5		.6	
12.450	40.85	7.99	.89	SENSITIVE FINE GRAINED	4	6		.6	
12.600	41.34	7.80	.96	SENSITIVE FINE GRAINED	4	5		.6	
12.750	41.83	7.54	.86	SENSITIVE FINE GRAINED	4	5		.6	
12.900	42.32	7.10	1.16	SENSITIVE FINE GRAINED	4	5		.5	
13.050	42.81	8.58	.96	SENSITIVE FINE GRAINED	4	6		.7	
13.200	43.31	8.37	.96	SENSITIVE FINE GRAINED	4	6		.7	
13.350	43.80	8.56	.99	SENSITIVE FINE GRAINED	4	6		.7	
13.500	44.29	9.56	.99	CLAYEY SILT to SILTY CLAY	5	6		.8	
13.650	44.78	9.20	.86	SENSITIVE FINE GRAINED	5	6		.7	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 80 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-15A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	8.58	1.21	CLAYEY SILT to SILTY CLAY	4	6		.7	
13.950	45.77	8.31	1.02	SENSITIVE FINE GRAINED	4	6		.6	
14.100	46.26	8.67	1.04	CLAYEY SILT to SILTY CLAY	4	6		.7	
14.250	46.75	8.69	.92	SENSITIVE FINE GRAINED	4	6		.7	
14.400	47.24	8.86	.99	CLAYEY SILT to SILTY CLAY	4	6		.7	
14.550	47.74	8.63	1.00	SENSITIVE FINE GRAINED	4	6		.7	
14.700	48.23	8.60	1.02	CLAYEY SILT to SILTY CLAY	4	6		.7	
14.850	48.72	8.84	1.00	CLAYEY SILT to SILTY CLAY	4	6		.7	
15.000	49.21	8.77	1.00	CLAYEY SILT to SILTY CLAY	4	6		.7	
15.150	49.70	8.75	1.10	CLAYEY SILT to SILTY CLAY	4	6		.7	
15.300	50.20	8.94	1.11	CLAYEY SILT to SILTY CLAY	4	6		.7	
15.450	50.69	8.97	1.06	CLAYEY SILT to SILTY CLAY	4	6		.7	
15.600	51.18	9.14	.94	CLAYEY SILT to SILTY CLAY	5	6		.7	
15.750	51.67	8.41	.67	SENSITIVE FINE GRAINED	4	5		.6	
15.900	52.17	9.26	1.07	CLAYEY SILT to SILTY CLAY	5	6		.7	
16.050	52.66	18.61	.53	SANDY SILT to CLAYEY SILT	7	9		1.7	
16.200	53.15	10.18	.78	CLAYEY SILT to SILTY CLAY	5	6		.8	
16.350	53.64	9.39	.92	CLAYEY SILT to SILTY CLAY	5	6		.7	
16.500	54.13	9.60	1.18	CLAYEY SILT to SILTY CLAY	5	6		.7	
16.650	54.63	9.48	1.23	CLAYEY SILT to SILTY CLAY	5	6		.6	
16.800	55.12	9.39	1.02	CLAYEY SILT to SILTY CLAY	5	6		.7	
16.950	55.61	9.22	1.10	CLAYEY SILT to SILTY CLAY	5	6		.7	
17.100	56.10	9.16	.98	CLAYEY SILT to SILTY CLAY	5	6		.7	
17.250	56.59	9.41	1.02	CLAYEY SILT to SILTY CLAY	5	6		.7	
17.400	57.09	27.34	.78	SILTY SAND to SANDY SILT	9	11	36		36.5
17.550	57.58	36.50	.94	SILTY SAND to SANDY SILT	12	15	44		38.0
17.700	58.07	50.29	.94	SILTY SAND to SANDY SILT	17	21	53		38.5
17.850	58.56	62.08	.89	SAND to SILTY SAND	16	19	59		39.5
18.000	59.06	59.21	.94	SILTY SAND to SANDY SILT	20	24	58		39.5
18.150	59.55	65.82	1.81	SILTY SAND to SANDY SILT	22	27	61		39.5
18.300	60.04	196.54	.84	SAND	39	48	92		45.0
18.450	60.53	149.78	.63	SAND	30	36	84		44.0
18.600	61.02	85.32	.88	SAND to SILTY SAND	21	26	68		41.5
18.750	61.52	46.46	1.51	SILTY SAND to SANDY SILT	15	19	50		38.5
18.900	62.01	23.54	2.22	SANDY SILT to CLAYEY SILT	9	11		1.4	
19.050	62.50	12.85	1.63	CLAYEY SILT to SILTY CLAY	6	8		.8	
19.200	62.99	11.32	1.78	CLAYEY SILT to SILTY CLAY	6	7		.7	
19.350	63.48	10.94	1.33	CLAYEY SILT to SILTY CLAY	5	6		.7	
19.500	63.98	10.45	1.33	CLAYEY SILT to SILTY CLAY	5	6		.6	
19.650	64.47	10.47	1.31	CLAYEY SILT to SILTY CLAY	5	6		.6	
19.800	64.96	10.71	1.21	CLAYEY SILT to SILTY CLAY	5	6		.6	
19.950	65.45	10.86	1.07	CLAYEY SILT to SILTY CLAY	5	6		.8	
20.100	65.94	9.67	.98	CLAYEY SILT to SILTY CLAY	5	6		.7	
20.250	66.44	9.75	.91	CLAYEY SILT to SILTY CLAY	5	6		.7	
20.400	66.93	10.41	.90	CLAYEY SILT to SILTY CLAY	5	6		.8	
20.550	67.42	10.26	1.03	CLAYEY SILT to SILTY CLAY	5	6		.8	
20.700	67.91	10.49	1.06	CLAYEY SILT to SILTY CLAY	5	6		.8	
20.850	68.41	10.75	1.13	CLAYEY SILT to SILTY CLAY	5	6		.8	
21.000	68.90	10.79	.95	CLAYEY SILT to SILTY CLAY	5	6		.8	
21.150	69.39	10.81	1.17	CLAYEY SILT to SILTY CLAY	5	6		.6	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 80 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-15A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
21.300	69.88	10.98	1.23	CLAYEY SILT to SILTY CLAY	5	6		.7	
21.450	70.37	11.09	1.08	CLAYEY SILT to SILTY CLAY	6	6		.8	
21.600	70.87	11.66	2.67	CLAY to SILTY CLAY	8	9		.6	
21.750	71.36	106.67	.77	SAND to SILTY SAND	27	30	72		42.0
21.900	71.85	117.33	1.09	SAND to SILTY SAND	29	33	75		42.5
22.050	72.34	128.57	.69	SAND	26	29	77		42.5
22.200	72.83	115.57	.76	SAND to SILTY SAND	29	32	74		42.5
22.350	73.33	73.66	1.07	SAND to SILTY SAND	18	21	61		39.5
22.500	73.82	87.32	.74	SAND to SILTY SAND	22	24	66		40.5
22.650	74.31	58.04	.89	SILTY SAND to SANDY SILT	19	21	54		38.5
22.800	74.80	44.78	.97	SILTY SAND to SANDY SILT	15	17	47		38.0
22.950	75.30	62.67	.90	SAND to SILTY SAND	16	17	56		39.0
23.100	75.79	115.23	.90	SAND to SILTY SAND	29	32	74		42.0
23.250	76.28	173.23	.58	SAND	35	38	85		44.0
23.400	76.77	84.64	1.18	SAND to SILTY SAND	21	23	65		40.0
23.550	77.26	150.12	.62	SAND	30	33	81		43.0
23.700	77.76	131.14	1.25	SAND to SILTY SAND	33	36	77		42.5
23.850	78.25	147.59	1.15	SAND to SILTY SAND	37	40	81		43.0
24.000	78.74	131.12	.88	SAND to SILTY SAND	33	36	77		42.5
24.150	79.23	150.46	1.34	SAND to SILTY SAND	38	41	81		43.0
24.300	79.72	211.26	.64	SAND	42	46	91		44.5
24.450	80.22	180.09	.78	SAND	36	39	86		44.0
24.600	80.71	213.17	.63	SAND	43	46	91		44.5
24.750	81.20	180.56	.85	SAND	36	39	86		44.0
24.900	81.69	189.80	.61	SAND	38	41	87		44.0
25.050	82.19	232.57	1.04	SAND	47	50	93		45.0
25.200	82.68	314.08	.88	SAND	63	67	100		46.0
25.350	83.17	295.22	.83	SAND	59	63	100		46.0
25.500	83.66	277.20	.73	SAND	55	59	98		45.5
25.650	84.15	225.02	.84	SAND	45	48	92		44.5
25.800	84.65	193.31	.83	SAND	39	41	87		44.0
25.950	85.14	194.33	.62	SAND	39	41	87		44.0
26.100	85.63	117.14	.87	SAND to SILTY SAND	29	31	73		42.0
26.250	86.12	95.41	1.10	SAND to SILTY SAND	24	25	67		40.0
26.400	86.61	98.60	1.21	SAND to SILTY SAND	25	26	68		40.5
26.550	87.11	148.63	.88	SAND	30	31	79		42.5
26.700	87.60	164.65	.70	SAND	33	34	82		43.0
26.850	88.09	114.79	.65	SAND to SILTY SAND	29	30	72		41.5
27.000	88.58	31.27	2.54	SANDY SILT to CLAYEY SILT	13	13		1.8	
27.150	89.07	13.19	.81	SANDY SILT to CLAYEY SILT	5	5		1.0	
27.300	89.57	20.12	2.58	CLAYEY SILT to SILTY CLAY	10	10		1.1	
27.450	90.06	78.58	1.17	SAND to SILTY SAND	20	20	61		39.0
27.600	90.55	130.87	.60	SAND	26	27	75		42.0
27.750	91.04	76.01	.84	SAND to SILTY SAND	19	19	60		39.0
27.900	91.54	57.91	1.00	SILTY SAND to SANDY SILT	19	20	52		38.0
28.050	92.03	15.66	1.48	SANDY SILT to CLAYEY SILT	6	6		1.0	
28.200	92.52	22.01	1.15	SANDY SILT to CLAYEY SILT	9	9		1.5	
28.350	93.01	59.06	1.18	SILTY SAND to SANDY SILT	20	20	52		38.0
28.500	93.50	150.73	.73	SAND	30	30	79		42.5
28.650	94.00	99.66	1.35	SAND to SILTY SAND	25	25	67		40.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 80 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-15A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
28.800	94.49	20.44	2.04	CLAYEY SILT to SILTY CLAY	10	10		1.3	
28.950	94.98	14.72	2.23	CLAYEY SILT to SILTY CLAY	7	7		.9	
29.100	95.47	15.21	1.79	CLAYEY SILT to SILTY CLAY	8	8		.9	
29.250	95.96	14.38	1.75	CLAYEY SILT to SILTY CLAY	7	7		.8	
29.400	96.46	14.49	1.79	CLAYEY SILT to SILTY CLAY	7	7		.9	
29.550	96.95	14.38	1.97	CLAYEY SILT to SILTY CLAY	7	7		.8	
29.700	97.44	62.46	1.63	SILTY SAND to SANDY SILT	21	21	53		38.0
29.850	97.93	57.79	2.04	SILTY SAND to SANDY SILT	19	19	51		38.0
30.000	98.43	14.94	1.13	SANDY SILT to CLAYEY SILT	6	6		.9	
30.150	98.92	15.55	2.23	CLAYEY SILT to SILTY CLAY	8	8		.9	
30.300	99.41	55.64	2.45	SANDY SILT to CLAYEY SILT	22	22		3.4	
30.450	99.90	79.94	1.88	SILTY SAND to SANDY SILT	27	26	60		39.0
30.600	100.39	67.01	2.91	SANDY SILT to CLAYEY SILT	27	26		4.2	
30.750	100.89	121.80	2.24	SILTY SAND to SANDY SILT	41	40	72		41.0
30.900	101.38	215.98	1.09	SAND	43	42	88		44.0
31.050	101.87	211.41	1.86	SAND to SILTY SAND	53	52	88		44.0
31.200	102.36	364.31	1.41	SAND	73	71	100		46.0
31.350	102.85	351.09	1.45	SAND	70	68	100		46.0
31.500	103.35	319.35	1.76	SAND to SILTY SAND	80	77	99		45.5
31.650	103.84	341.83	1.94	SAND to SILTY SAND	85	83	100		45.5
31.800	104.33	425.34	.93	SAND	85	82	100		46.5
31.950	104.82	277.22	1.14	SAND	55	53	95		44.5
32.100	105.31	184.66	1.00	SAND	37	35	83		43.0
32.250	105.81	171.32	.39	SAND	34	33	81		42.5
32.400	106.30	32.72	2.40	SANDY SILT to CLAYEY SILT	13	13		1.9	
32.550	106.79	23.35	2.39	CLAYEY SILT to SILTY CLAY	12	11		1.3	
32.700	107.28	21.50	2.36	CLAYEY SILT to SILTY CLAY	11	10		1.1	
32.850	107.78	22.33	1.98	SANDY SILT to CLAYEY SILT	9	8		1.4	
33.000	108.27	21.14	2.02	SANDY SILT to CLAYEY SILT	8	8		1.3	
33.150	108.76	21.27	2.22	CLAYEY SILT to SILTY CLAY	11	10		1.4	
33.300	109.25	24.62	2.53	CLAYEY SILT to SILTY CLAY	12	12		1.4	
33.450	109.74	28.26	3.54	CLAYEY SILT to SILTY CLAY	14	13		1.6	
33.600	110.24	30.85	2.43	SANDY SILT to CLAYEY SILT	12	12		1.8	
33.750	110.73	21.65	3.46	CLAYEY SILT to SILTY CLAY	11	10		1.1	
33.900	111.22	27.30	2.84	CLAYEY SILT to SILTY CLAY	14	13		1.5	
34.050	111.71	26.02	3.14	CLAYEY SILT to SILTY CLAY	13	12		1.4	
34.200	112.20	26.47	3.63	CLAYEY SILT to SILTY CLAY	13	12		1.5	
34.350	112.70	25.51	3.09	CLAYEY SILT to SILTY CLAY	13	12		1.4	
34.500	113.19	24.69	2.85	CLAYEY SILT to SILTY CLAY	12	11		1.3	
34.650	113.68	22.77	2.94	CLAYEY SILT to SILTY CLAY	11	11		1.2	
34.800	114.17	22.82	2.84	CLAYEY SILT to SILTY CLAY	11	11		1.2	
34.950	114.67	21.99	2.88	CLAYEY SILT to SILTY CLAY	11	10		1.2	
35.100	115.16	22.50	2.92	CLAYEY SILT to SILTY CLAY	11	10		1.2	
35.250	115.65	21.61	2.74	CLAYEY SILT to SILTY CLAY	11	10		1.1	
35.400	116.14	25.24	2.89	CLAYEY SILT to SILTY CLAY	13	12		1.4	
35.550	116.63	23.20	2.81	CLAYEY SILT to SILTY CLAY	12	11		1.2	
35.700	117.13	22.26	2.17	CLAYEY SILT to SILTY CLAY	11	10		1.4	
35.850	117.62	22.43	2.16	CLAYEY SILT to SILTY CLAY	11	10		1.4	
36.000	118.11	22.29	2.41	CLAYEY SILT to SILTY CLAY	11	10		1.2	
36.150	118.60	21.95	2.21	CLAYEY SILT to SILTY CLAY	11	10		1.4	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 80 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-15A

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
36.300	119.09	23.11	2.37	CLAYEY SILT to SILTY CLAY	12	11		1.2	
36.450	119.59	24.67	1.82	SANDY SILT to CLAYEY SILT	10	9		1.6	
36.600	120.08	25.62	2.20	SANDY SILT to CLAYEY SILT	10	9		1.4	
36.750	120.57	23.41	2.20	SANDY SILT to CLAYEY SILT	9	8		1.2	
36.900	121.06	24.58	2.09	SANDY SILT to CLAYEY SILT	10	9		1.6	
37.050	121.56	25.90	2.02	SANDY SILT to CLAYEY SILT	10	9		1.7	
37.200	122.05	25.77	2.22	SANDY SILT to CLAYEY SILT	10	9		1.4	
37.350	122.54	25.37	2.13	SANDY SILT to CLAYEY SILT	10	9		1.4	
37.500	123.03	28.02	2.05	SANDY SILT to CLAYEY SILT	11	10		1.8	
37.650	123.52	24.20	1.72	SANDY SILT to CLAYEY SILT	10	9		1.5	
37.800	124.02	28.45	2.09	SANDY SILT to CLAYEY SILT	11	10		1.6	
37.950	124.51	28.49	1.98	SANDY SILT to CLAYEY SILT	11	10		1.9	
38.100	125.00	28.91	2.19	SANDY SILT to CLAYEY SILT	12	10		1.6	
38.250	125.49	29.19	2.23	SANDY SILT to CLAYEY SILT	12	10		1.6	
38.400	125.98	30.42	2.68	CLAYEY SILT to SILTY CLAY	15	14		1.7	
38.550	126.48	27.34	2.44	CLAYEY SILT to SILTY CLAY	14	12		1.5	
38.700	126.97	28.00	2.52	CLAYEY SILT to SILTY CLAY	14	12		1.5	
38.850	127.46	28.62	2.66	CLAYEY SILT to SILTY CLAY	14	13		1.6	
39.000	127.95	30.06	2.21	SANDY SILT to CLAYEY SILT	12	11		1.7	
39.150	128.44	26.94	2.69	CLAYEY SILT to SILTY CLAY	13	12		1.5	
39.300	128.94	28.74	2.22	SANDY SILT to CLAYEY SILT	11	10		1.6	
39.450	129.43	28.13	1.20	SANDY SILT to CLAYEY SILT	11	10		1.8	
39.600	129.92	28.47	1.99	SANDY SILT to CLAYEY SILT	11	10		1.9	
39.750	130.41	32.63	2.17	SANDY SILT to CLAYEY SILT	13	11		1.8	
39.900	130.91	31.36	2.17	SANDY SILT to CLAYEY SILT	13	11		1.7	
40.050	131.40	28.64	2.38	SANDY SILT to CLAYEY SILT	11	10		1.6	
40.200	131.89	26.41	2.17	SANDY SILT to CLAYEY SILT	11	9		1.4	
40.350	132.38	26.60	1.92	SANDY SILT to CLAYEY SILT	11	9		1.7	
40.500	132.87	29.34	2.32	SANDY SILT to CLAYEY SILT	12	10		1.6	
40.650	133.37	30.00	1.87	SANDY SILT to CLAYEY SILT	12	10		2.0	
40.800	133.86	27.56	2.10	SANDY SILT to CLAYEY SILT	11	10		1.5	
40.950	134.35	25.92	2.05	SANDY SILT to CLAYEY SILT	10	9		1.6	
41.100	134.84	26.58	1.96	SANDY SILT to CLAYEY SILT	11	9		1.7	
41.250	135.33	29.04	1.92	SANDY SILT to CLAYEY SILT	12	10		1.9	
41.400	135.83	27.19	2.19	SANDY SILT to CLAYEY SILT	11	9		1.5	
41.550	136.32	21.50	2.03	SANDY SILT to CLAYEY SILT	9	7		1.3	
41.700	136.81	20.76	1.90	SANDY SILT to CLAYEY SILT	8	7		1.2	
41.850	137.30	20.76	1.82	SANDY SILT to CLAYEY SILT	8	7		1.2	
42.000	137.80	20.91	1.77	SANDY SILT to CLAYEY SILT	8	7		1.2	
42.150	138.29	21.37	1.69	SANDY SILT to CLAYEY SILT	9	7		1.3	
42.300	138.78	21.08	1.71	SANDY SILT to CLAYEY SILT	8	7		1.2	
42.450	139.27	21.37	1.60	SANDY SILT to CLAYEY SILT	9	7		1.3	
42.600	139.76	21.73	1.55	SANDY SILT to CLAYEY SILT	9	7		1.3	
42.750	140.26	22.22	1.65	SANDY SILT to CLAYEY SILT	9	8		1.3	
42.900	140.75	22.43	1.64	SANDY SILT to CLAYEY SILT	9	8		1.3	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 80 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

FIELD LOG OF TEST PIT

LENGTH 6' WIDTH 2' DEPTH 1.5' CASE BACKHOE 580 SUPER L	TEST PIT NUMBER TP-2-1 SHEET 1 OF 1 CORDINATES: N 471853.35 E 1472682.76 FIELD ENGINEER/ GEOLOGIST: VINCE RICHARDS DATE BEGAN: 2-8-02 EDITED BY: DATE FINISHED: 2-8-02 CHECKED BY: GROUND SURFACE EL.: 9.28

SOIL DESCRIPTION & REMARKS

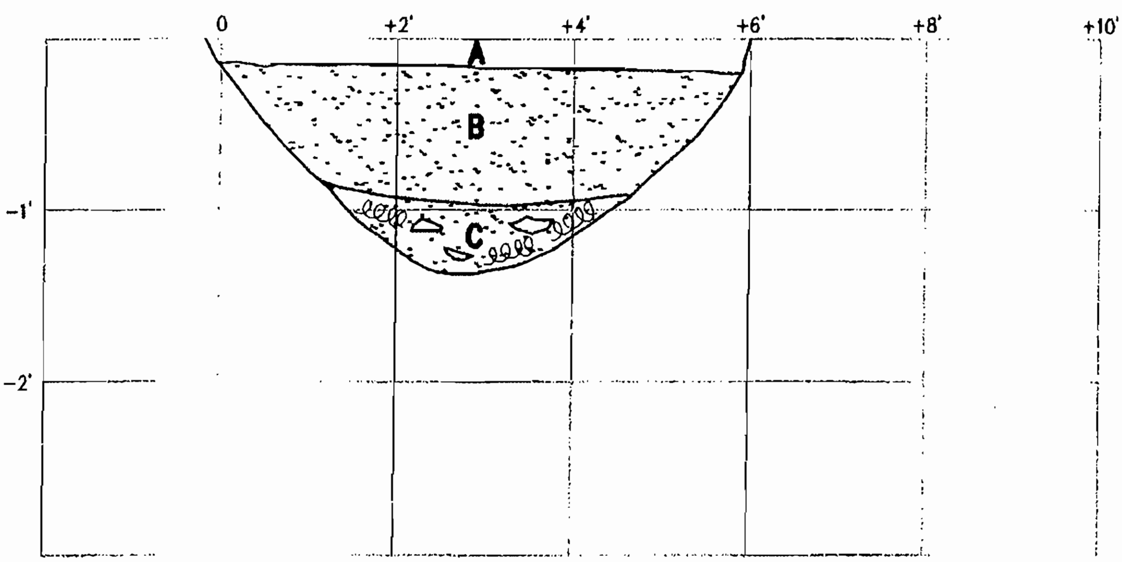
A) 0-4" - SOIL/GRASS COVER W/ 3"-4" ROOT ZONE - SM, SILTY SAND, OLIVE BROWN (2.5Y 4/3), LOW PLASTICITY

B) 3"-1' - FILL - SP, FINE SAND W/SHELL FRAGMENTS, OLIVE BROWN (2.5Y 3/4), SLIGHT MOIST AND LOOSE

C) 1'-1.5' - REFUSE WOOD, PAPER, MINOR METAL, PLASTIC IN SOIL (FINE SAND MATRIX)

COLLECT SAMPLE #095-02-051 FROM HORIZON B

PROFILE OF PITWALL: ← NORTH   SOUTH →



SCALE: 1"=2'   BEARING: NORTH/SOUTH   TRENCH WALL: WEST

PNZG-6-WALL

CLIENT SWDIV
PROJECT NO. 2384.095D
LOCATION ALAMEDA, IN SITE 2

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

I:\Projects\2384095b041901000\dwg\TP-2-1.dwg 08/02/2002 10:08:40 AM PDT

FIELD LOG OF TEST PIT

LENGTH 9'
WIDTH 2'
DEPTH 2.5'

CASE BACKHOE
580 SUPER L

TEST PIT NUMBER TP-2-4 (STAKE 718)

SHEET 1 OF 1

CORDINATES: N 472581.08
E 1472228.51

FIELD ENGINEER/
GEOLOGIST: VINCE RICHARDS

EDITED BY:

CHECKED BY:

DATE BEGAN: 2-8-02

DATE FINISHED: 2-8-02

GROUND SURFACE EL.: 13.18

SOIL DESCRIPTION & REMARKS

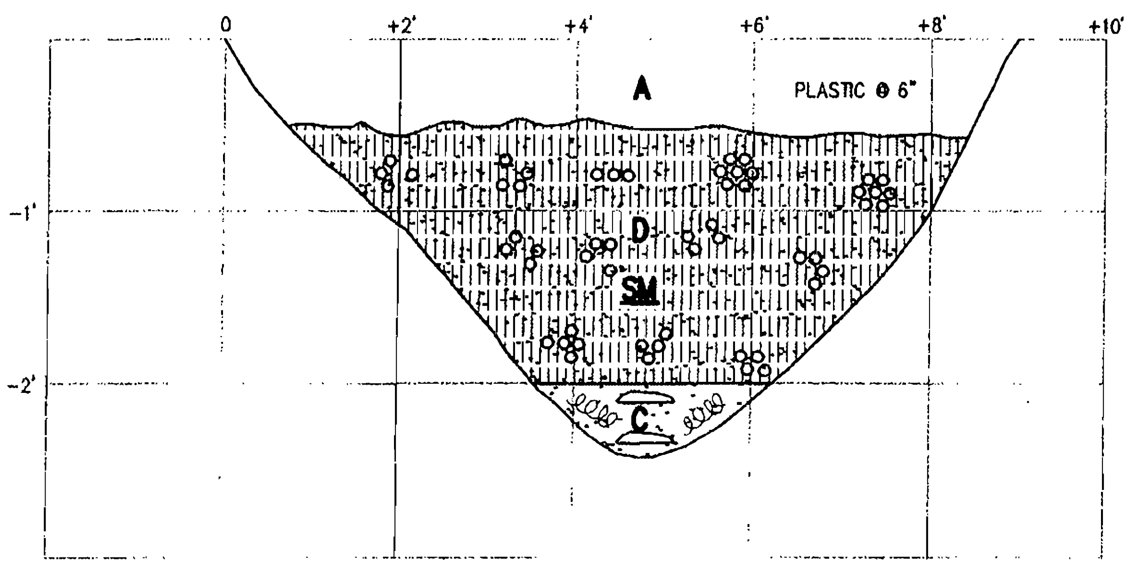
A) 0-5" - SOIL/GRASS COVER W/ 5" ROOT ZONE - SILTY SAND/SANDY SILT

D) 5"-2' - FILL - SANDY SILT, VERY GRAYISH BROWN (2.5y 4/2), MED-HIGH PLASTICITY CONSOLIDATED-FIRM CONSISTENCY, SLIGHT MOISTURE

C) 2'-2.5' REFUSE - PLASTIC, PAPER >20% IN SANDY SILT SOIL MATRIX . SLIGHT MOISTURE, NO ODOR

COLLECT 095-2-053 FROM D HORIZON

PROFILE OF PITWALL: ← NORTH SOUTH →



SCALE: 1"=2'

BEARING: NORTH/SOUTH

TRENCH WALL: WEST
PHOTO: IR2G-12

CLIENT US NAVY/SWDIV
PROJECT NO. 2384.095D
LOCATION ALAMEDA, IN SITE 2

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

I:\Projects\2384095b04190100C\dwg\TP-2-4.dwg 08/02/2002 10:25:20 AM PDT

FIELD LOG OF TEST PIT

LENGTH 8' WIDTH 2' DEPTH 2.5" CASE BACKHOE 580 SUPER L	TEST PIT NUMBER TP-2-8 FIELD ENGINEER/ GEOLOGIST: VINCE RICHARDS EDITED BY: CHECKED BY:	SHEET 1 OF 1 CORDINATES: N 473601.31 E 1471252.62 DATE BEGAN: 2-11-02 DATE FINISHED: 2-11-02 GROUND SURFACE EL.: 4.15

SOIL DESCRIPTION & REMARKS

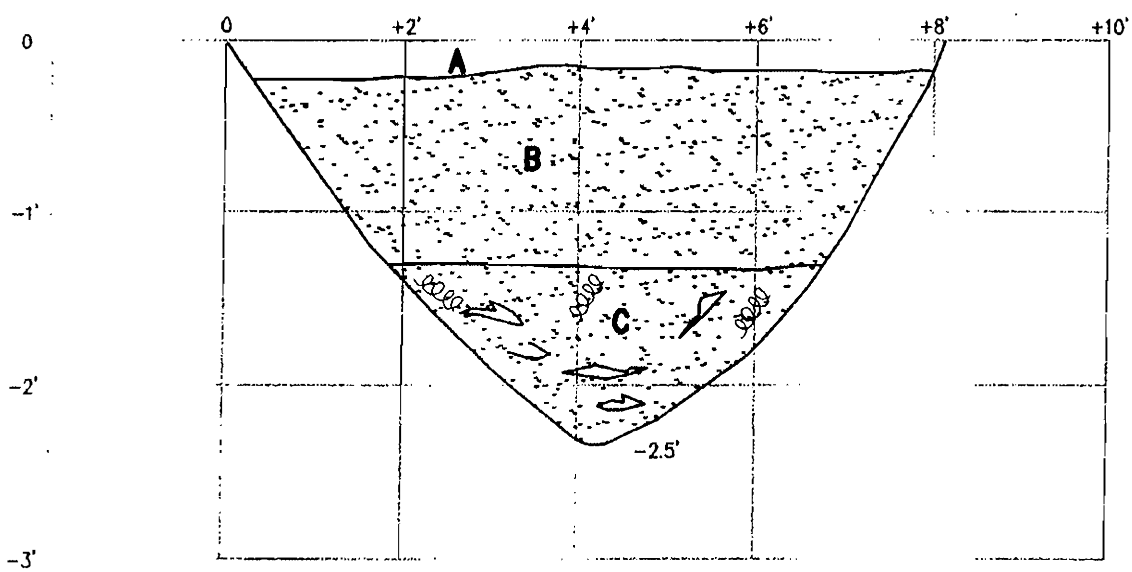
A) 0"-3" SOIL/GRASS COVER W/ 3" ROOT ZONE ON SILTY SAND

B) 3"-1.5' FILL - SP, FINE SAND, OLIVE BROWN (2.5Y 4/3), SLIGHT MOISTURE

C) 1.5'-2.5' REFUSE - OXIDIZED LAYER OF WOOD, METAL , ETC. IN A DARK SILTY SAND. MATRIX

COLLECT SOIL SAMPLE 095-055 FROM HORIZON B

PROFILE OF PITWALL: ← NORTH SOUTH →



SCALE: 1' - VERT.
2' - HORZ.

BEARING: NORTH/SOUTH

TRENCH WALL: WEST
IR2G-9

CLIENT US NAVY/SWDIV
PROJECT NO. 2384.095D
LOCATION ALAMEDA, IN SITE 2

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

Appendix B
(on CD only)

Laboratory Test Results from Previous Investigations

CH2M Hill Kleinfelder, a Joint Venture
Document Control No. KCH-2622-0006-0029

and

Tetra Tech Foster Wheeler
Document Control No. FWSD-RAC-02-1787

BORING NO.	SAMPLE DEPTH (ft)	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (% of dry weight)	PARTICLE SIZE SIEVE SIZE (percent passing)						ATTERBERG LIMITS		OTHER TESTS
				6"	3"	3/4"	#4	#10	#200	L.L.	P.I.	
KCHSB-1	1.5											MEC screening with MG 230 every 1 foot from 0-10'
KCHSB-1	3.8											Hollow Stem Auger (6") 0-15'
KCHSB-1	5.0											Casing set 0-18.5' (pounded in last few feet)
KCHSB-1	13.0											Driller notes change to sandy material at ~13'
KCHSB-1	16.0	111	20						5			Stopped to set up mud rotary
KCHSB-1	18.5											Mud rotary 18.5' to bottom
KCHSB-1	20.0											Note: driller forgot to use liners. Sample bagged
KCHSB-1	26.0	106	21						3			
KCHSB-1	40.0		39				93		44	41	25	
KCHSB-1	42.0											500 PSI PUSH
KCHSB-1	45.0								24			0 PSI PUSH
KCHSB-1	51.0									NP	NP	TXUU
KCHSB-1	58.0											Color changed in cuttings at 58 ft.
KCHSB-1	71.0	110	19						20			
KCHSB-1	90.0	115	20						15			
KCHSB-2	1.0											Hollow Stem Auger (6") 0-15'
KCHSB-2	1.5											MEC screening with MG 230 every 1 foot from 0-10'
KCHSB-2	5.0											RAD screening on all samplers augers
KCHSB-2	11.0											0-600 PSI PUSH
KCHSB-2	11.5									46	28	
KCHSB-2	12.0											TXUU
KCHSB-2	15.0											Stopped Hollow stem auger @ 15 feet, removed 6" casing, set 1-19.5'.
												Mud equipment set up
KCHSB-2	16.0	107	22						9			
KCHSB-2	20.5											UC
KCHSB-2	21.0									94	65	
KCHSB-2	21.5											Recovery = 27"
KCHSB-2	27.0											Recovery = 27"
KCHSB-2	31.0	79	44						56	46	29	
KCHSB-2	36.0											Recovery = 27"
KCHSB-2	41.0											Recovery = 28"
KCHSB-2	46.0	81	43						91			
KCHSB-2	50.0											Recovery = 28"
KCHSB-2	60.0									41	17	Recovery = 28"
KCHSB-2	61.5	73	48									
KCHSB-2	62.0											CONSOL
KCHSB-2	71.5											Recovery = 17"
KCHSB-3	26.0	114	18						10			
KCHSB-3	35.5	105	24						23	20	4	
KCHSB-3	36.0	101	25									
KCHSB-3	47.5	73	49							43	20	

KA LAB SUMMARY KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

Project Number: 106454

Date: 06-14-11

Entry By: A.Markey

Checked By: M.John

File Name:

SUMMARY OF LABORATORY TESTS

GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

Plate

B-1

BORING NO.	SAMPLE DEPTH (ft)	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (% of dry weight)	PARTICLE SIZE SIEVE SIZE (percent passing)						ATTERBERG LIMITS		OTHER TESTS
				6"	3"	3/4"	#4	#10	#200	L.L.	P.I.	
KCHSB-3	97.5	101	22						15			
KCHSB-3	98.0	108	17									
KCHSB-4	24.0		42				100		60	33	15	
KCHSB-4	50.5	74	46									
KCHSB-4	61.0									41	20	
KCHSB-4	80.5	99	24				100		23	19	4	
KCHSB-5	21.0	93	33						48	26	6	
KCHSB-5	25.0									77	50	
KCHSB-5	26.0	55	77									
KCHSB-5	26.5	59	67									
KCHSB-5	27.0	58	71									
KCHSB-5	27.5	50	89									
KCHSB-5	30.5								87			
KCHSB-5	80.0									39	19	
KCHSB-5	81.5	94	27									
KCHSB-5	91.0	74	44									
KCHSB-6	20.0						100		5			
KCHSB-6	22.0	106	23									
KCHSB-6	35.0		36				100		67			
KCHSB-6	40.0						100		30	NP	NP	
KCHSB-6	41.0	104	23									
KCHSB-6	41.5	98	29									
KCHSB-6	42.0	99	27									
KCHSB-6	51.0	110	18						9			

KA LAB SUMMARY KA CORPORATE STD.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

KCH

Project Number: 106454

Date: 06-14-11

Entry By: A.Markey

Checked By: M.John

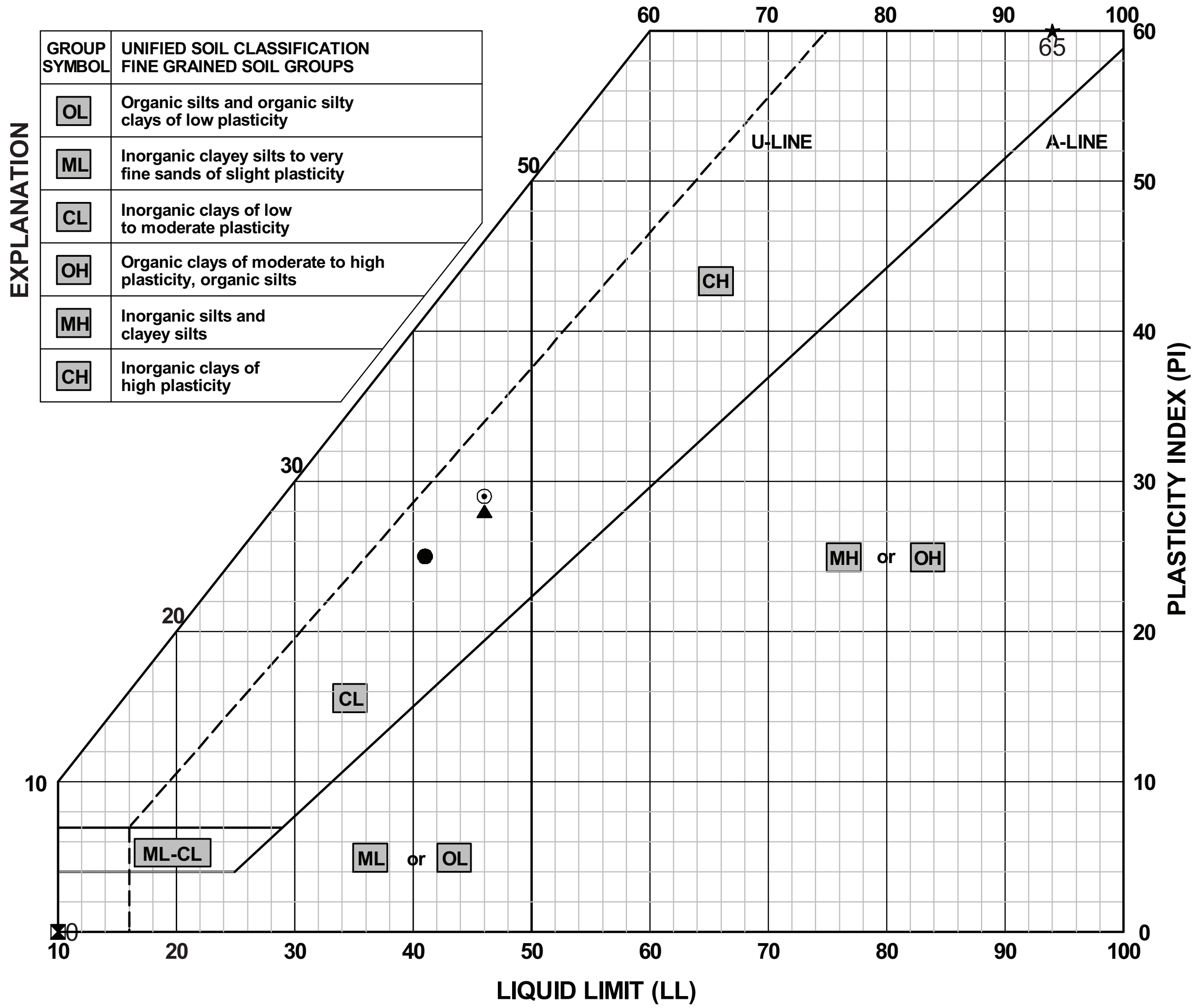
File Name:

SUMMARY OF LABORATORY TESTS

GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

Plate

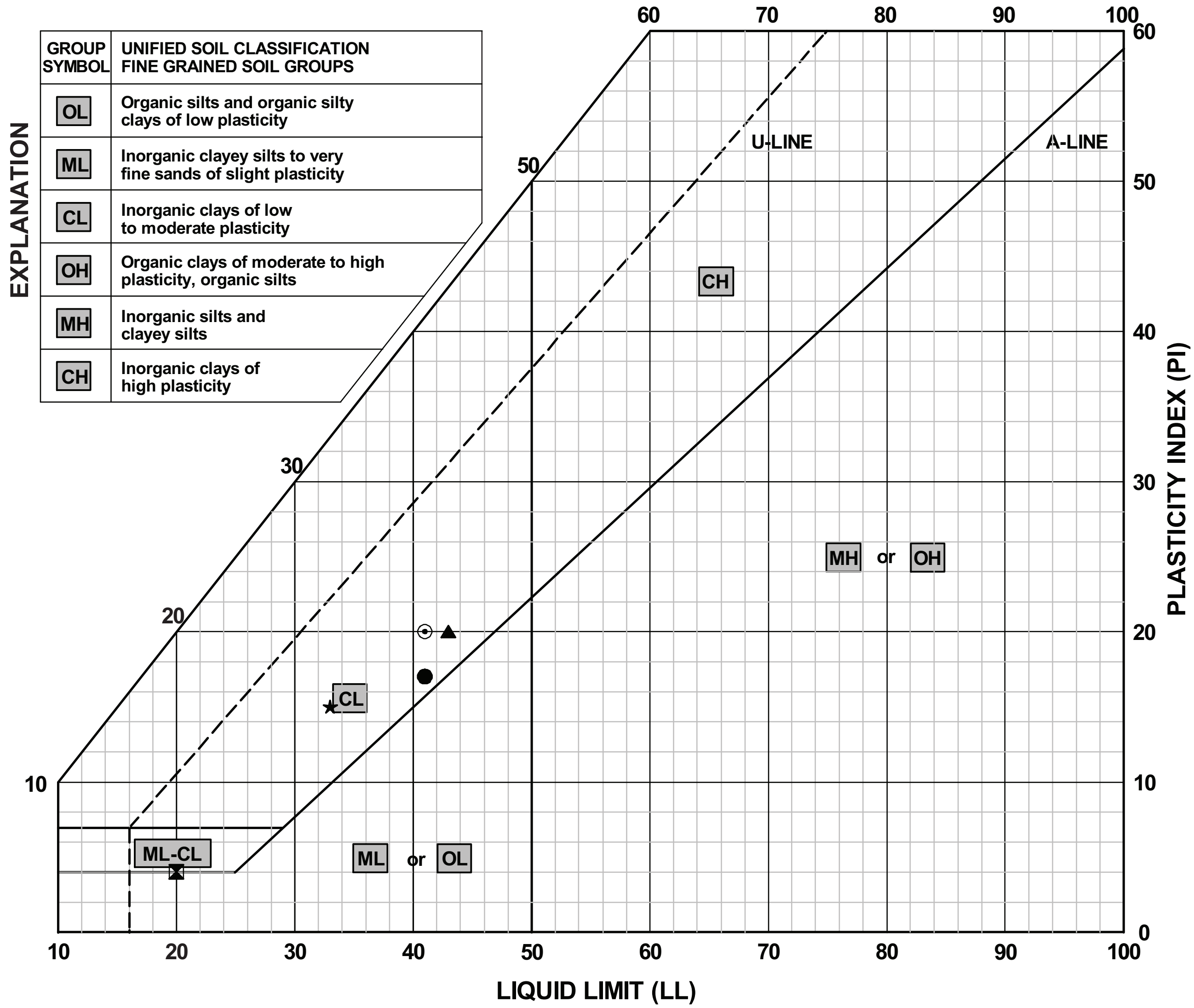
B-1



LEGEND:	SOURCE	DEPTH (ft)	LL	PL	PI	DESCRIPTION
●	KCHSB-1	40.0	41	16	25	Very Dark Gray Clayey Sand with Shells (SC)
⧗	KCHSB-1	51.0	NP	NP	NP	Dark Gray Silty Sand (SM)
▲	KCHSB-2	11.5	46	18	28	Very Dark Gray Sandy Lean Clay (CL)
★	KCHSB-2	21.0	94	29	65	Black Fat Clay (CH)
⊙	KCHSB-2	31.0	46	17	29	Mottled Black Sandy Lean Clay (CL)

KA_ATTERBERG KA_2005.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

KCH Drafted By: A.Markey Project No.: 106454 Date: 6/14/2011 File Number:	**PLASTICITY CHART** GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	PLATE 1 of 3 B-2



LEGEND:	SOURCE	DEPTH (ft)	LL	PL	PI	DESCRIPTION
●	KCHSB-2	60.0	41	24	17	Lean Clay with Sand (CL)
⊠	KCHSB-3	35.5	20	16	4	Black Silty Clayey Sand (SC-SM) - Composite
▲	KCHSB-3	47.5	43	23	20	Lean Clay with Sand (CL)
★	KCHSB-4	24.0	33	18	15	Very Dark Gray Sandy Lean Clay (CL)
⊙	KCHSB-4	61.0	41	21	20	Dark Gray Lean Clay (CL)

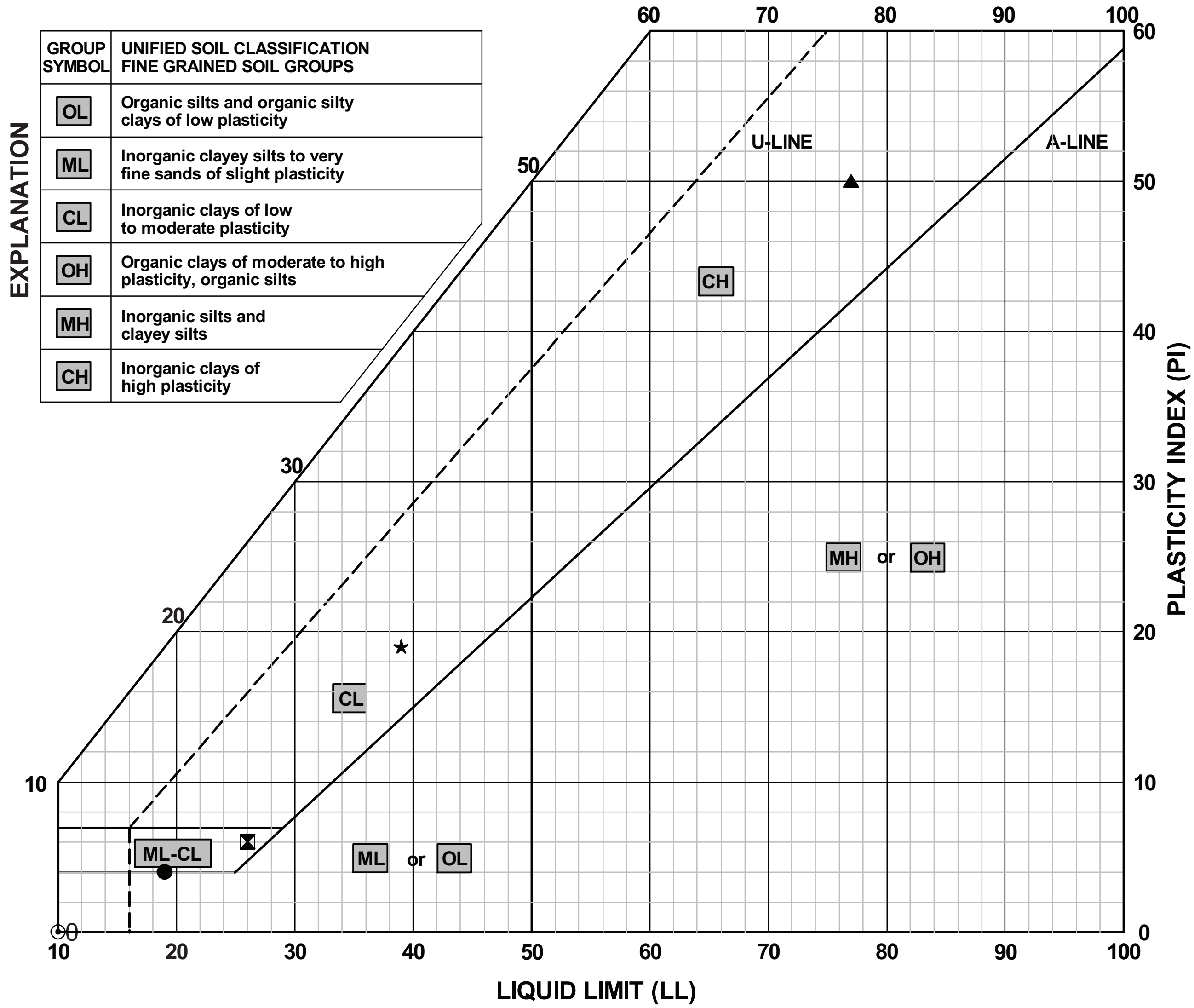
KCH

Drafted By: A.Markey
Date: 6/14/2011
Project No.: 106454
File Number:

PLASTICITY CHART
GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

PLATE
2 of 3
B-2

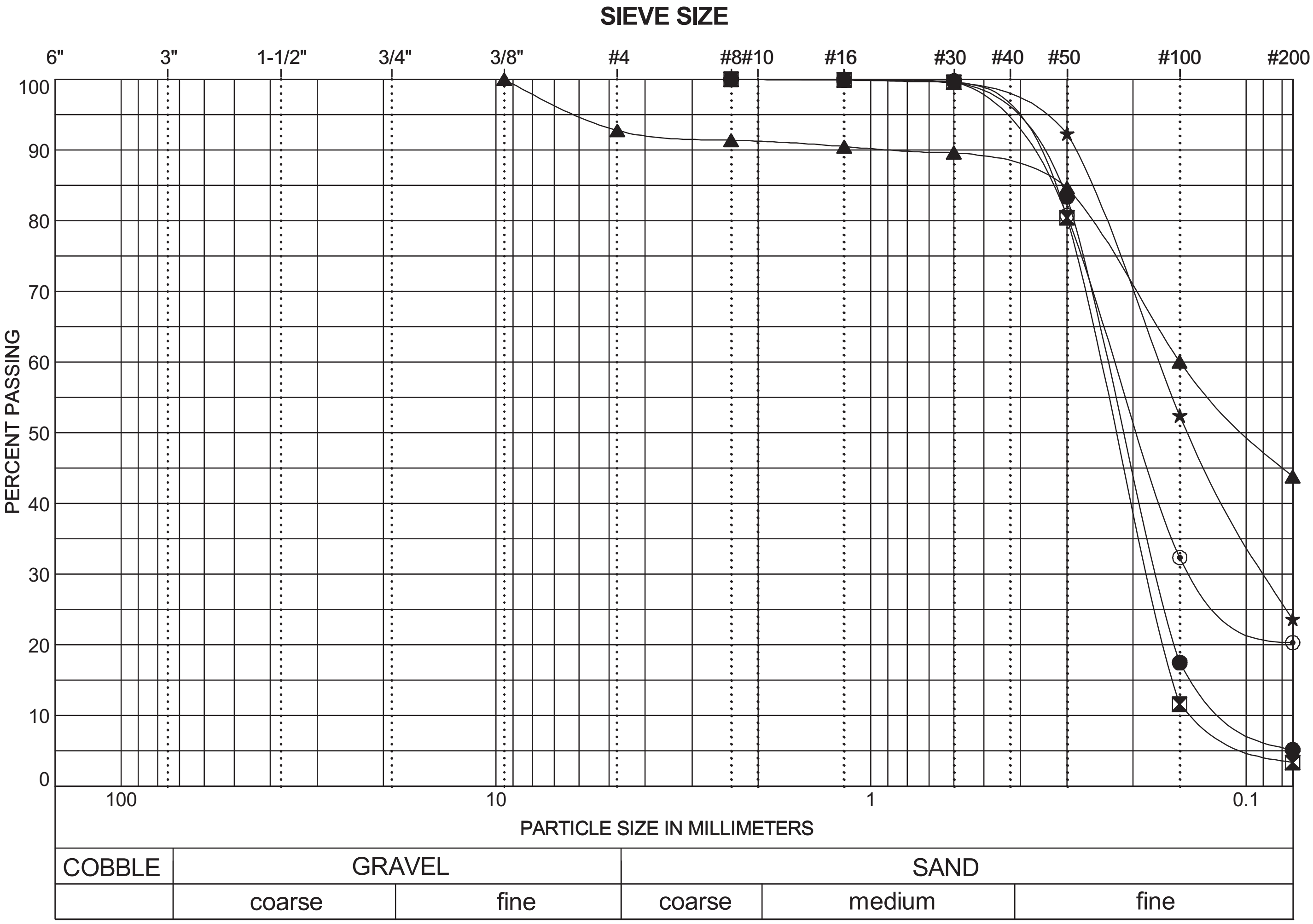
KA_ATTERBERG KA_2005.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11



LEGEND:	SOURCE	DEPTH (ft)	LL	PL	PI	DESCRIPTION
●	KCHSB-4	80.5	19	15	4	Olive Gray Silty Clayey Sand (SC-SM)
⧗	KCHSB-5	21.0	26	20	6	Very Dark Gray Silty Clayey Sand (SC-SM)
▲	KCHSB-5	25.0	77	27	50	Fat Clay (CH)
★	KCHSB-5	80.0	39	20	19	Lean Clay with Sand (CL)
⊙	KCHSB-6	40.0	NP	NP	NP	Silty Sand (SM)

KA_ATTERBERG KA_2005.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

KCH Drafted By: A.Markey Project No.: 106454 Date: 6/14/2011 File Number:	**PLASTICITY CHART** GEOTECHNICAL INVESTIGATION REPORT INSTALLATION RESTORATION SITE 2 FORMER NAVAL AIR STATION ALAMEDA ALAMEDA COUNTY, CALIFORNIA	PLATE 3 of 3 B-2



LEGEND:	SOURCE	DEPTH (ft)	COBBLE (%)	GRAVEL (%)	SAND (%)	FINES (%)	D60 (mm)	D10 (mm)	Cu	Cc	DESCRIPTION
●	KCHSB-1	16.0	0	0	95	5	0.23	0.1	2.4	1.3	Very Dark Gray Poorly Graded Sand with Silt (SP-SM)
⊠	KCHSB-1	26.0	0	0	97	3	0.24	0.13	1.9	1	Very Dark Gray Poorly Graded Sand (SP)
▲	KCHSB-1	40.0	0	7	49	44	0.15				Very Dark Gray Clayey Sand with Shells (SC)
★	KCHSB-1	45.0	0	0	76	24	0.17				Dark Gray Silty Sand (SM) - Composite
⊙	KCHSB-1	71.0	0	0	80	20	0.22				Olive Silty Clayey Sand (SC-SM)

KA_SIEVE KA_2005.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

KCH

GRAIN SIZE ANALYSES

GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

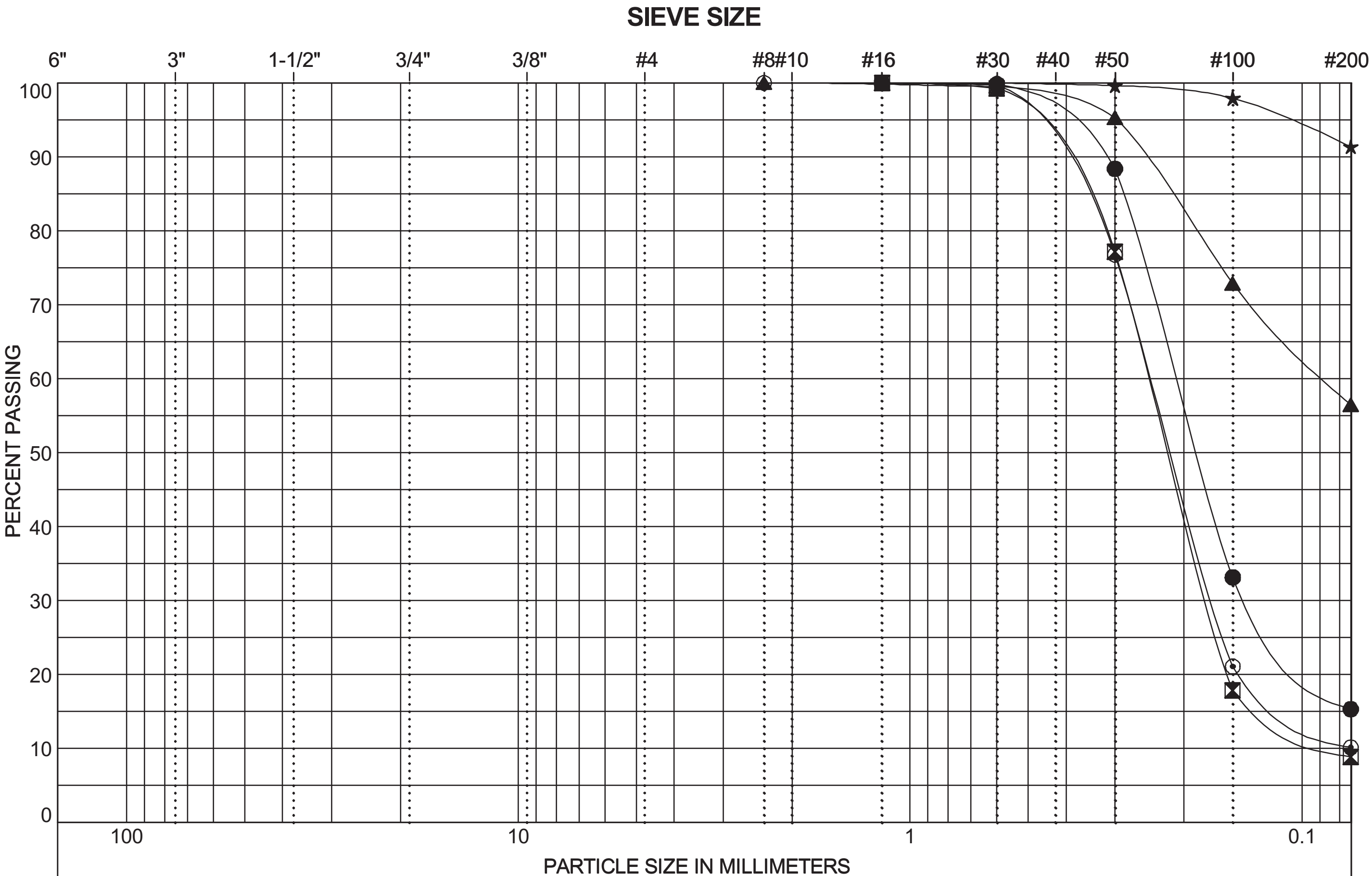
PLATE

1 of 4

B-3

Drafted By: A.Markey
Date: 6/14/2011

Project No.: 106454
File Number:



COBBLE	GRAVEL		SAND		
	coarse	fine	coarse	medium	fine

LEGEND:	SOURCE	DEPTH (ft)	COBBLE (%)	GRAVEL (%)	SAND (%)	FINES (%)	D60 (mm)	D10 (mm)	Cu	Cc	DESCRIPTION
●	KCHSB-1	90.0	0	0	85	15	0.21				Poorly Graded Sand with Clay
⧗	KCHSB-2	16.0	0	0	91	9	0.25	0.08	3	1.5	Very Dark Gray Poorly Graded Sand with Clay (SP- SC)
▲	KCHSB-2	31.0	0	0	44	56	0.09				Mottled Black Sandy Lean Clay (CL)
★	KCHSB-2	46.0	0	0	9	91					Very Dark Gray Lean Clay (CL)
⊙	KCHSB-3	26.0	0	0	90	10	0.24		3.3	1.6	Very Dark Gray Poorly Graded Sand with Silt (SP-SM)

KA_SIEVE KA_2005.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

KCH

Drafted By: A.Markey
Date: 6/14/2011
Project No.: 106454
File Number:

GRAIN SIZE ANALYSES
GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

PLATE
2 of 4
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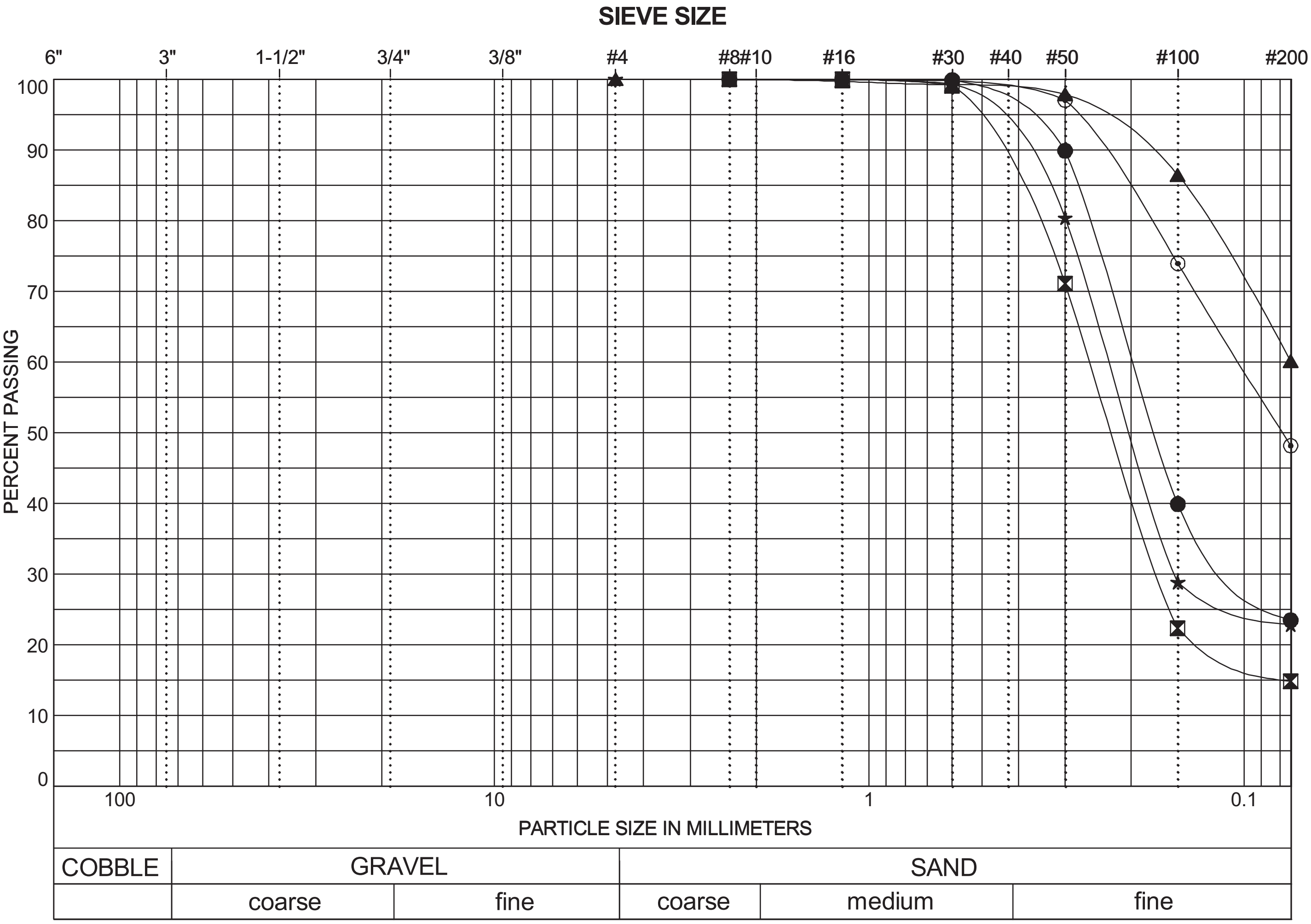

LEGEND:	SOURCE	DEPTH (ft)	COBBLE (%)	GRAVEL (%)	SAND (%)	FINES (%)	D60 (mm)	D10 (mm)	Cu	Cc	DESCRIPTION
●	KCHSB-3	35.5	0	0	77	23	0.2				Black Silty Clayey Sand (SC-SM) - Composite
⊠	KCHSB-3	97.5	0	0	85	15	0.26				Dark Gray Clayey Sand (SC) - Composite
▲	KCHSB-4	24.0	0	0	40	60					Very Dark Gray Sandy Lean Clay (CL)
★	KCHSB-4	80.5	0	0	77	23	0.23				Olive Gray Silty Clayey Sand (SC-SM)
⊙	KCHSB-5	21.0	0	0	52	48	0.1				Very Dark Gray Silty Clayey Sand (SC-SM)

KCH

Drafted By: A.Markey
Date: 6/14/2011
Project No.: 106454
File Number:

GRAIN SIZE ANALYSES
GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

PLATE
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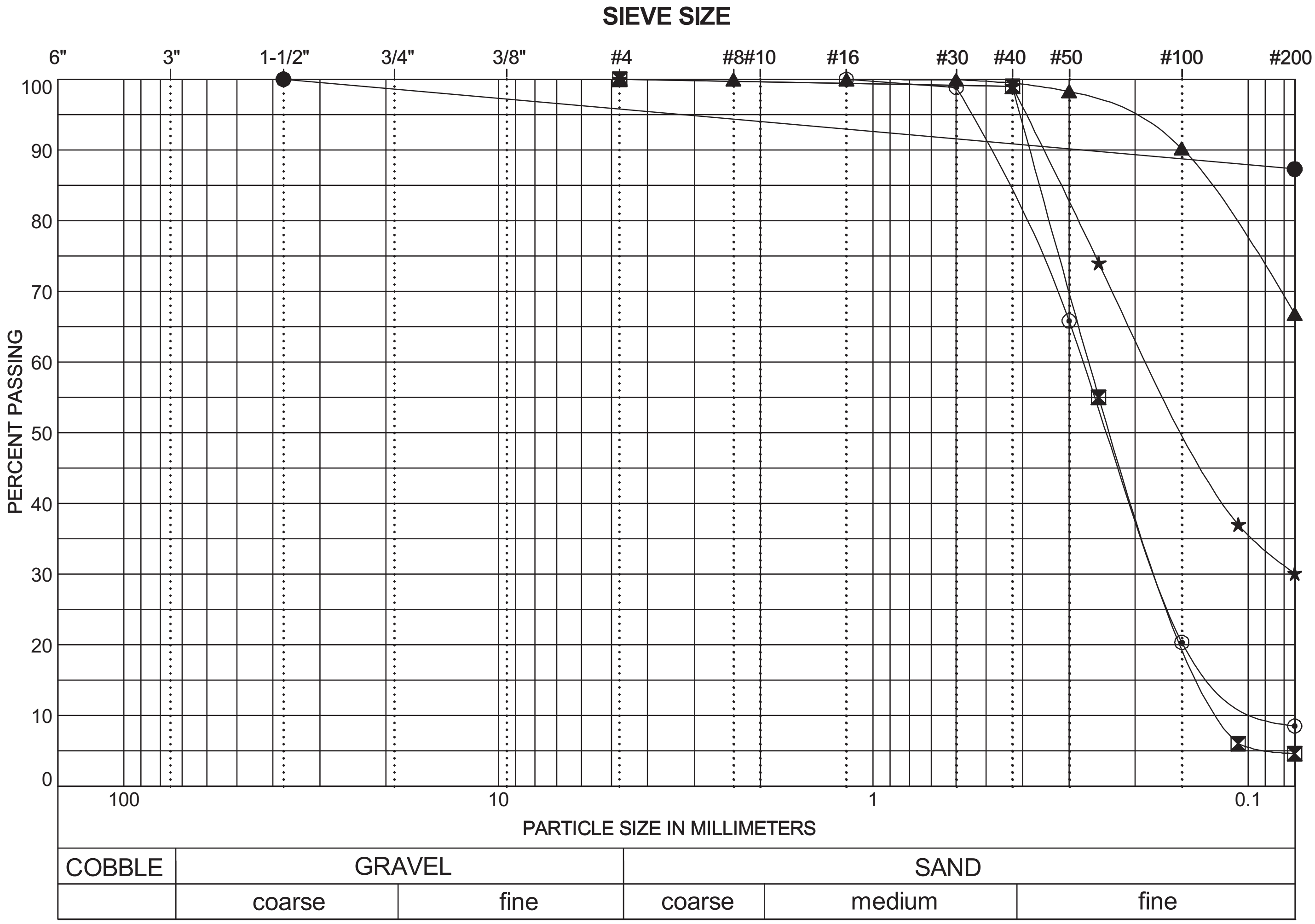


LEGEND:	SOURCE	DEPTH (ft)	COBBLE (%)	GRAVEL (%)	SAND (%)	FINES (%)	D60 (mm)	D10 (mm)	Cu	Cc	DESCRIPTION
●	KCHSB-5	30.5	0	4	8	87					Very Dark Gray Lean Clay (CL)
⧗	KCHSB-6	20.0	0	0	95	5	0.27	0.11	2.3	0.9	Poorly Graded Sand (SP)
▲	KCHSB-6	35.0	0	0	33	67					Dark Gray Sandy Silt (ML)
★	KCHSB-6	40.0	0	0	70	30	0.18				Silty Sand (SM)
⊙	KCHSB-6	51.0	0	0	91	9	0.27	0.08	3.4	1.3	Very Dark Gray Poorly Graded Sand with Silt (SP-SM)

KA_SIEVE KA_2005.GDT KLEINFELDER-CH GINT STD LIBRARY R4.GLB CTO_0006_MORLEY.GPJ 6/14/11

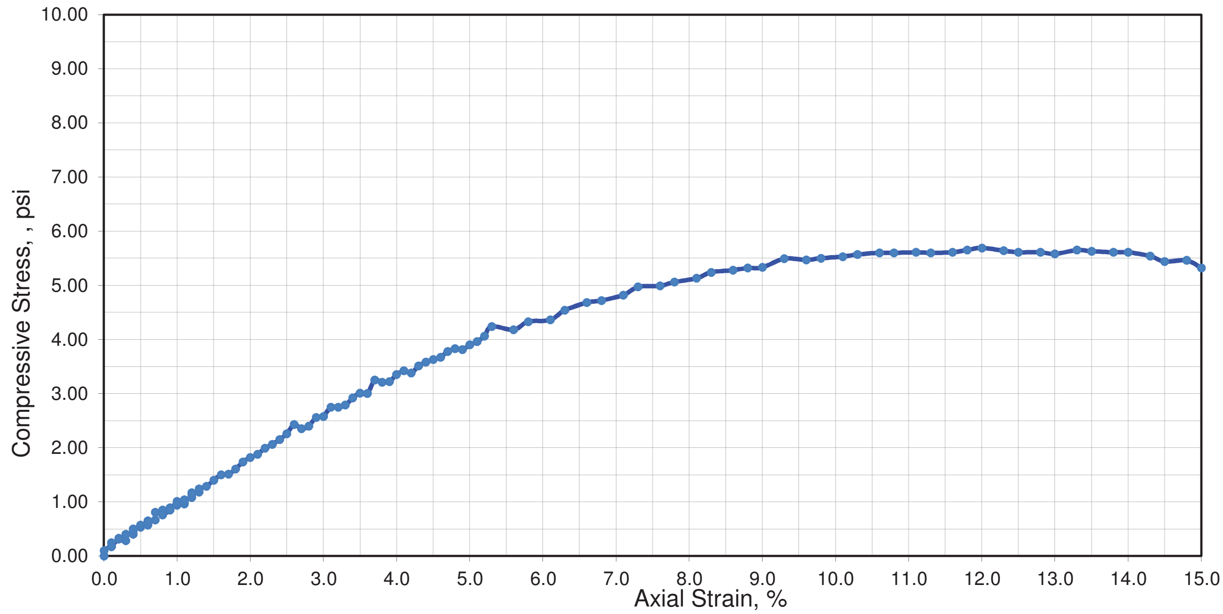
KCH

Drafted By: A.Markey
Date: 6/14/2011
Project No.: 106454
File Number:

GRAIN SIZE ANALYSES
GEOTECHNICAL INVESTIGATION REPORT
INSTALLATION RESTORATION SITE 2
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA COUNTY, CALIFORNIA

PLATE
4 of 4
B-3

Unconfined Compression Test Report



Specimen Failure Picture

Specimen No.			1
Initial	Diameter, in	D_O	2.40
	Height, in	H_O	4.90
	Water Content, %	ω_O	48.0
	Dry Density, lbs/ft^3	γ_{d_o}	74.2
	Saturation, %	S_O	100.7
	Void Ratio	e_O	1.313
Time to Failure, min.		t_f	6.1
Unconfined Compressive Strength, psi		q_u	5.694
Shear Strength, psi		s_u	2.847
Strain at Failure, %		ε_f	12.0
Average Rate of Strain to Failure, %/min		ε	2.0

Description of Specimen: Lean clay with sand

Amount of Material Finer than the No. 200, %: nm

LL: 43	PL: 23	PI: 20	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2166

nm = not measured, na = not applicable

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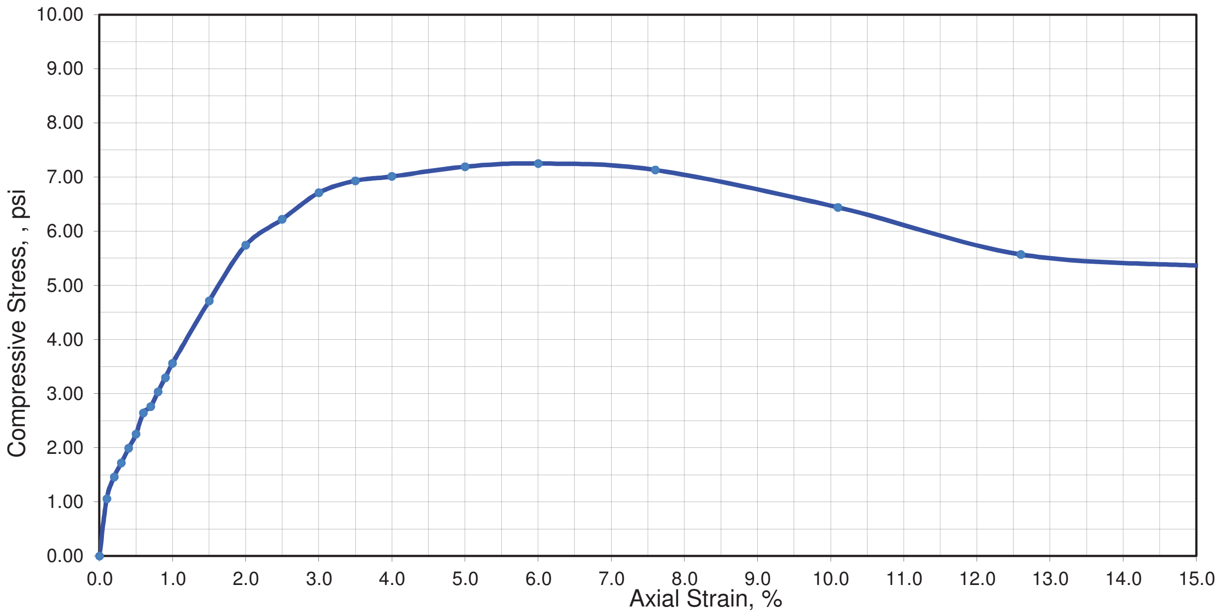
Project No.:	106454-08.04
Boring:	KCHSB-3
Sample:	9
Depth, ft.:	47-47.5
Date:	April 7, 2011

Plate

1 of 1

B-5

Unconfined Compression Test Report



Specimen Failure Picture

Specimen No.			1
Initial	Diameter, in	D_O	2.84
	Height, in	H_O	5.96
	Water Content, %	ω_O	57.8
	Dry Density, lbs/ft^3	γ_{d_o}	66.8
	Saturation, %	S_O	101.3
	Void Ratio	e_O	1.570
Time to Failure, min.		t_f	6.0
Unconfined Compressive Strength, psi		q_u	7.250
Shear Strength, psi		s_u	3.625
Strain at Failure, %		ε_f	6.0
Average Rate of Strain to Failure, %/min		ε	1.0

Description of Specimen: Fat clay

Amount of Material Finer than the No. 200, %: nm

LL: nm	PL: nm	PI: nm	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2166

nm = not measured, na = not applicable

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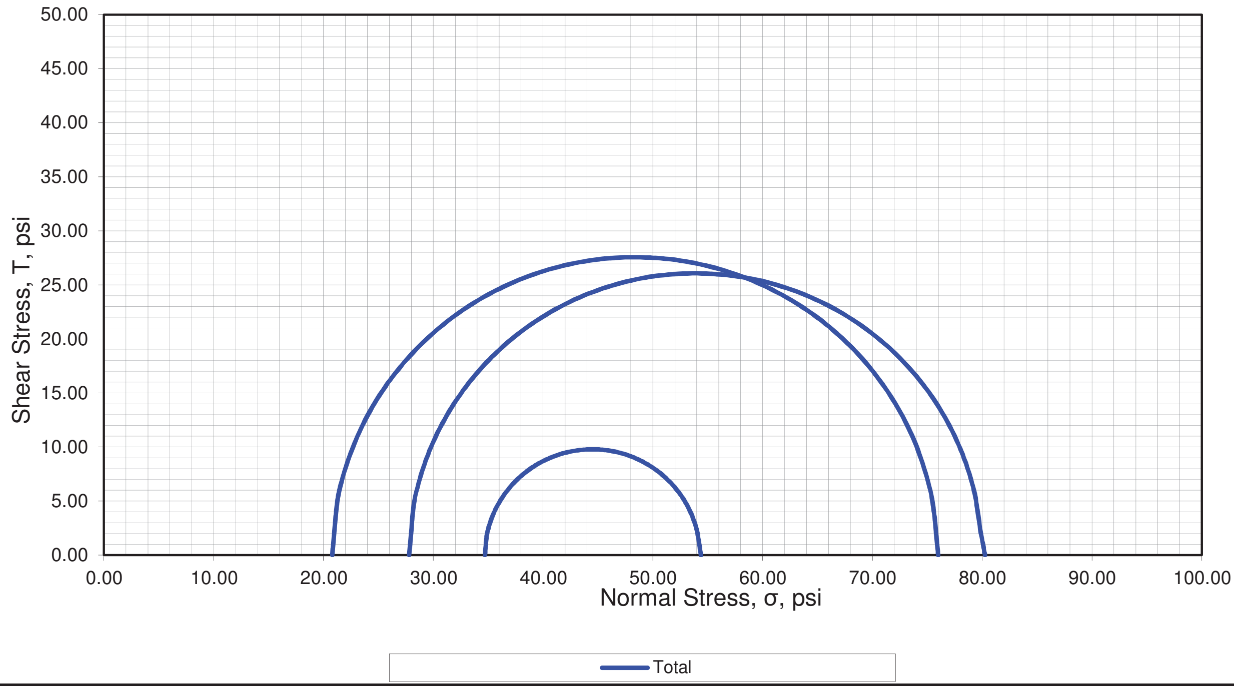
Project No.:	106454-08.04
Boring:	KCHSB-5
Sample:	5
Depth, ft.:	30.5
Date:	May 17, 2011

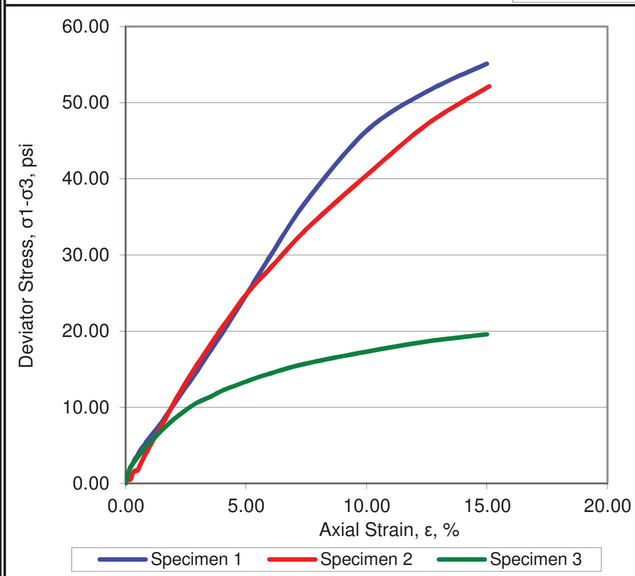
Plate

1 of 1

B-6

Triaxial Compression Test Report





Specimen No.			1	2	3
Initial	Diameter, in	D_O	2.84	2.83	2.85
	Height, in	H_O	6.51	5.95	6.18
	Water Content, %	ω_O	23.2	22.3	23.3
	Dry Density, lbs/ft^3	γ_{d_o}	105.2	106.3	103.1
	Saturation, %	S_O	101.0	99.7	96.5
	Void Ratio	e_O	0.631	0.615	0.664
Minor Principal Stress, psi		σ_3	20.8	27.8	34.7
Maximum Deviator Stress, psi		$(\sigma1-\sigma3)_{max}$	55.1	52.1	19.6
Time to $(\sigma_1-\sigma_3)_{max}$, min		t_f	15.0	15.0	15.0
Deviator Stress @ 15% Axial Strain, psi		$(\sigma_1-\sigma_3)_{15\%}$	55.1	47.3	19.6
Ultimate Deviator Stress, psi		$(\sigma_1-\sigma_3)_{ult}$	na	na	na
Rate of strain, %/min		'ε	1.0		

Description of Specimen 1: Silty sand

Description of Specimen 2: Silty sand

Description of Specimen 3: Silty sand

Amount of Material Finer than the No. 200, %: nm

LL: nm	PL: nm	PI: nm	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2850

Membrane Correction applied.

nm = not measured, na = not applicable

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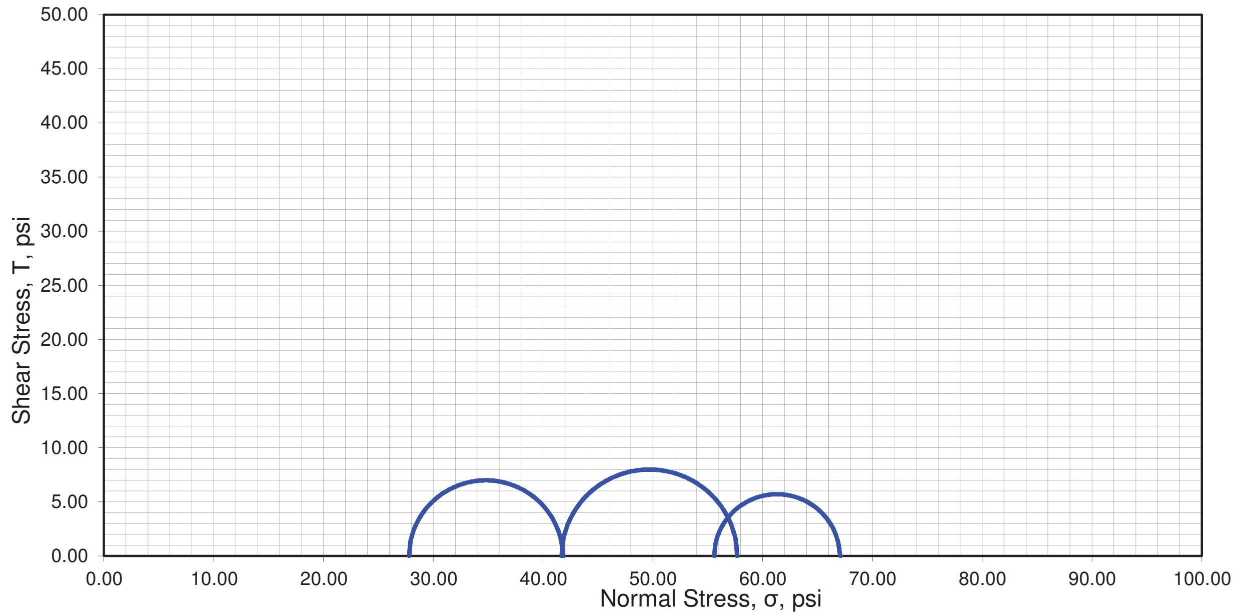
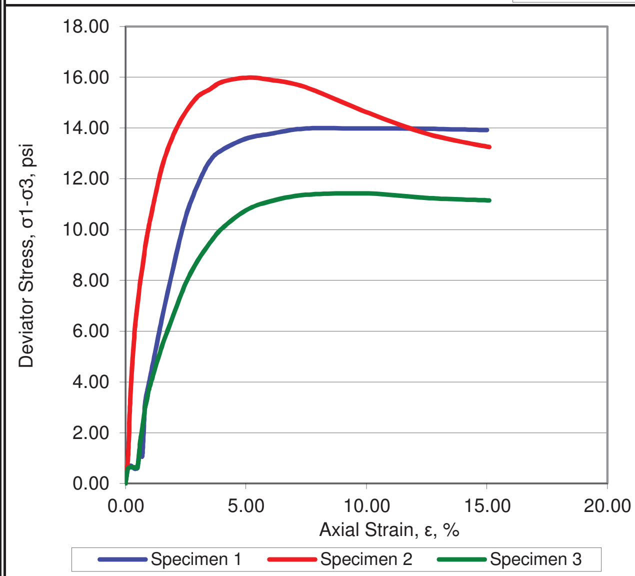
Project No.:	106454-08.04
Boring:	KCHSB-1
Sample:	10
Depth, ft.:	50-52
Date:	May 17, 2011

Plate

B-7

Triaxial Compression Test Report





Specimen No.			1	2	3
Initial	Diameter, in	D_O	2.86	2.85	2.86
	Height, in	H_O	6.30	6.16	6.46
	Water Content, %	ω_O	38.8	37.1	40.5
	Dry Density, lbs/ft^3	γ_{d_o}	81.7	83.4	78.9
	Saturation, %	S_O	97.0	96.5	94.8
	Void Ratio	e_O	1.100	1.058	1.176
Minor Principal Stress, psi		σ_3	27.8	41.7	55.6
Maximum Deviator Stress, psi		$(\sigma1-\sigma3)_{max}$	14.0	16.0	11.4
Time to $(\sigma_1\text{-}\sigma_3)_{max}$, min		t_f	10.0	5.0	10.0
Deviator Stress @ 15% Axial Strain, psi		$(\sigma_1-\sigma_3)_{15\%}$	13.9	13.7	11.2
Ultimate Deviator Stress, psi		$(\sigma_1-\sigma_3)_{ult}$	na	na	na
Rate of strain, %/min		'ε	1.0		

Description of Specimen 1: Sandy lean clay

Description of Specimen 2: Sandy silty clay

Description of Specimen 3: Lean clay with sand

Amount of Material Finer than the No. 200, %: nm

LL: nm	PL: nm	PI: nm	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2850

Membrane Correction applied.

nm = not measured, na = not applicable

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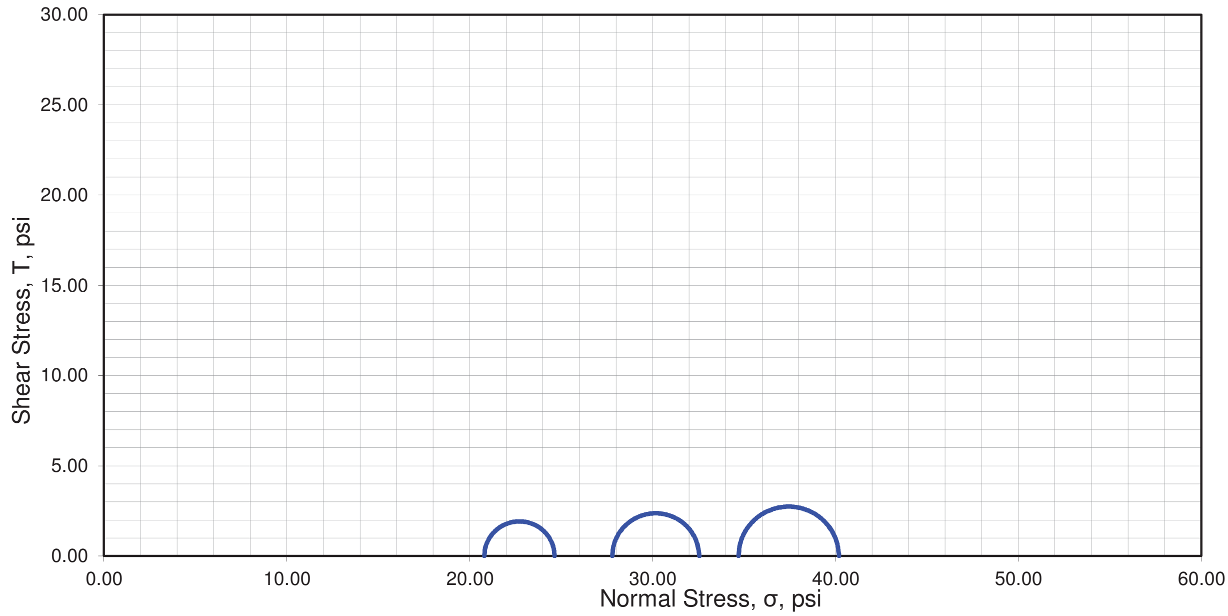
Project No.:	106454-08.04
Boring:	KCHSB-3
Sample:	13
Depth, ft.:	80-82
Date:	May 17, 2011

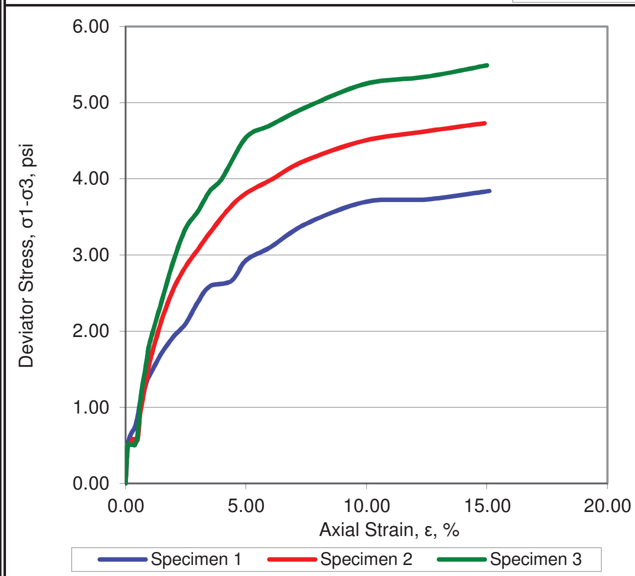
Plate

1 of 1

B-9

Triaxial Compression Test Report





Specimen No.			1	2	3
Initial	Diameter, in	D_O	2.90	2.86	2.87
	Height, in	H_O	5.78	6.34	6.30
	Water Content, %	ω_O	49.6	47.5	46.5
	Dry Density, lbs/ft^3	γ_{d_o}	69.7	73.3	73.3
	Saturation, %	S_O	93.4	97.5	95.3
	Void Ratio	e_O	1.462	1.340	1.341
Minor Principal Stress, psi		σ_3	20.8	27.8	34.7
Maximum Deviator Stress, psi		$(\sigma1-\sigma3)_{max}$	3.8	4.7	5.5
Time to $(\sigma_1\text{-}\sigma_3)_{max}$, min		t_f	15.0	15.0	15.0
Deviator Stress @ 15% Axial Strain, psi		$(\sigma_1-\sigma_3)_{15\%}$	3.7	4.7	5.5
Ultimate Deviator Stress, psi		$(\sigma_1-\sigma_3)_{ult}$	na	na	na
Rate of strain, %/min		'ε	1.0		

Description of Specimen 1:	Sandy lean clay
Description of Specimen 2:	Lean clay
Description of Specimen 3:	Lean clay
Amount of Material Finer than the No. 200, %:	nm

LL: nm	PL: nm	PI: nm	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2850

Membrane Correction applied.

nm = not measured, na = not applicable

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Project No.:	106454-08.04
Boring:	KCHSB-4
Sample:	9
Depth, ft.:	60-62
Date:	May 17, 2011

Plate

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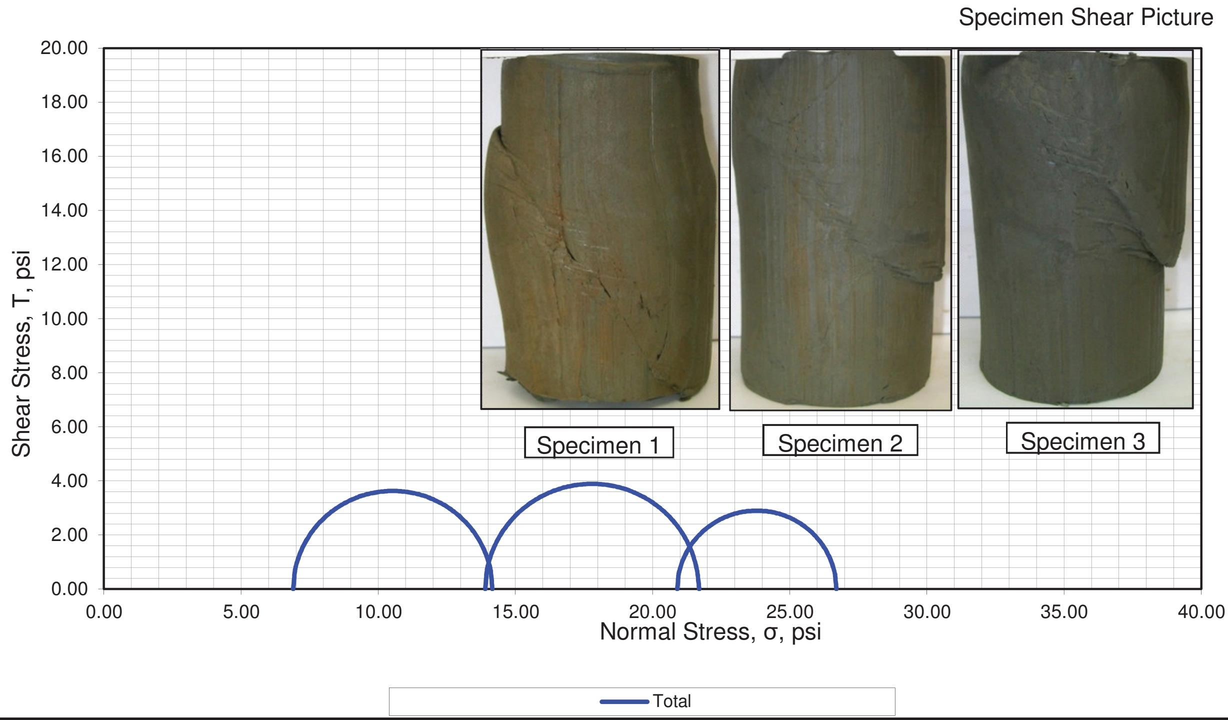
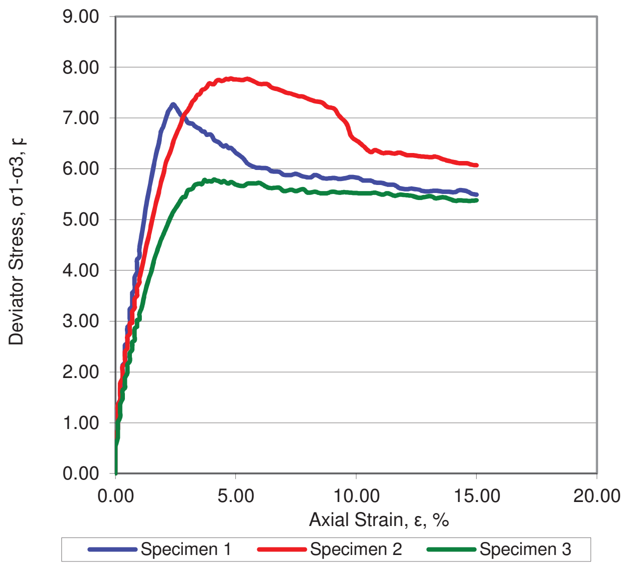
Triaxial Compression Test Report





Specimen No.			1	2	3
Initial	Diameter, in	D_O	2.83	2.84	2.82
	Height, in	H_O	5.90	5.91	5.89
	Water Content, %	ω_O	77.0	66.9	71.4
	Dry Density, lbs/ft^3	$^{\gamma}d_o$	55.3	59.2	57.5
	Saturation, %	S_O	100.6	97.1	99.0
	Void Ratio	e_O	2.105	1.897	1.983
Minor Principal Stress, psi		σ_3	6.9	13.9	20.9
Maximum Deviator Stress, psi		$(\sigma1-\sigma3)_{max}$	7.3	7.8	5.8
Time to $(\sigma_1\text{-}\sigma_3)_{max}$, min		t_f	3.0	6.1	5.2
Deviator Stress @ 15% Axial Strain, psi		$(\sigma_1-\sigma_3)_{15\%}$	5.5	6.1	5.4
Ultimate Deviator Stress, psi		$(\sigma_1-\sigma_3)_{ult}$	na	na	na
Rate of strain, %/min		'ε	0.8		

Description of Specimen 1:	Fat clay
Description of Specimen 2:	Fat clay
Description of Specimen 3:	Fat clay
Amount of Material Finer than the No. 200, %:	nm

LL: 77	PL: 27	PI: 50	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2850

Membrane Correction applied.

nm = not measured, na = not applicable

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Project No.:	106454-08.04
Boring:	KCHSB-5
Sample:	4
Depth, ft.:	25-27.5
Date:	April 21, 2011

Plate

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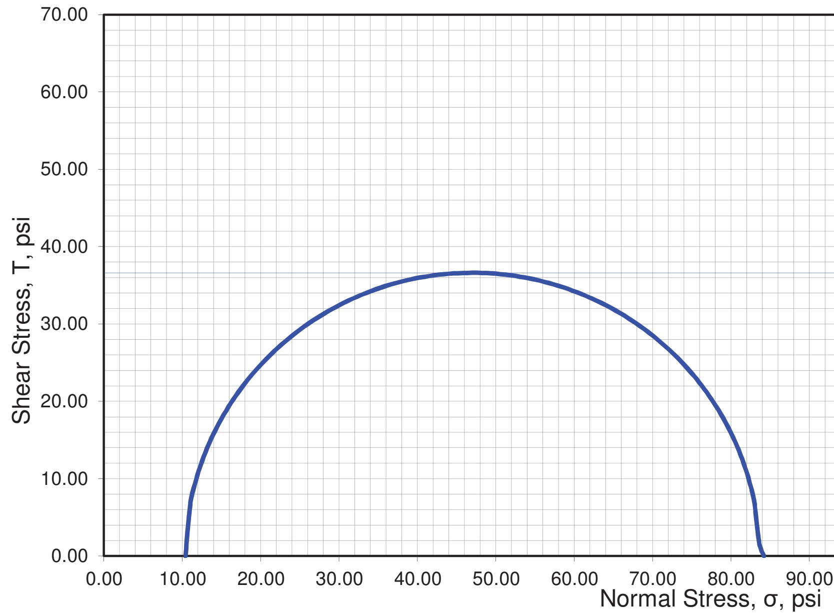
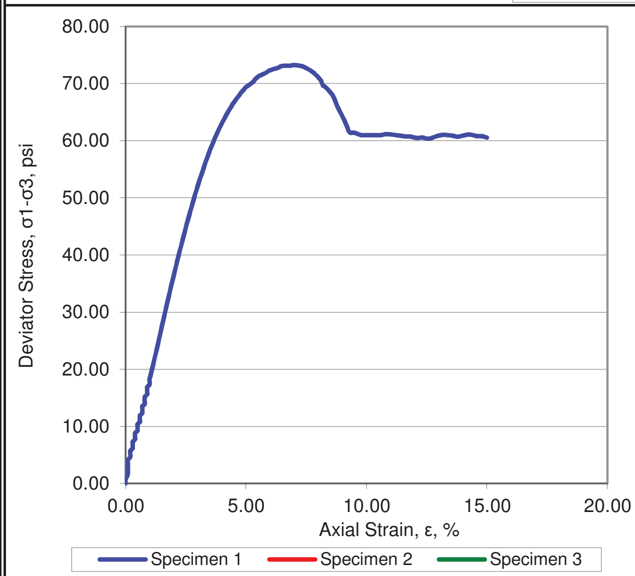
Triaxial Compression Test Report

Total		
c =	36.6	psi

Specimen Shear Picture





Specimen No.				1
Initial	Diameter, in		D_O	2.82
	Height, in		H_O	5.87
	Water Content, %		ω_O	22.7
	Dry Density, lbs/ft^3		γ_{d_o}	105.6
	Saturation, %		S_O	100.0
	Void Ratio		e_O	0.625
Minor Principal Stress, psi			σ_3	10.4
Maximum Deviator Stress, psi			$(\sigma1-\sigma3)_{max}$	73.2
Time to $(\sigma_1\text{-}\sigma_3)_{max}$, min			t_f	8.8
Deviator Stress @ 15% Axial Strain, p			$(\sigma_1-\sigma_3)_{15\%}$	60.5
Ultimate Deviator Stress, psi			$(\sigma_1-\sigma_3)_{ult}$	60.4
Rate of strain, %/min			'ε	0.8

Description of Specimen: Sand

Amount of Material Finer than the No. 200, %: 5

LL: --	PL: --	PI: NP	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2850

Membrane correction applied

nm = not measured, na = not applicable

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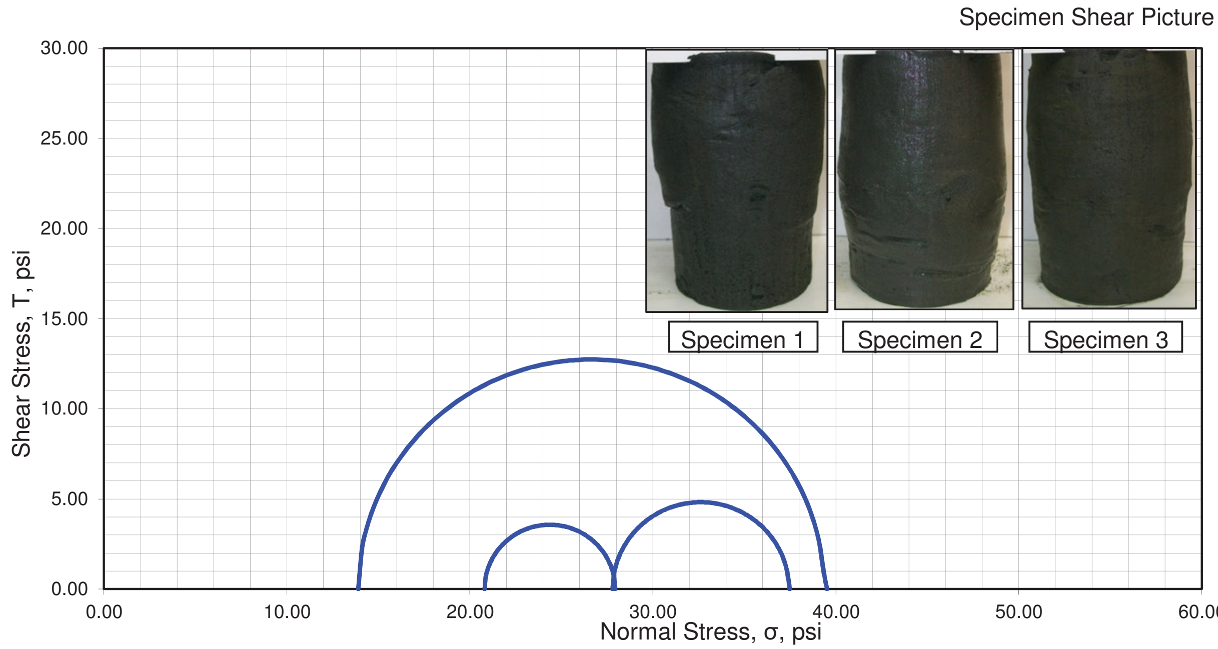
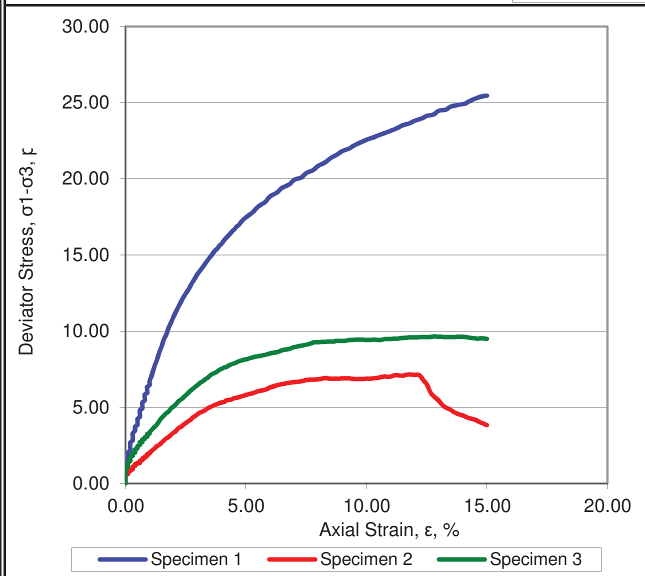
Project No.:	106454-08.04
Boring:	KCHSB-6
Sample:	1
Depth, ft.:	20-22.5
Date:	April 7, 2011

Plate

B-12

Triaxial Compression Test Report





Specimen No.			1	2	3
Initial	Diameter, in	D_O	2.83	2.85	2.85
	Height, in	H_O	5.87	5.74	5.83
	Water Content, %	ω_O	23.0	28.5	27.0
	Dry Density, lbs/ft^3	γ_{d_o}	104.4	98.1	99.2
	Saturation, %	S_O	98.3	104.7	101.9
	Void Ratio	e_O	0.644	0.749	0.729
Minor Principal Stress, psi		σ_3	13.9	20.8	27.8
Maximum Deviator Stress, psi		$(\sigma 1-\sigma 3)_{max}$	25.5	7.1	9.6
Time to $(\sigma_1-\sigma_3)_{max}$, min		t_f	25.0	19.7	21.2
Deviator Stress @ 15% Axial Strain, psi		$(\sigma_1-\sigma_3)_{15\%}$	25.5	3.8	9.5
Ultimate Deviator Stress, psi		$(\sigma_1-\sigma_3)_{ult}$	na	na	na
Rate of strain, %/min		'ε	0.6		

Description of Specimen 1:	Silty sand
Description of Specimen 2:	Silty sand
Description of Specimen 3:	Silty sand
Amount of Material Finer than the No. 200, %:	30

LL: --	PL: --	PI: NP	G_S: 2.75 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D 2850

Membrane Correction applied.

nm = not measured, na = not applicable

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Project No.:	106454-08.04
Boring:	KCHSB-6
Sample:	4
Depth, ft.:	40-42.5
Date:	April 7, 2011

Plate

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B-13

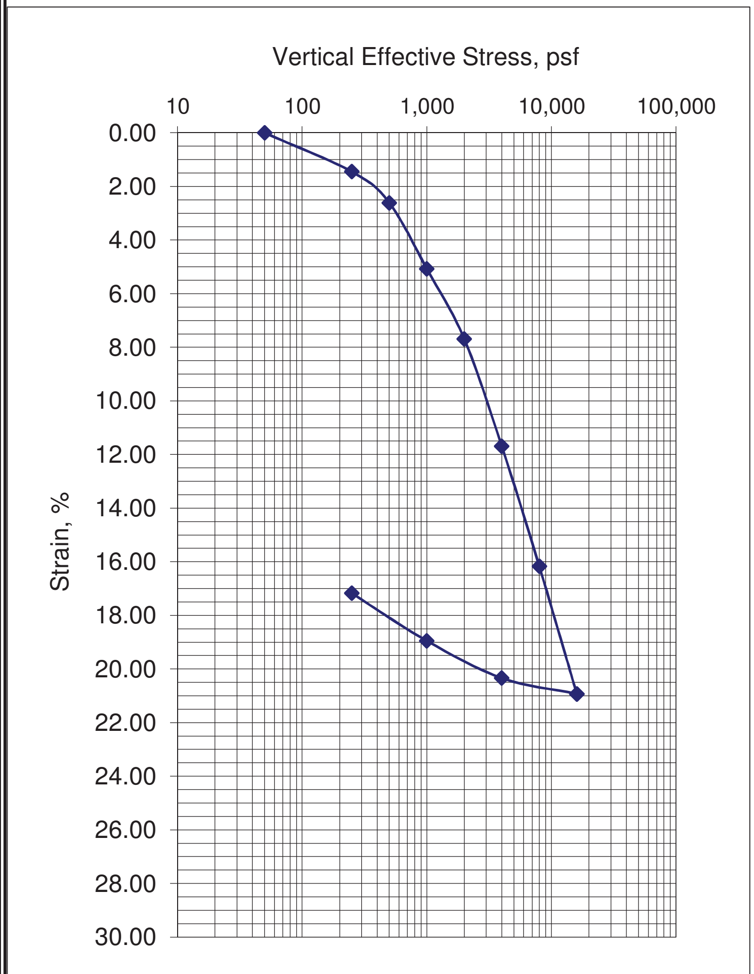
One-Dimensional Consolidation Test Report

Project Name:	CLEAN 2622 CTO 006RD IR Site 2
Project No.:	106454-08.04
Boring No.:	KCHSB-3
Sample No.:	9
Sample Depth, ft.:	45-47.5
Sample Description:	Lean clay with sand
Report Date:	April 14, 2011

One-Dimensional Consolidation of Soil (ASTM D 2435)

Water Content, %:		Density, pcf, Initial:		Density, pcf, Final:		Void Ratio:		Saturation, %:	
Initial:	48.9	Wet:	109.1	Wet:	118.8	Initial:	1.34	Initial:	100
Final:	33.8	Dry:	73.2	Dry:	88.8	Final:	0.93	Final:	100
Specific Gravity:	2.75	assumed							

Consolidation Graphs



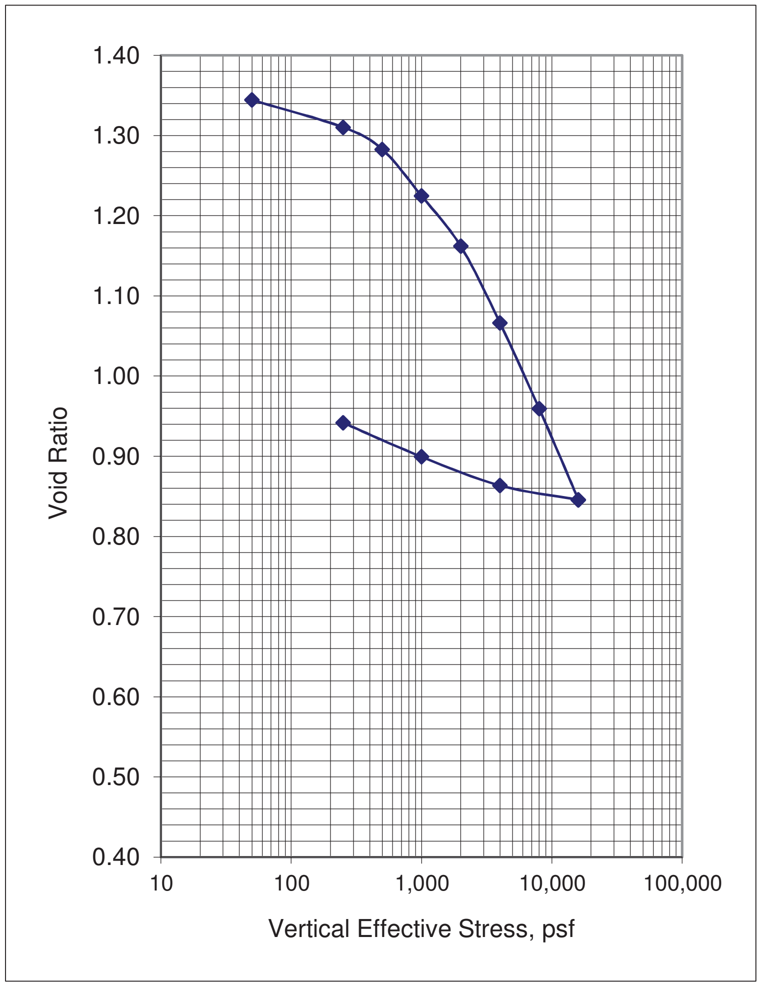


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Plate
1 of 2

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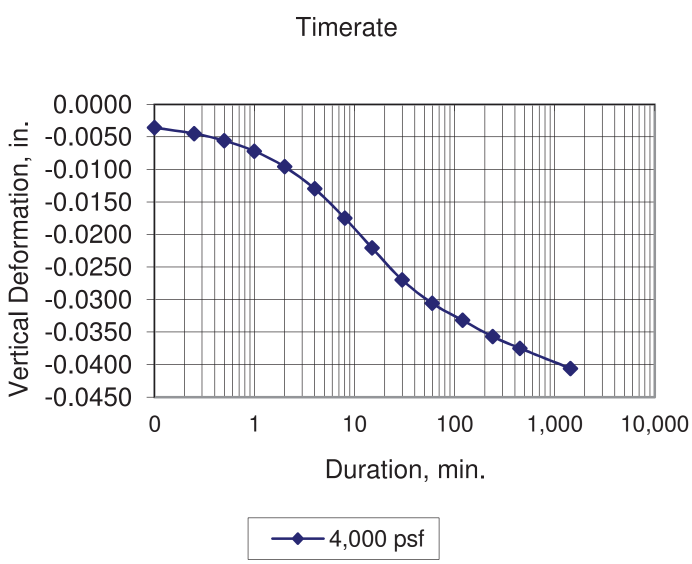
One-Dimensional Consolidation Test Report

Project Name:	CLEAN 2622 CTO 006RD IR Site 2
Project No.:	106454-08.04
Boring No.:	KCHSB-3
Sample No.:	9
Sample Depth, ft.:	45-47.5
Sample Description:	Lean clay with sand
Report Date:	April 14, 2011

One-Dimensional Consolidation of Soil (ASTM D 2435)

Time Rate Graphs



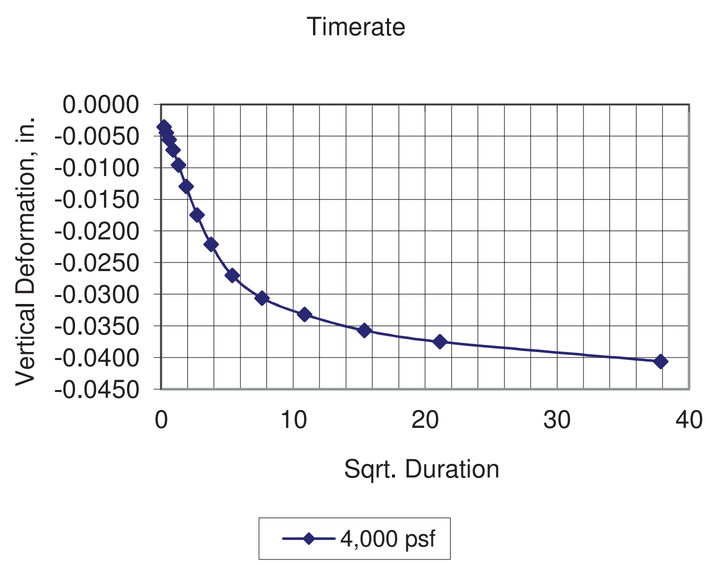


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Plate
2 of 2

B-15

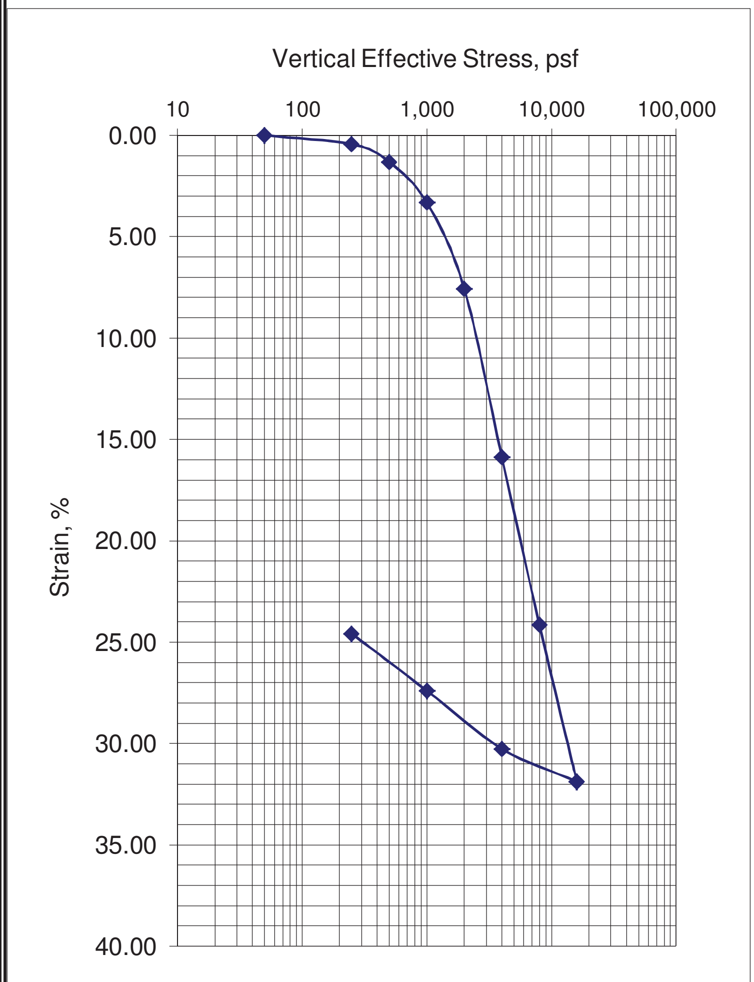
One-Dimensional Consolidation Test Report

Project Name:	CLEAN 2622 CTO 006RD IR Site 2
Project No.:	106454-08.04
Boring No.:	KCHSB-5
Sample No.:	4
Sample Depth, ft.:	25-27.5
Sample Description:	Fat clay
Report Date:	April 25, 2011

One-Dimensional Consolidation of Soil (ASTM D 2435)

Water Content, %:		Density, pcf, Initial:		Density, pcf, Final:		Void Ratio:		Saturation, %:	
Initial:	88.7	Wet:	94.5	Wet:	105.9	Initial:	2.43	Initial:	100
Final:	57.0	Dry:	50.1	Dry:	67.5	Final:	1.59	Final:	100
Specific Gravity:	2.75	assumed							

Consolidation Graphs



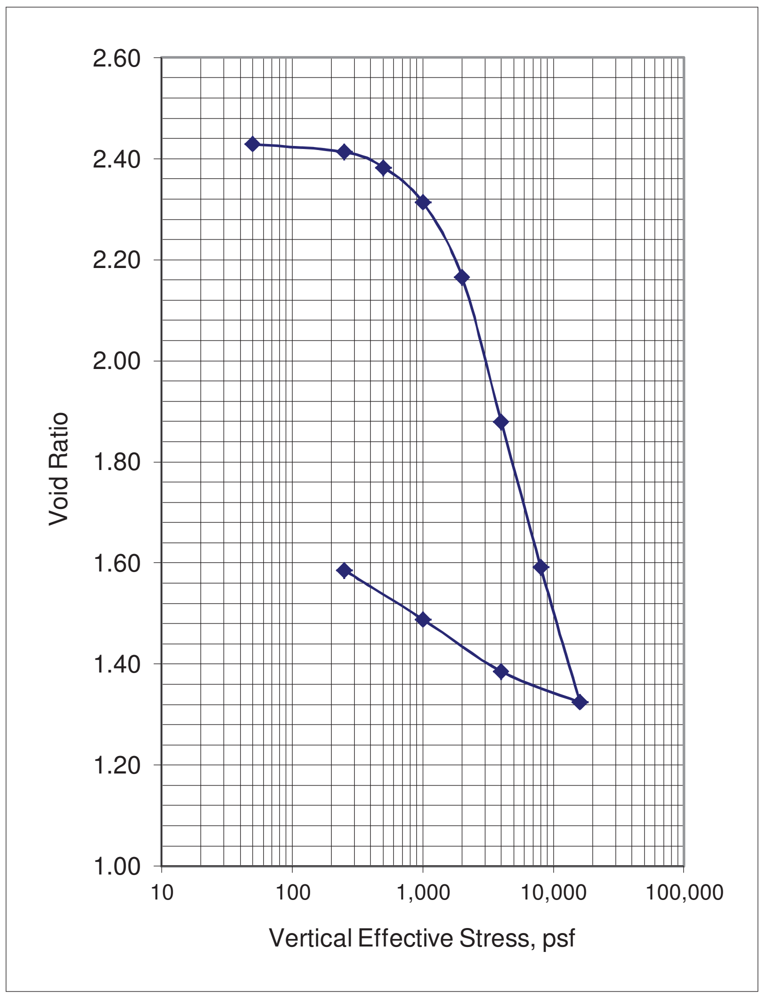


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Plate

1 of 1

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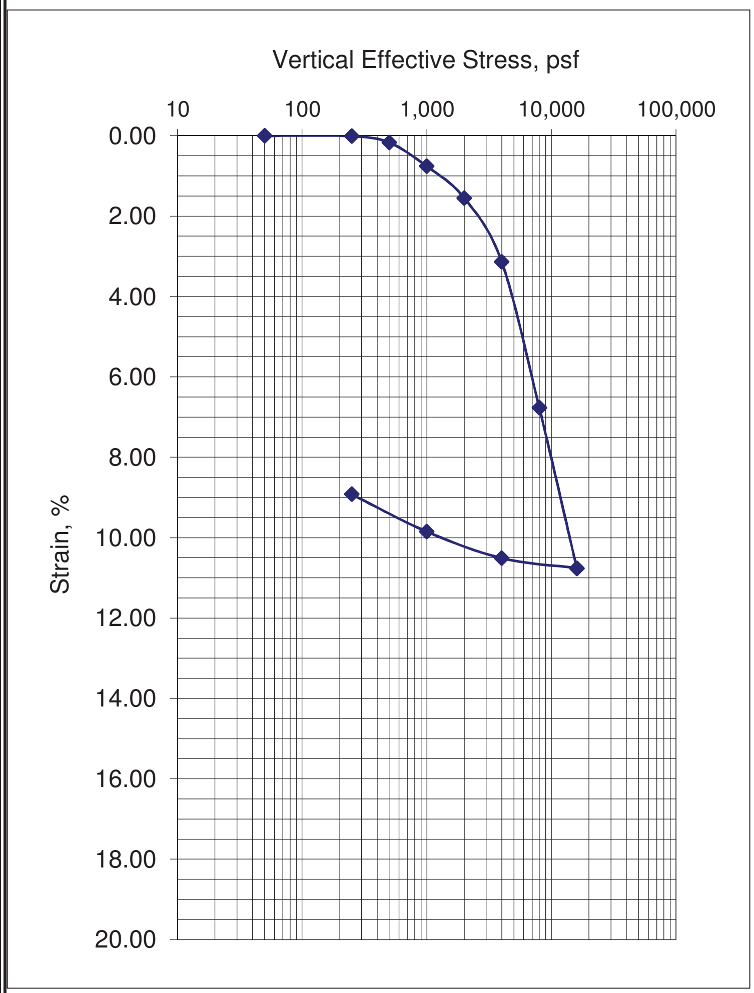
One-Dimensional Consolidation Test Report

Project Name:	CLEAN 2622 CTO 006RD IR Site 2
Project No.:	106454-08.04
Boring No.:	KCHSB-5
Sample No.:	12
Sample Depth, ft.:	80-82.5
Sample Description:	Lean clay with sand
Report Date:	April 14, 2011

One-Dimensional Consolidation of Soil (ASTM D 2435)

Water Content, %:		Density, pcf, Initial:		Density, pcf, Final:		Void Ratio:		Saturation, %:	
Initial:	27.4	Wet:	119.8	Wet:	127.5	Initial:	0.79	Initial:	93
Final:	23.5	Dry:	94.0	Dry:	103.3	Final:	0.63	Final:	100
Specific Gravity:	2.70	assumed							

Consolidation Graphs



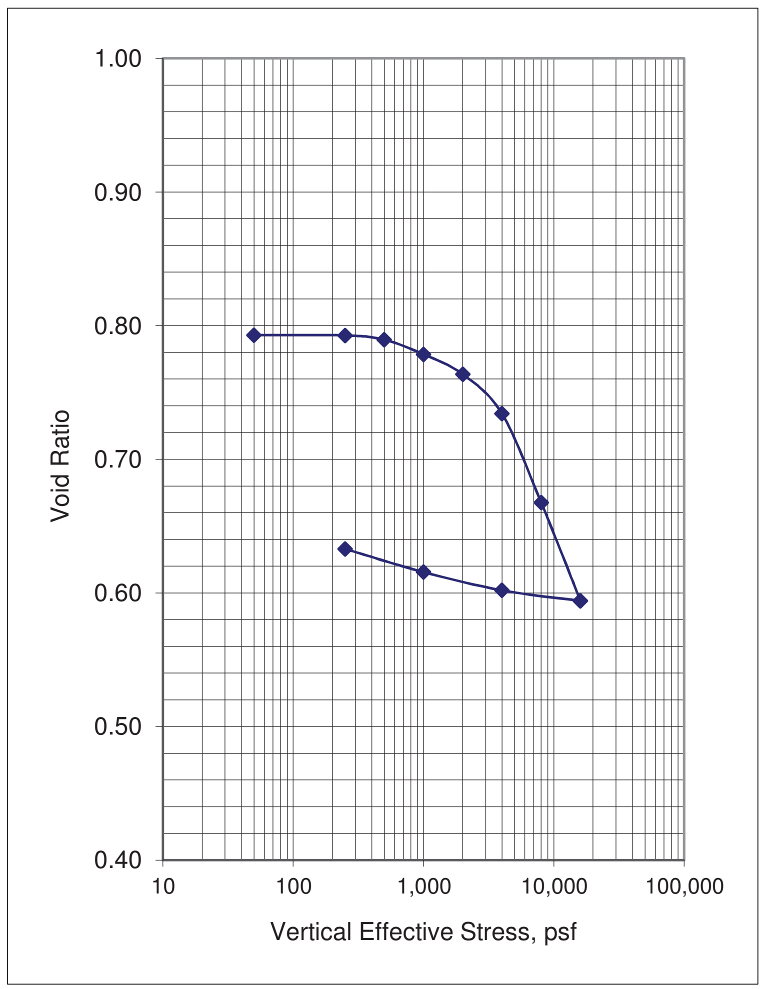


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Plate
1 of 1

B-17

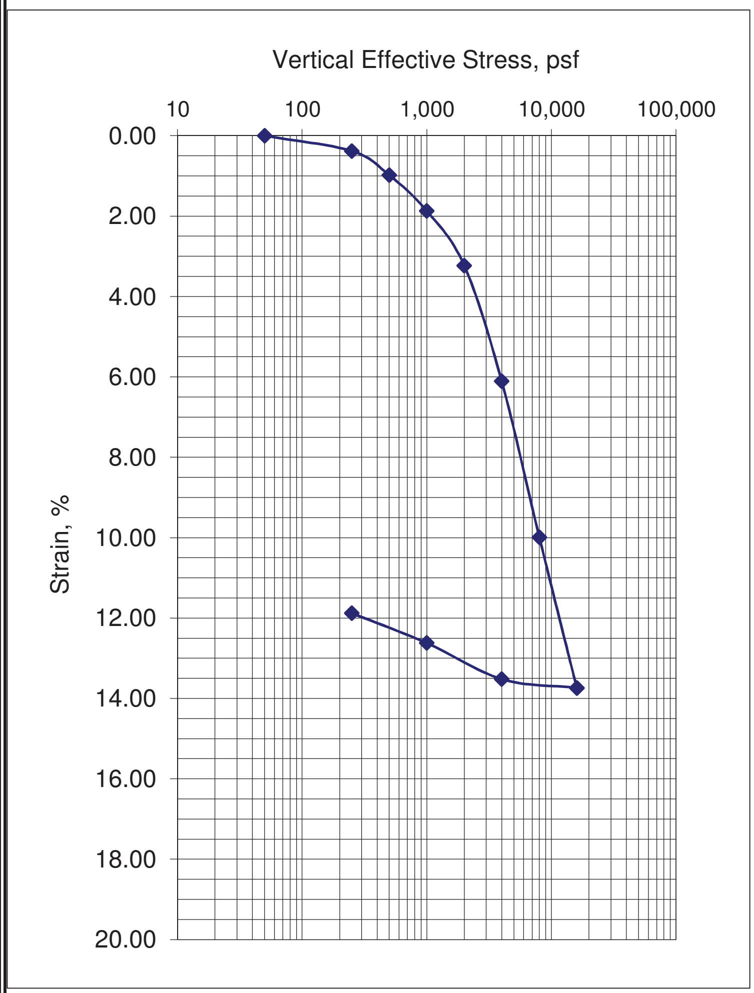
One-Dimensional Consolidation Test Report

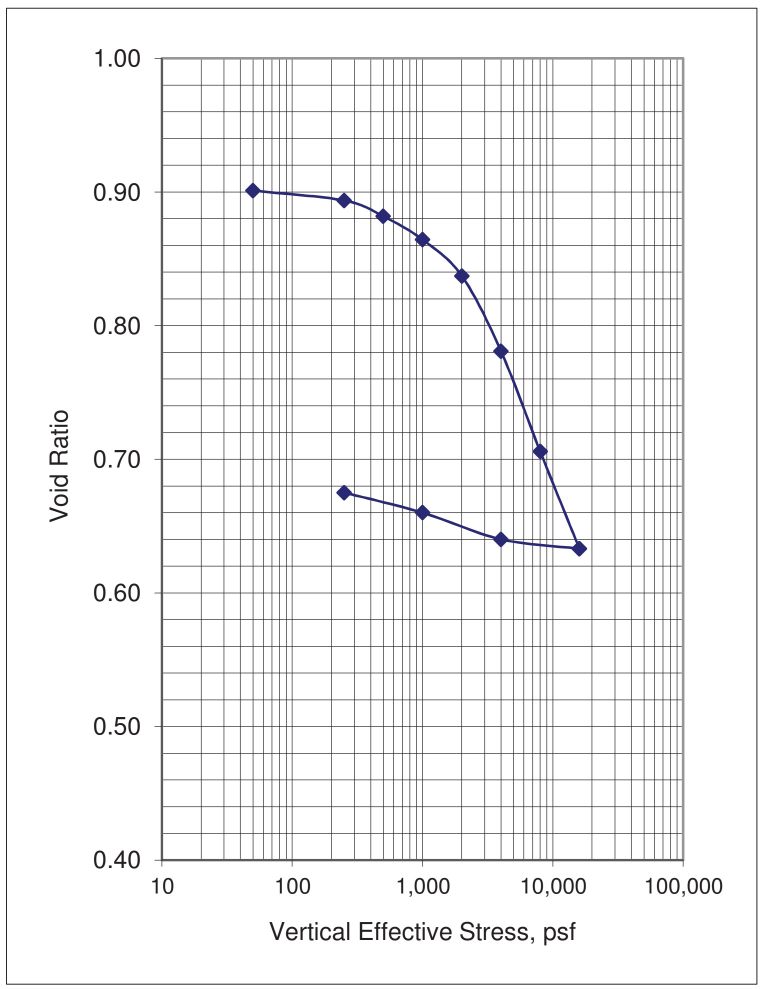
Project Name:	CLEAN 2622 CTO 006RD IR Site 2
Project No.:	106454-08.04
Boring No.:	KCHSB-6
Sample No.:	4
Sample Depth, ft.:	40-42.5
Sample Description:	Silty sand
Report Date:	April 14, 2011

One-Dimensional Consolidation of Soil (ASTM D 2435)

Water Content, %:		Density, pcf, Initial:		Density, pcf, Final:		Void Ratio:		Saturation, %:	
Initial:	31.0	Wet:	118.3	Wet:	127.6	Initial:	0.90	Initial:	95
Final:	24.4	Dry:	90.3	Dry:	102.5	Final:	0.68	Final:	100
Specific Gravity:	2.75	assumed							

Consolidation Graphs





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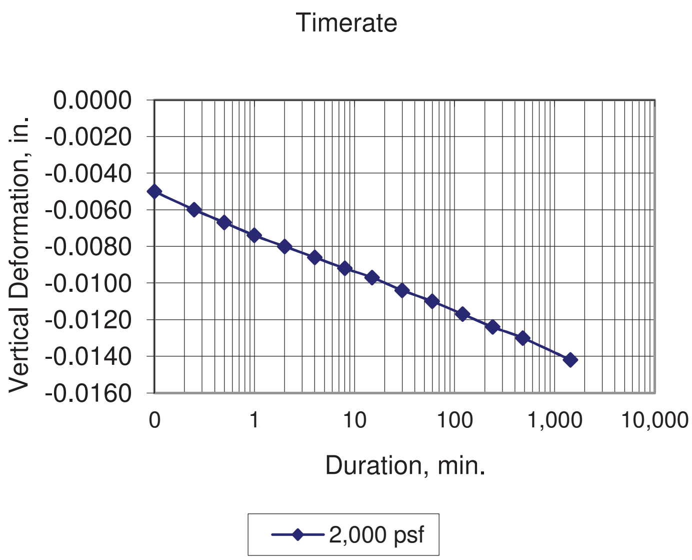
B-18

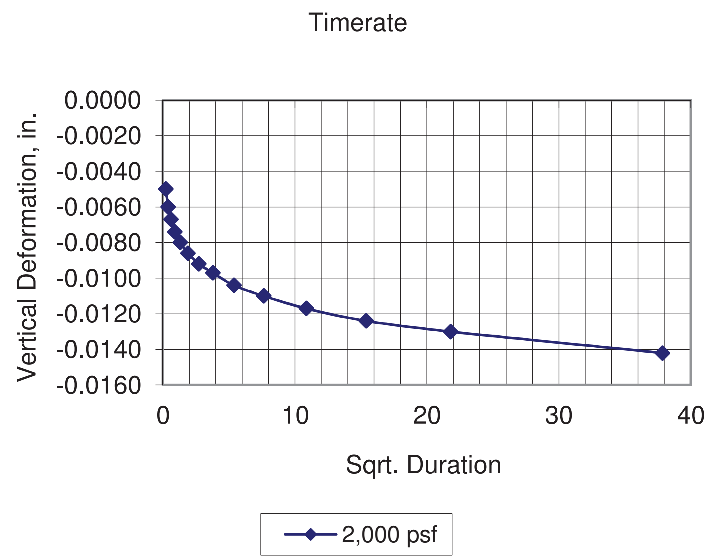
One-Dimensional Consolidation Test Report

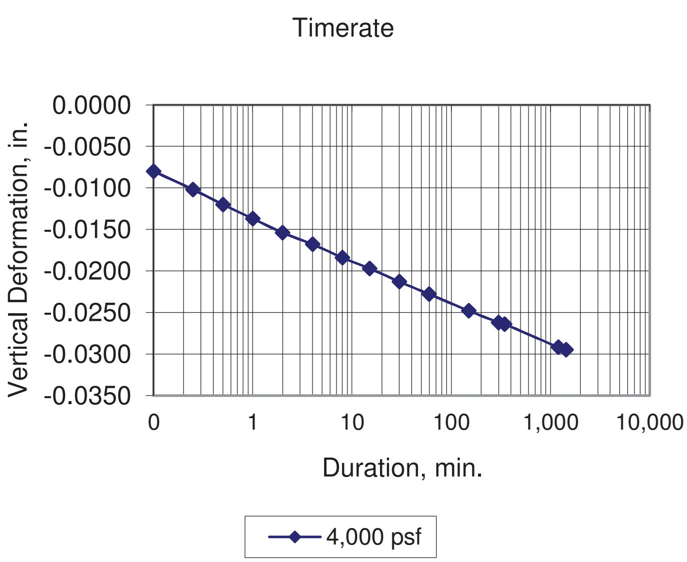
Project Name:	CLEAN 2622 CTO 006RD IR Site 2
Project No.:	106454-08.04
Boring No.:	KCHSB-6
Sample No.:	4
Sample Depth, ft.:	40-42.5
Sample Description:	Silty sand
Report Date:	April 14, 2011

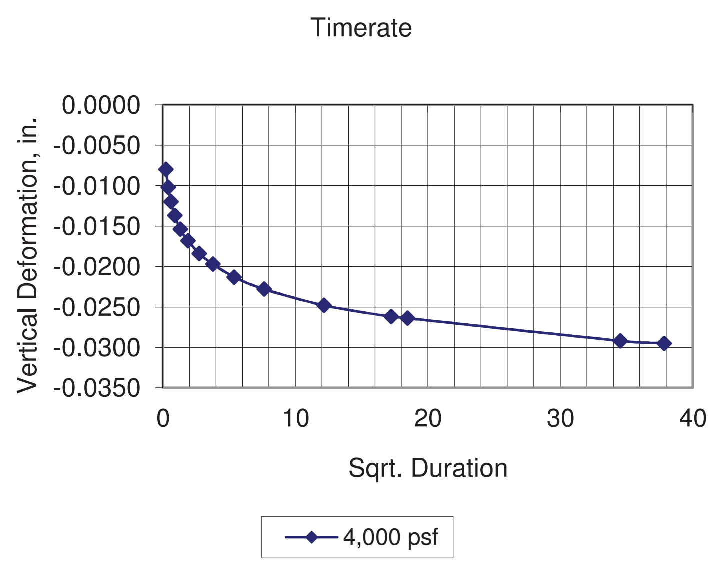
One-Dimensional Consolidation of Soil (ASTM D 2435)

Time Rate Graphs









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B-18

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

TABLE D1

SUMMARY OF LABORATORY TEST RESULTS

Project Name: ALAMEDA NAS (SITE II and between Site I and II) *Project Number: 01-0810*

Borehole No.	Elev. (ft)	Depth (ft)	Sample No.	In situ Moisture Content (%)	In situ Dry Density (pcf)	Percent Passing # 200	Gs	Atterberg Limits			USCS	Sieve Analysis (Percent Passing)										Direct Shear				Vane Shear (ksf)
																						Peak		Ultimate		
								LL	PL	PI		3/4"	3/8"	# 4	# 10	# 16	# 30	# 50	# 100	# 200	2 μ	c (ksf)	ϕ (deg)	c (ksf)	ϕ (deg)	
	-17.4																									
	-22.4	5.0	095-2-001	21.8	103.7			NP	NP	NP	SP-SM					100.0	99.9	94.7	35.4	8.0	5.6					0.498
	-27.4	10.0	095-2-002			23.0					SM															
B-2-1	-32.4	15.0	095-2-003			34.0					SM											0.3	35.8	0.1	31.4	
	-42.9	25.5	095-2-005	19.1	110.3	17.5					SM															
	-57.4	40.0	095-2-008			21.4					SM															
	-62.4	45.0	095-2-009	19.5	111.3	18.4					SM															
	-20.3																									
	-25.3	5.0	095-2-041	26.9	93.2						SM				100.0	99.8	98.6	95.4	38.2	27.2	10.9					
	-30.3	10.0	095-2-042			18.4					SM											0.1	28.1	0.0	24.2	
	-35.3	15.0	095-2-043			34.5					SM											0.3	39.5	0.1	34.0	
B-2-2	-40.3	20.0	095-2-044			15.5					SM															
	-45.3	25.0	095-2-045			22.4					SM															
	-55.3	35.0	095-2-046			20.8					SM															
	-70.3	50.0	095-2-048			11.1					SP-SM															
	-80.3	60.0	095-2-049			8.2					SP-SM															
	-35.3																									
	-40.3	5.0	095-2-034			12.7					SM											0.1	29.3	0.0	22.4	
	-45.3	10.0	095-2-035	19.1	112.1	37.2					SM															
B-2-3	-50.3	15.0	095-2-036	17.1		29.9					SC															
	-60.3	25.0	095-2-037			18.9					SM															
	-70.3	35.0	095-2-038			11.8					SP-SM															
	-80.3	45.0	095-2-039			15.1					SM															
	-90.3	55.0	095-2-040			8.7					SP-SM															
	-17.5																									
	-22.5	5.0	095-2-011	43.1	74.6			NP	NP	NP	ML					100.0	99.9	99.8	98.3	77.9	16.2					0.161
	-32.5	15.0	095-2-012	60.5	64.7			47	22	25	CL						100.0	99.9	99.0	96.3	33.8					0.538
B-2-4	-42.5	25.0	095-2-013	53.5	66.1			44	21	23	CL						100.0	99.7	98.7	97.8	32.1					0.295
	-48.5	31.0	095-2-014	32.9	86.4	43.1					SC															
	-52.5	35.0	095-2-015			12.5					SM															
	-62.5	45.0	095-2-016			17.1					SM															
	-77.5	60.0	095-2-018			17.0					SM															

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

TABLE D1

SUMMARY OF LABORATORY TEST RESULTS

Project Name: ALAMEDA NAS (SITE II and between Site I and II) *Project Number: 01-0810*

Borehole No.	Elev. (ft)	Depth (ft)	Sample No.	In situ Moisture Content (%)	In situ Dry Density (pcf)	Percent Passing # 200	Gs	Atterberg Limits			USCS	Sieve Analysis (Percent Passing)										Direct Shear				Vane Shear (ksf)
																						Peak		Ultimate		
								LL	PL	PI		3/4"	3/8"	# 4	# 10	# 16	# 30	# 50	# 100	# 200	2 μ	c (ksf)	φ (deg)	c (ksf)	φ (deg)	
B-2-5	-9.5																									
	-14.5	5.0	095-2-019	31.5	86.5			NP	NP	NP	SM						100.0	99.8	83.1	48.6	12.2					0.525
	-24.5	15.0	095-2-020	20.6	107.2			NP	NP	NP	SM				100.0	99.9	98.9	94.0	42.7	17.9	7.2					0.460
	-29.5	20.0	095-2-021	47.9	70.0			25	20	5	CL-ML				100.0	98.6	97.6	93.6	68.0	52.1	13.2					0.558
	-39.5	30.0	095-2-022	45.9	68.4			38	19	19	CL					100.0	99.9	99.8	98.7	90.1	28.6					0.255
	-59.5	50.0	095-2-023	45.3	72.9			45	25	20	CL					100.0	99.9	99.9	99.5	96.0	34.9					0.456
	-79.5	70.0	095-2-024	48.7	71.1			53	26	27	CH					100.0	99.9	99.9	99.5	97.2	39.3					0.371
B-2-6	-13.2																									
	-20.2	7.0	095-2-027	44.2	75.7			25	14	11	SC				100.0	99.0	97.9	93.6	51.6	39.5	19.4					0.302
	-28.2	15.0	095-2-028	39.5	80.6			31	17	14	CL					100.0	99.9	99.8	97.8	59.9	21.8					0.210
	-54.2	41.0	095-2-029	25.0	96.9			25	15	10	SC					100.0	99.0	96.0	63.0	46.0	31.0					0.239
	-63.2	50.0	095-2-030			14.9					SM											0.2	33.3	0.2	30.1	
	-68.2	55.0	095-2-031			12.0					SP-SM															
	-73.2	60.0	095-2-032			9.3					SP-SM															
	-78.2	65.0	095-2-033			10.9					SP-SM															
B-2-7	16.9																									
	11.9	5.0	095-2-062	22.8	100.8																					
	1.9	15.0	095-2-064	25.8	102.5																					
B-2-7A	8.5																									
	-16.5	25.0	095-2-131	24.0	100.0			NP	NP	NP	SP-SM	100.0	99.2	97.1	96.6	96.3	95.5	78.8	20.7	11.0	3.9					0.478
	-21.5	30.0	095-2-132	36.5	90.1			24	16	8	SC				100.0	99.9	99.7	95.8	64.1	47.0	13.7					
	-26.5	35.0	095-2-133	23.5	102.0			NP	NP	NP	SP-SM					100.0	99.4	77.0	40.6	11.7	5.9					0.627
	-31.5	40.0	095-2-134			31.4					SM											0.4	30.8	0.2	28.2	
	-41.5	50.0	095-2-136			15.2					SM															
B-2-8	16.8																									
	11.8	5.0	095-2-069	31.7	94.8	27.8					SC															
	6.8	10.0	095-2-070	18.7	101.5	43.0					SC															
	1.8	15.0	095-2-071	19.3	107.0	8.9					SP-SM															
	-3.2	20.0	095-2-072	21.8	100.6	4.4					SP															
	-13.2	30.0	095-2-074	22.7		5.9					SP-SM															
	-18.2	35.0	095-2-075	48.1	74.9			42	23	19	CL							100.0	96.2	67.8	22.5					0.551
	-28.2	45.0	095-2-076			11.1					SP-SM															
	-33.2	50.0	095-2-077			22.1					SC															
	-43.2	60.0	095-2-079	20.4	113.9	6.7					SP-SM															
	-53.2	70.0	095-2-081	21.7	109.5	14.1					SC/SM															

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

TABLE D1

SUMMARY OF LABORATORY TEST RESULTS

Project Name: ALAMEDA NAS (SITE II and between Site I and II) *Project Number: 01-0810*

Borehole No.	Elev. (ft)	Depth (ft)	Sample No.	In situ Moisture Content (%)	In situ Dry Density (pcf)	Percent Passing #200	Gs	Atterberg Limits			USCS	Sieve Analysis (Percent Passing)										Direct Shear				Vane Shear (ksf)
																						Peak		Ultimate		
								LL	PL	PI		3/4"	3/8"	#4	#10	#16	#30	#50	#100	#200	2 μ	c (ksf)	φ (deg)	c (ksf)	φ (deg)	
B-2-9	16.2																									
	11.2	5.0	095-2-082	30.2	94.2	26.0					SC															
	6.2	10.0	095-2-083	14.2	115.5	43.6					SC															
	1.2	15.0	095-2-084	21.8	108.3	9.1					SP-SM											0.0	40.4	0.1	30.3	
	-3.8	20.0	095-2-085	20.6	104.0	2.3					SP															
	-8.8	25.0	095-2-086	20.8	104.6	5.5					SP-SM															
	-18.8	35.0	095-2-088	21.8	109.8	3.8					SP															
	-28.8	45.0	095-2-090	27.8	99.0	30.4					SC/SM															
	-38.8	55.0	095-2-092			23.6					SC															
	-48.8	65.0	095-2-094			17.2					SC															
B-2-10	16.8																									
	1.8	15.0	095-2-098	73.2	55.6			96	34	62	CH						100.0	99.9	99.6	98.9	44.6					0.536
	-3.2	20.0	095-2-099	18.7	111.0	7.1					SP-SM															
	-8.2	25.0	095-2-100			28.4					SC/SM											0.1	26.2	0.0	27.1	
	-13.2	30.0	095-2-101	22.3	107.5	6.5					SP-SM															
	-23.2	40.0	095-2-103	20.6	99.0	4.2					SP															
	-33.2	50.0	095-2-105	44.8	77.6			43	22	21	CL				100.0	99.6	99.2	98.2	91.9	88.4	25.5					0.634
	-43.2	60.0	095-2-107			9.3					SP-SM															
	-58.2	75.0	095-2-109			13.4					SM															
B-2-11	7.7																									
	2.7	5.0	095-2-110			36.4					SC											0.3	37.4	0.0	41.3	
	-7.3	15.0	095-2-112	23.5	104.8	7.5					SP-SM															
	-17.3	25.0	095-2-114	26.2	101.8	28.3					SM															
	-27.3	35.0	095-2-116	32.8	92.6			36	18	18	CL				100.0	99.9	99.9	99.8	92.6	49.6	14.5					0.894
	-37.3	45.0	095-2-118	47.4	70.7			57	32	25	MH						100.0	99.9	99.5	95.0	27.4					0.499
	-47.3	55.0	095-2-119	29.3	91.3			NP	NP	NP	SM						100.0	93.3	33.5	21.2	10.5					0.368
	-62.3	70.0	095-2-120	18.3	107.7			NP	NP	NP	SM					100.0	99.9	89.4	41.3	23.7	4.8					0.426
	-72.3	80.0	095-2-122			16.1					SC															
	-102.3	110.0	095-2-125	42.8	77.2			69	29	40	CH							100.0	99.7	94.0	49.7					0.299
	-112.3	120.0	095-2-126	44.5	75.4			60	31	29	CH						100.0	99.8	87.6	68.7	35.1					3.088

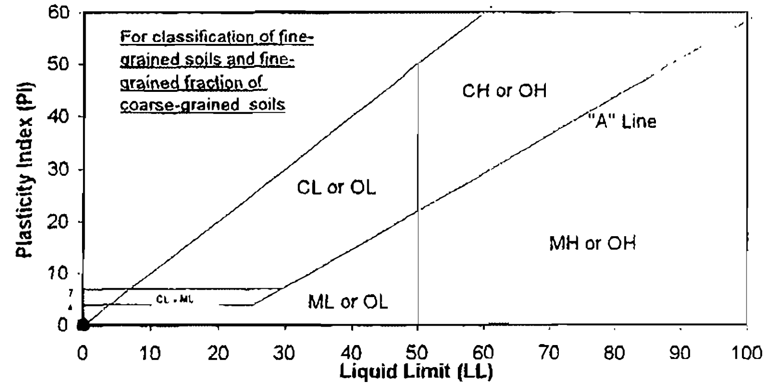
HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

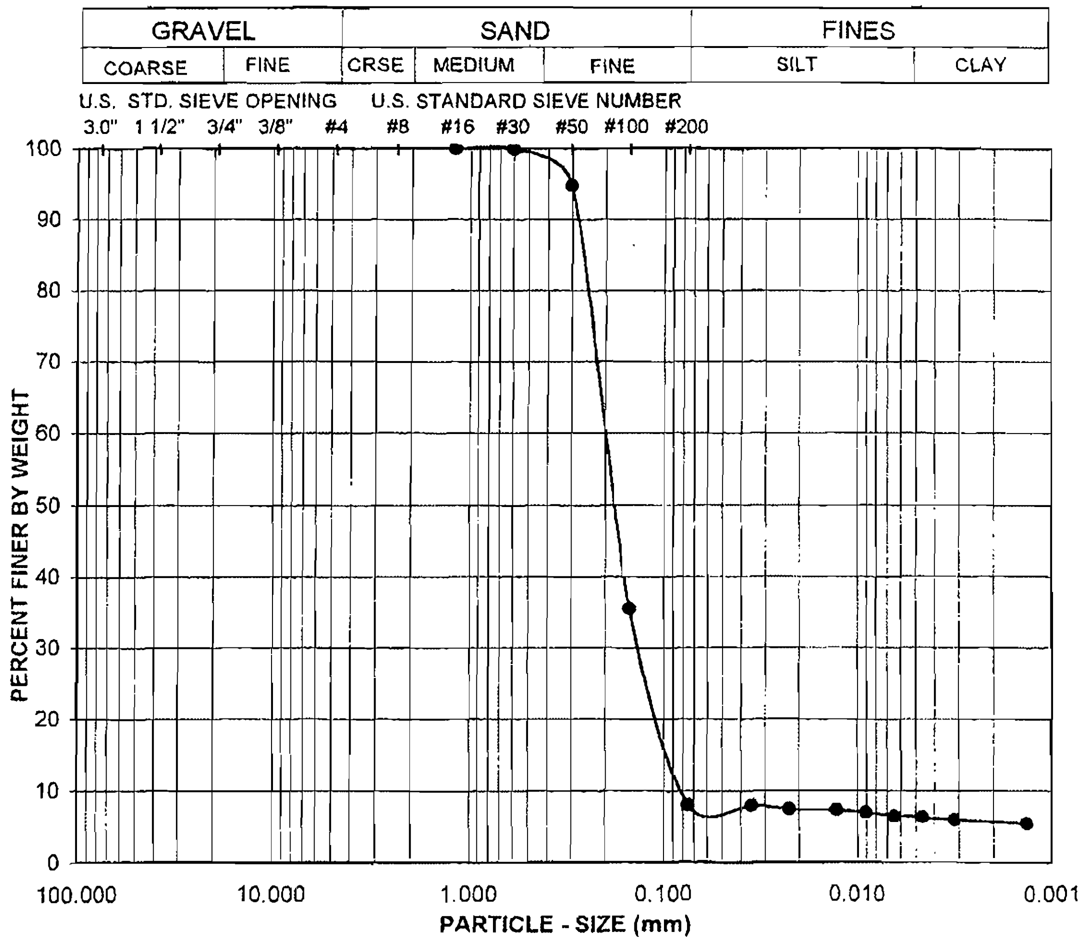
TABLE D1

SUMMARY OF LABORATORY TEST RESULTS

Project Name: ALAMEDA NAS (SITE II and between Site I and II) *Project Number: 01-0810*

Borehole No.	Elev. (ft)	Depth (ft)	Sample No.	In situ Moisture Content (%)	In situ Dry Density (pcf)	Percent Passing # 200	Gs	Atterberg Limits			USCS	Sieve Analysis (Percent Passing)										Direct Shear				Vane Shear (ksf)
																						Peak		Ultimate		
								LL	PL	PI		3/4"	3/8"	# 4	# 10	# 16	# 30	# 50	# 100	# 200	2 μ	c (ksf)	φ (deg)	c (ksf)	φ (deg)	
	4.6																									
	-25.4	30.0	095-2-059	64.8				54	31	23	MH					100.0	99.9	98.0	84.0	79.8	36.4					
B-2-12	-40.4	45.0	095-2-061	50.1	71.7			62	29	33	CH					100.0	99.9	99.6	98.5	90.5	34.8					0.433
	-50.4	55.0	095-2-066	52.8	69.7			62	27	35	CH					100.0	99.9	99.8	99.4	98.4	36.9					0.420
	-67.4	72.0	095-2-067	44.3	74.5			52	29	23	MH/CH						100.0	99.8	99.4	98.3	30.6					
	8.0																									
	-17.5	25.5	095-2-166	41.0	88.3			35	23	12	CL				100	99.8	99.6	98.3	94.2	88.1	20.0					0.224
B-2-13	-33.0	41.0	095-2-167	47.1	73.8		2.66	48	22	26	CL	100	98.6	96.5	89	82.9	76.5	72.1	68.8	64.6	32.0					1.491
(756)	-62.5	70.5	095-2-168	15.8	111.8	16.6					SM															
	-73.0	81.0	095-2-169			8.6					SP-SM															
	-83.0	91.0	095-2-170	62.2	61.4			82	41	41	MH															2.343
	-93.0	101.0	095-2-171	33.5							CL															
	8.0																									
	-17.0	25.0	095-2-152			2.9					SP															
	-17.0	25.0	095-2-155			8.4					SP-SM															
	-23.0	31.0	095-2-156	33.6	89.5		2.67	40	22	18	CL	100	99.3	98.6	97.1	96.8	94.6	93.4	87.4	81.4	33.0					1.363
B-2-14	-32.0	40.0	095-2-157			76.5					CLs															0.774
(754)	-42.0	50.0	095-2-158			5.7					SP-SM															
	-63.0	71.0	095-2-160			10.4					SP-SM															
	-72.5	80.5	095-2-161			8.3					SP-SM															
	-83.0	91.0	095-2-162	66.6	59.0			108	52	56	MH				100	99.8	99.4	98.2	96	93.9	61.0					
	-93.0	101.0	095-2-163	37.1	83.1						CL/CH															
	8.0																									
	-3.0	11.0	095-2-138			12.5					SM															
	-12.5	20.5	095-2-140			38.2					SM															
B-2-15	-23.0	31.0	095-2-141	29.4	91.3		2.66	31	17	14	CL	100	98.4	96.3	91.6	86.7	81.4	78	75.4	72	32.0					0.033
(755)	-32.0	40.0	095-2-142								CH															0.696
	-52.0	60.0	095-2-144			10.9					SP-SM															
	-81.0	89.0	095-2-147	43.7	74.0			48	26	22	CL															
	-104.0	112.0	095-2-148	45.0	76.9						CL															





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-1	095-02-001	5.0	SP-SM	0:92:8	NONPLASTIC

Sample Description:

Olive, poorly graded sand with silt (SP-SM)

TERATEST LABS

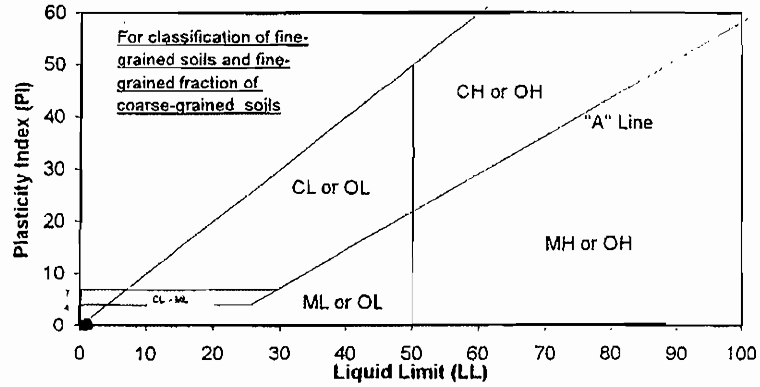
Project No.: 2384095-D-07060

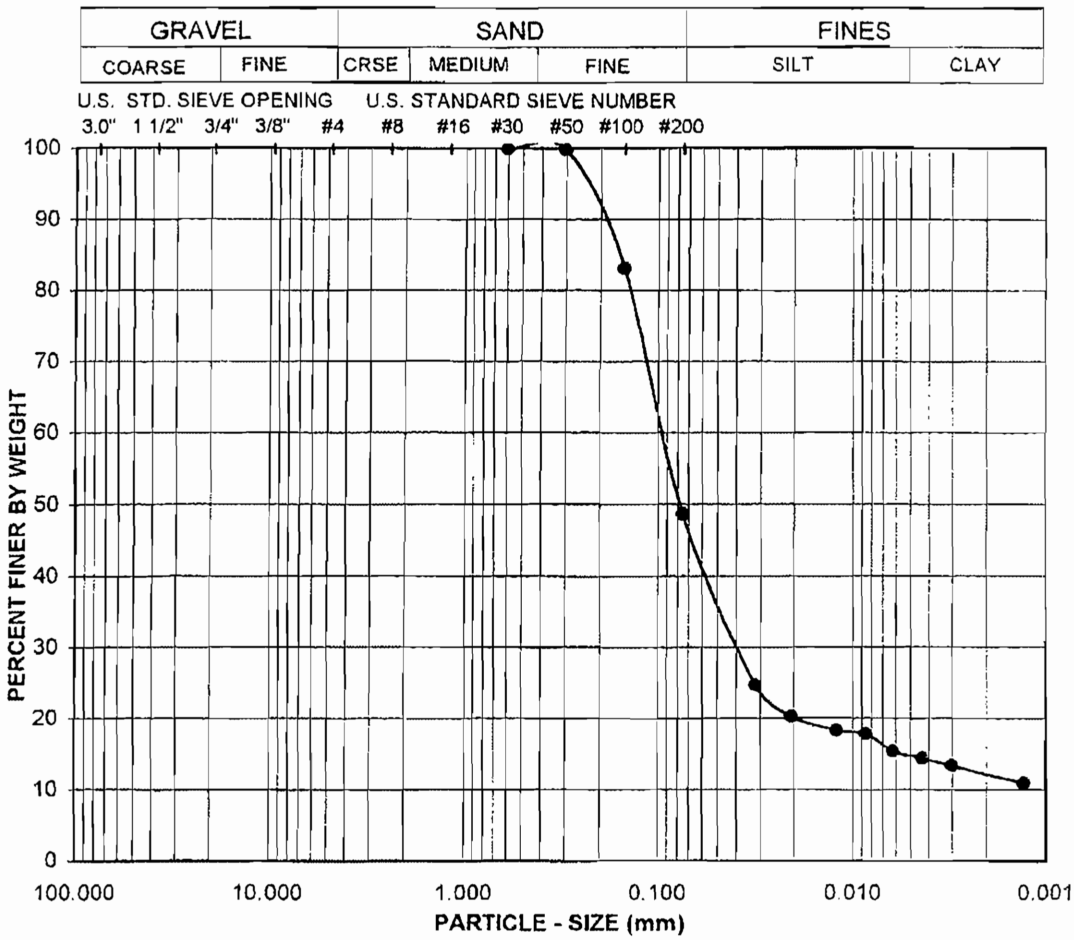
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point,

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-5	095-02-019	5.0-7.0	SM	0:51:49	Nonplastic

Sample Description:

Very dark gray, silty sand (SM)

TERATEST LABS

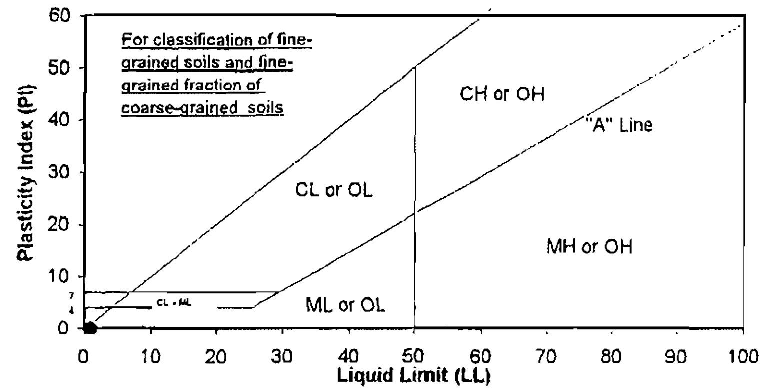
Project No.: 2384095-D-07060

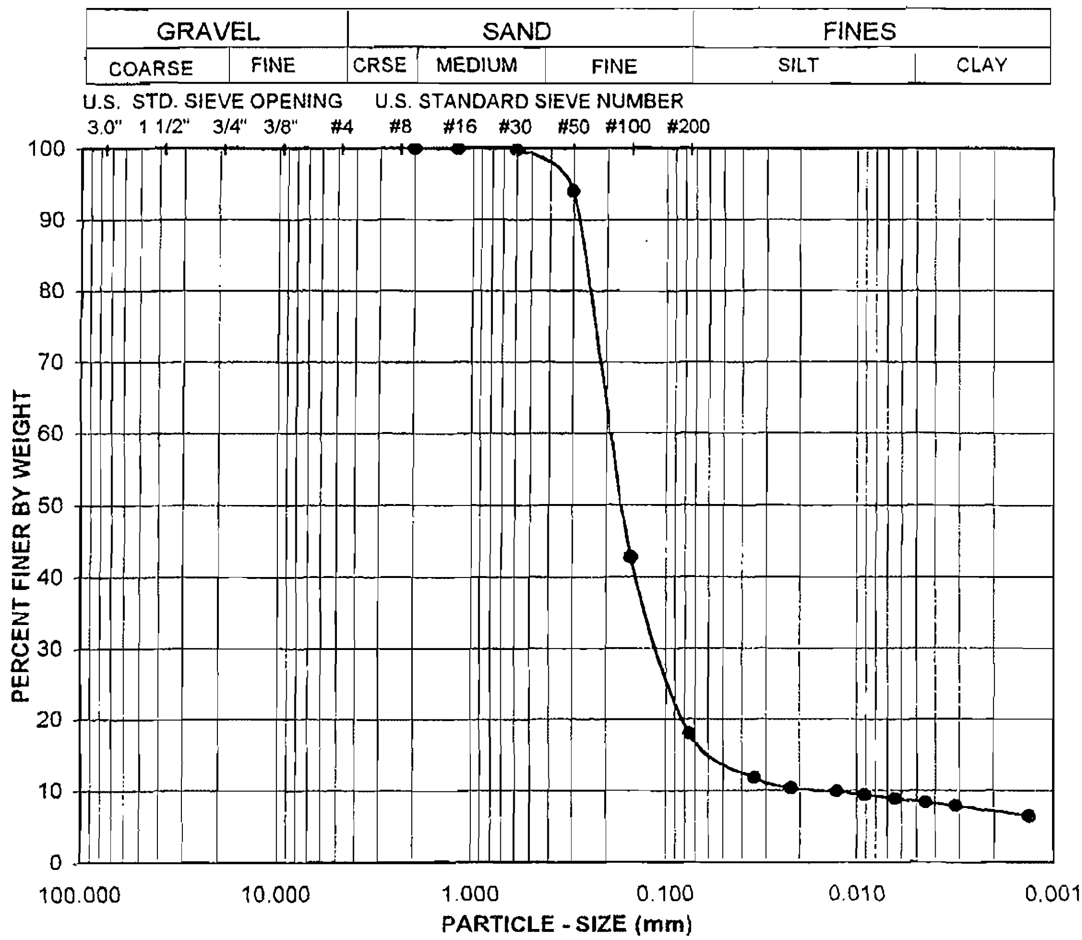
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-5	095-02-020	15.0-17.0	SM	0:82:18	Nonplastic

Sample Description:

Olive, silty sand (SM)

TERATEST LABS

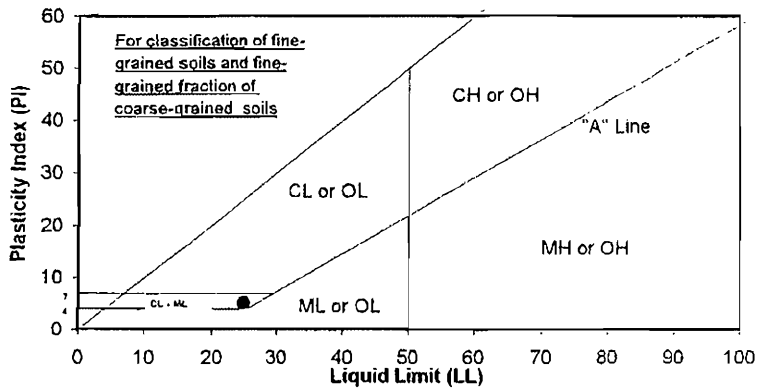
Project No.: 2384095-D-07060

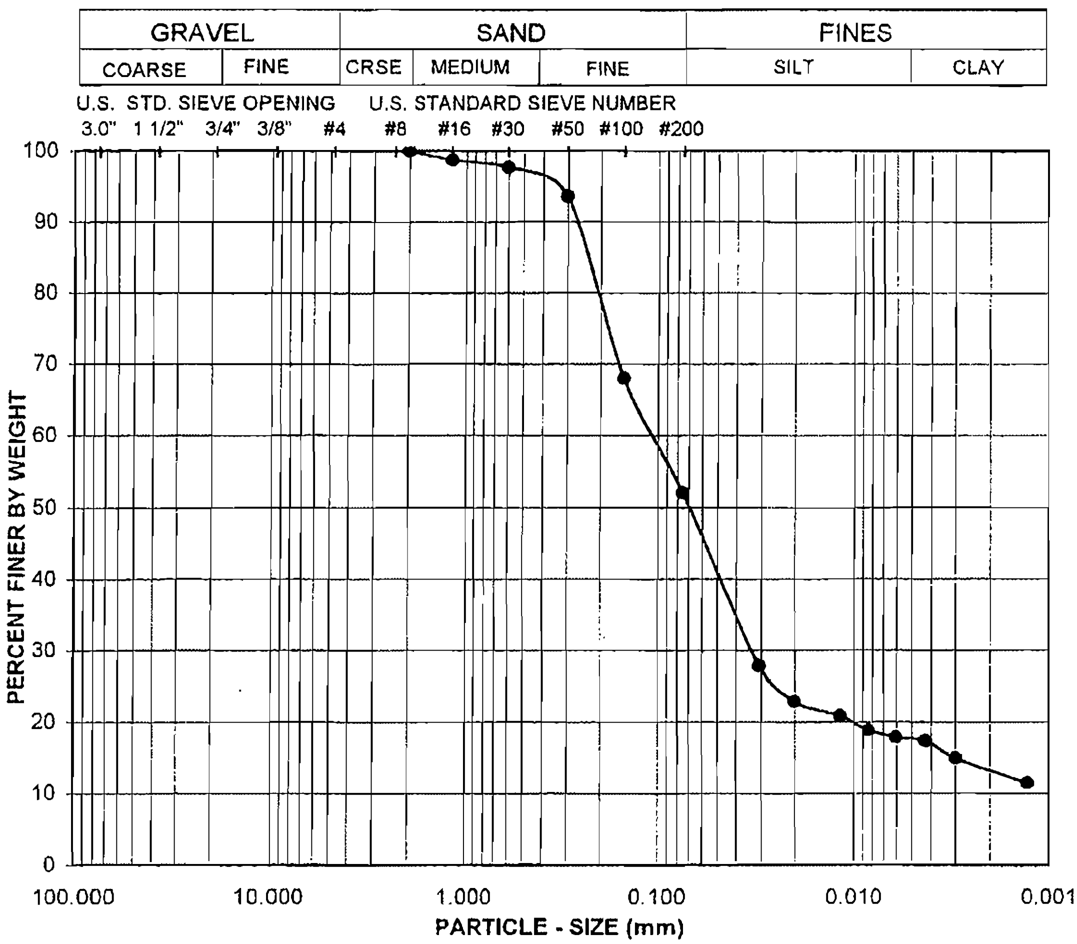
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-5	095-02-021	20.5-21.0	s(CL-ML)	0:48:52	25,20,5

Sample Description:

Olive, sandy silty clay s(CL-ML)

TERATEST LABS

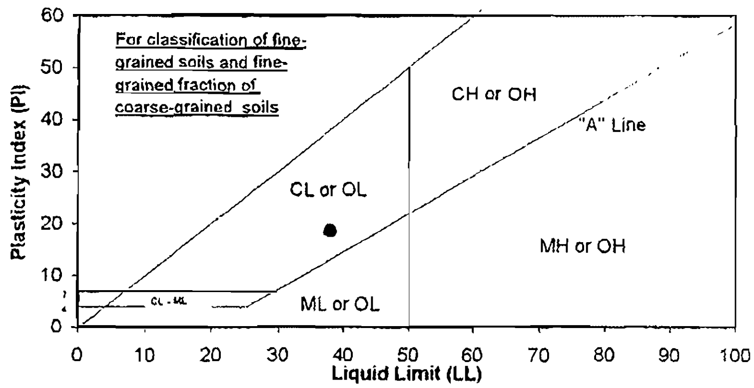
Project No.: 2384095-D-07060

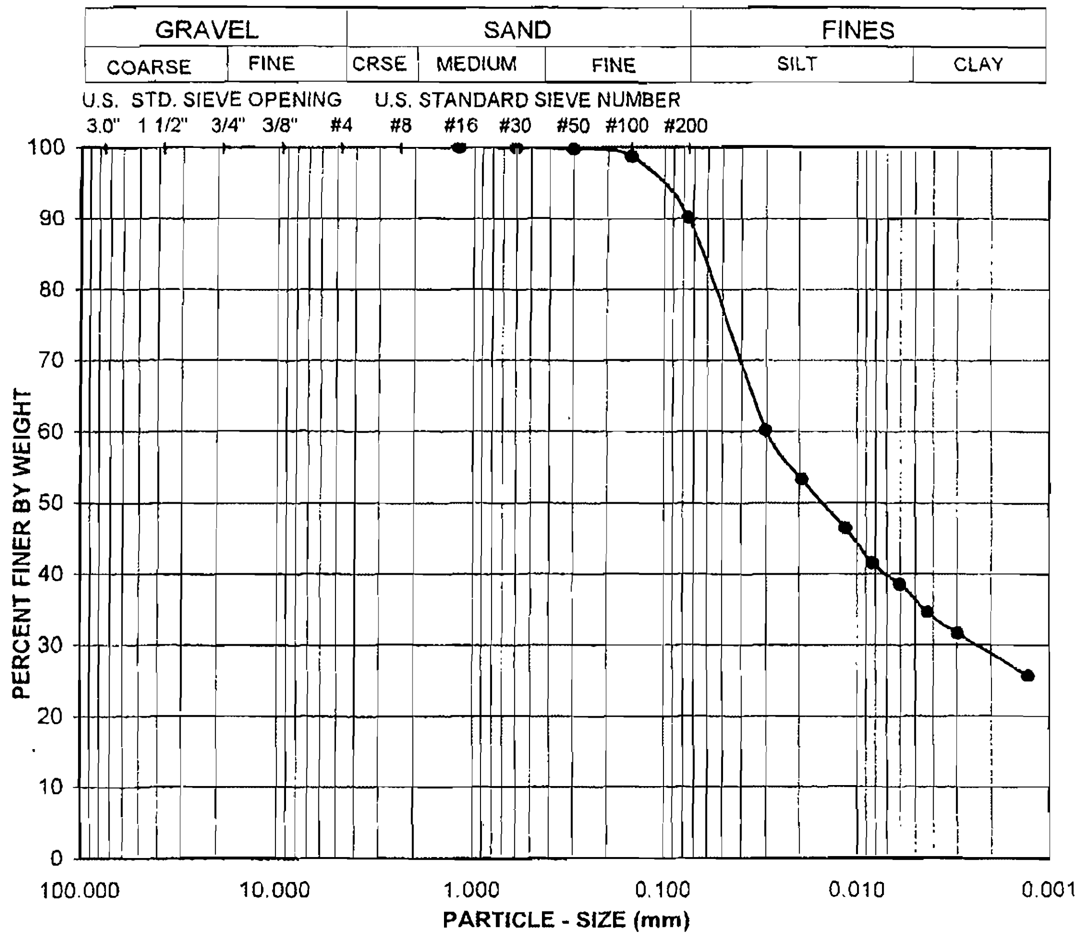
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-5	095-02-022	30.0-31.5	CL	0:10:90	38,19,19

Sample Description:

Olive, lean clay (CL)

TERATEST LABS

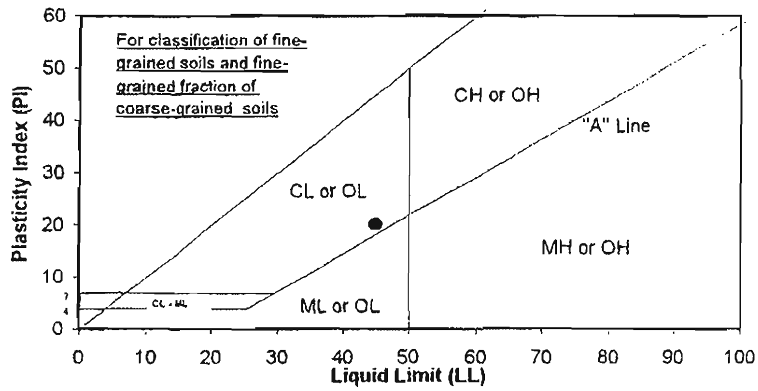
Project No.: 2384095-D-07060

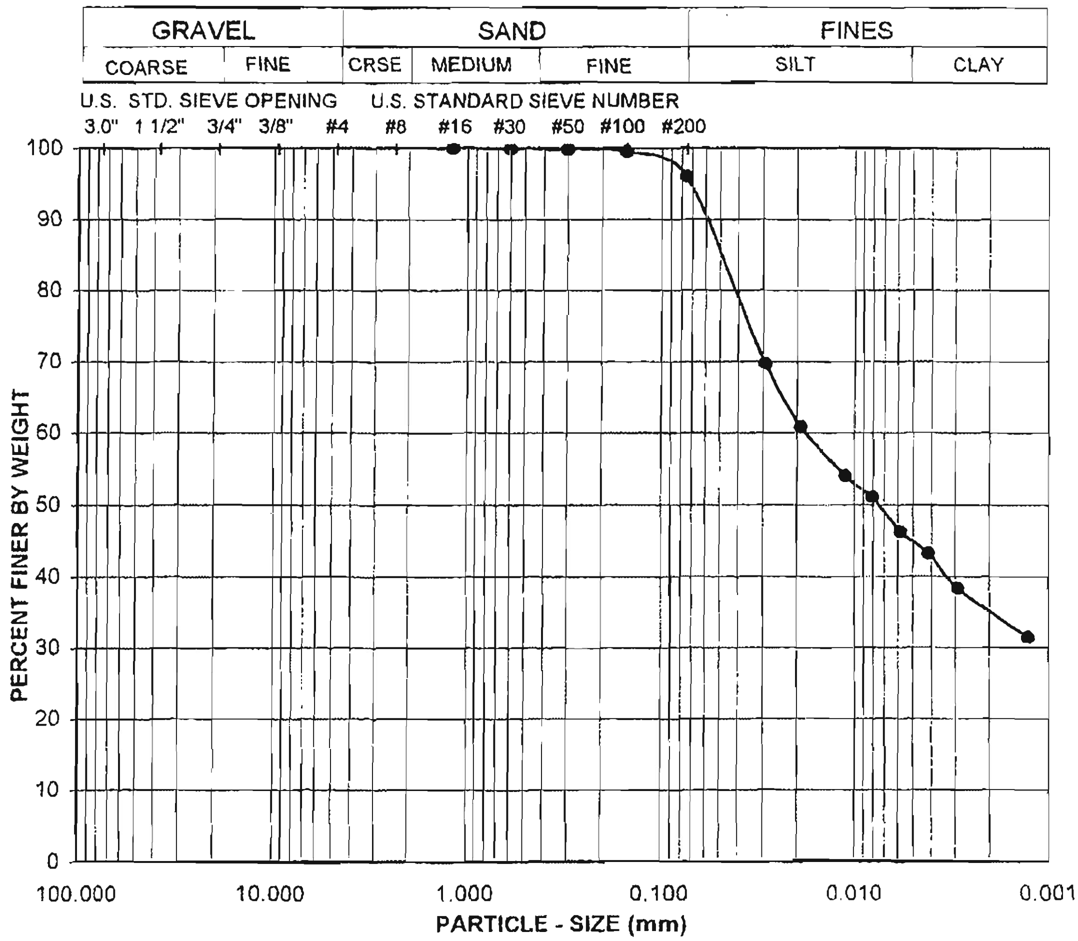
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point,

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-5	095-02-023	50.0-51.5	CL	0:4:96	45,25,20

Sample Description:

Olive, lean clay (CL)

TERATEST LABS

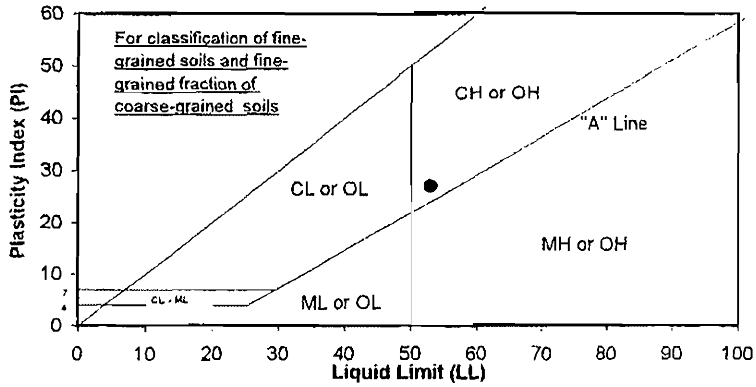
Project No.: 2384095-D-07060

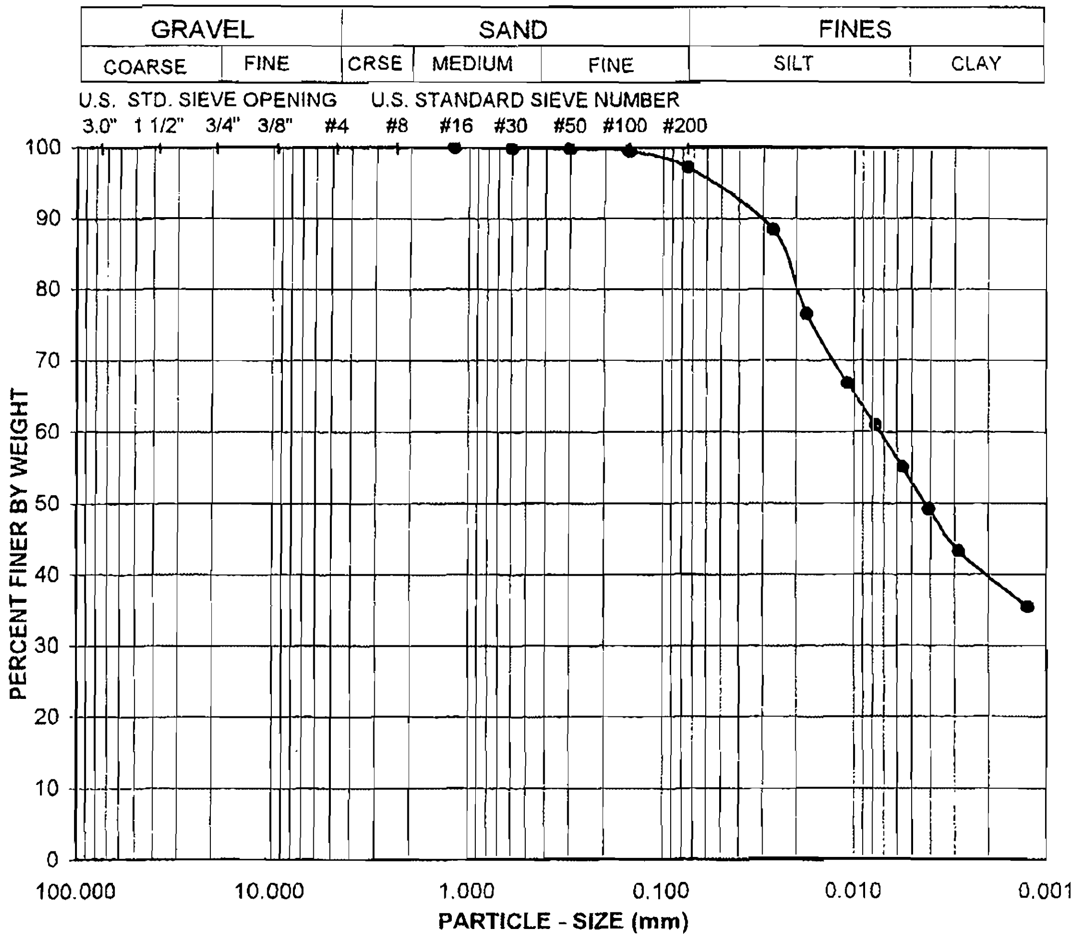
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-5	095-02-024	70.0-71.5	CH	0:3:97	53,26,27

Sample Description:

Olive, fat clay (CH)

TERATEST LABS

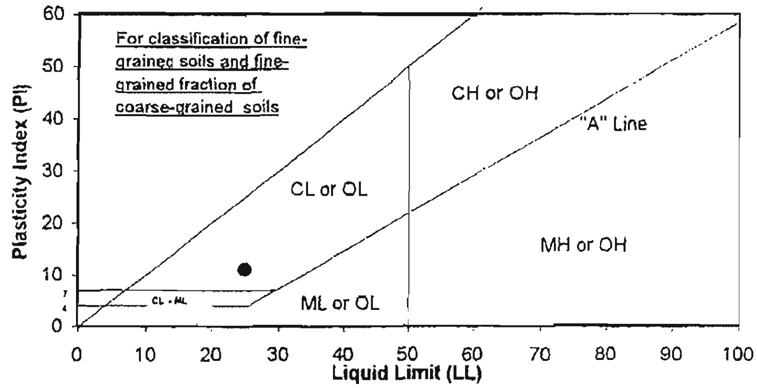
Project No.: 2384095-D-07060

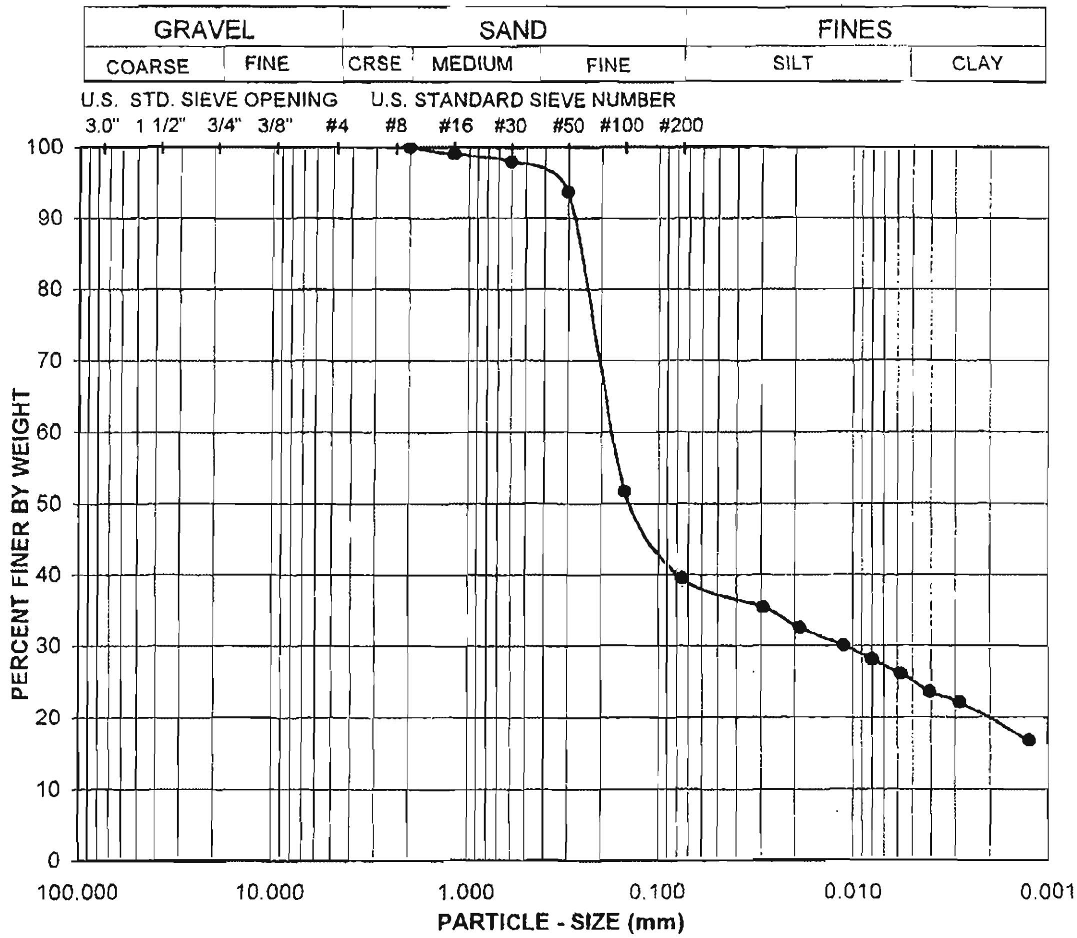
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-6	095-02-027	7.0-9.0	(SC)	0:60:40	25,14,11

Sample Description:

Olive, clayey sand (SC)

TERATEST LABS

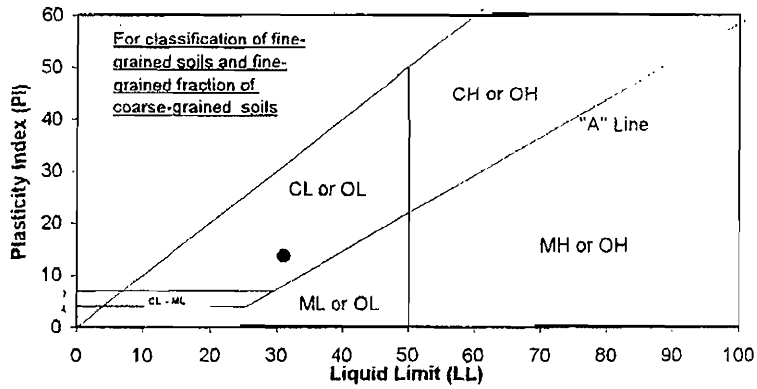
Project No.: 2384095-D-07060

Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

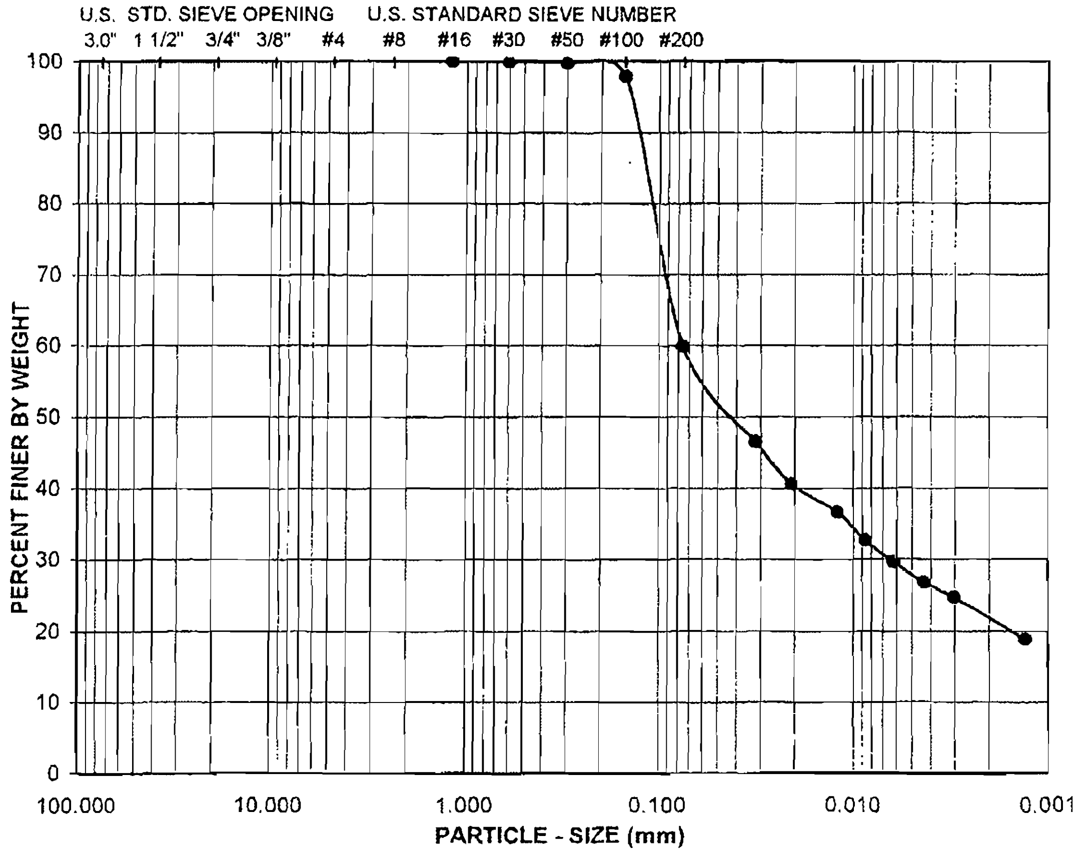
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-6	095-02-028	15.0-17.0	s(CL)	0:40:60	31,17,14

Sample Description:

Olive, sandy lean clay s(CL)

TERATEST LABS

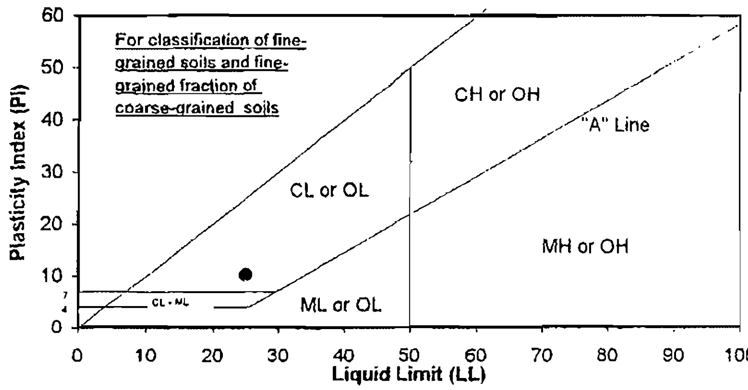
Project No.: 2384095-D-07060

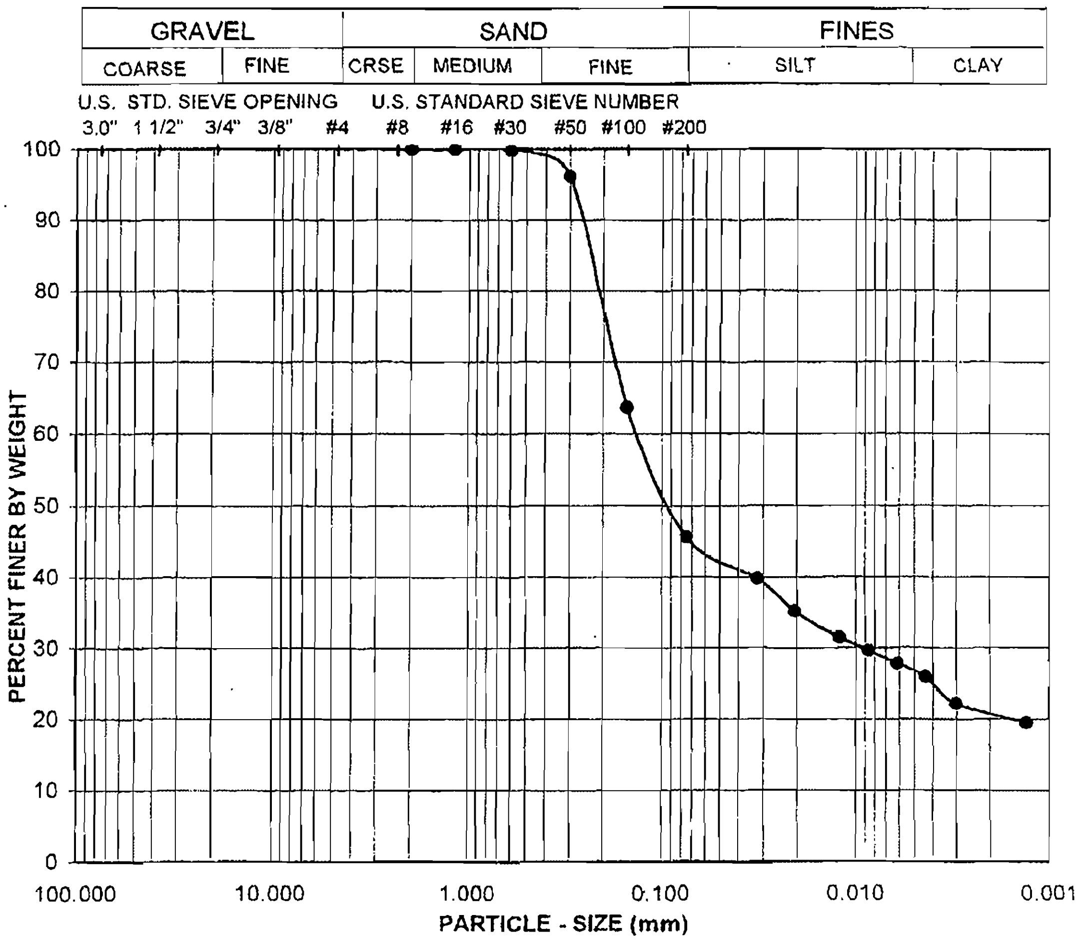
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-6	095-02-029	41.0-42.5	SC	0:54:46	25,15,10

Sample Description:

Olive, clayey sand (SC)

TERATEST LABS

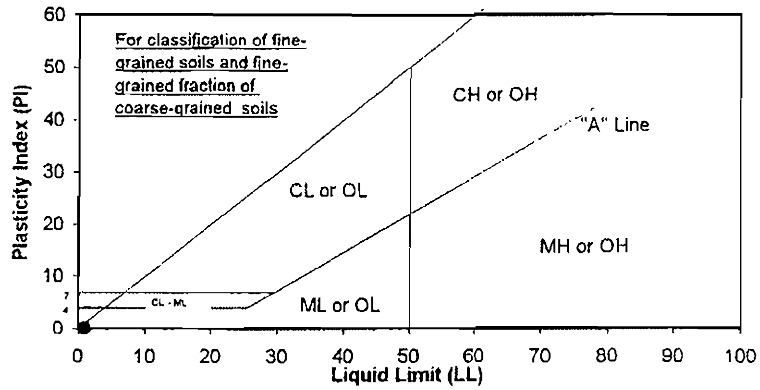
Project No.: 2384095-D-07060

Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA

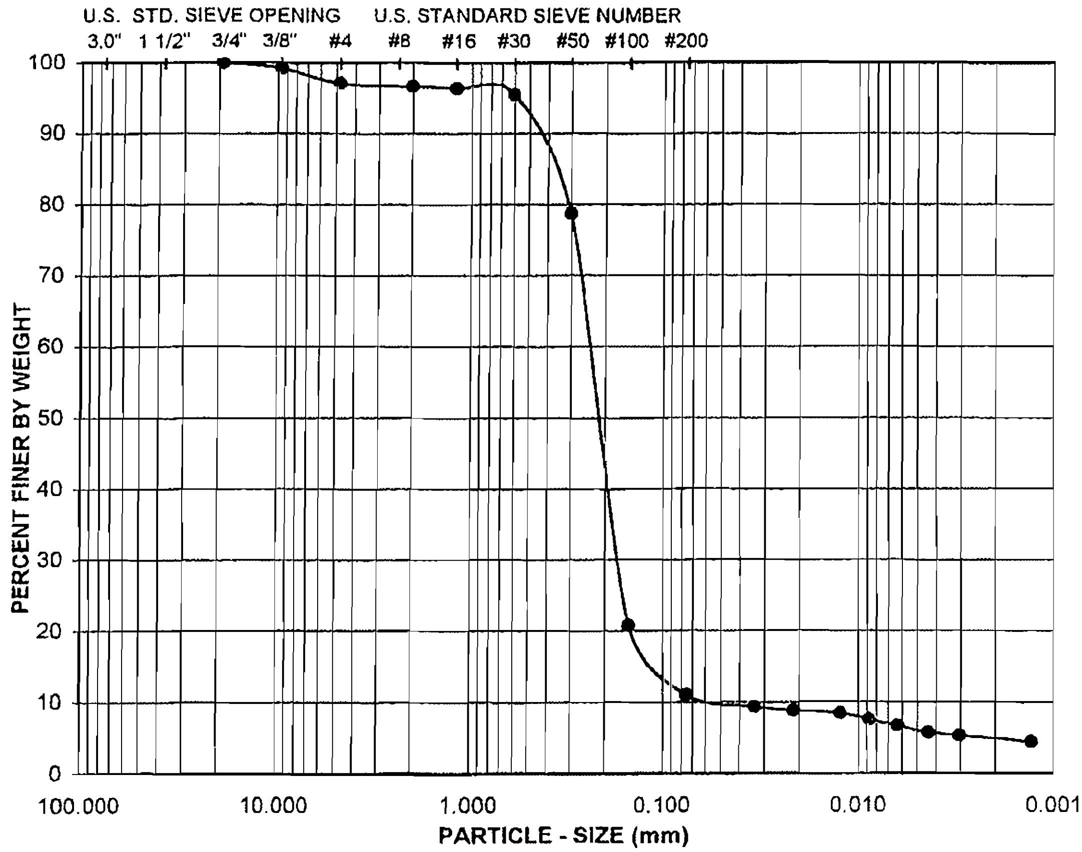
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7A	095-2-131	25.0-27.0	SP-SM	3:86:11	NONPLASTIC

Sample Description:

Dark gray poorly graded sand with silt (SP-SM) and shell fragments

TERATEST LABS

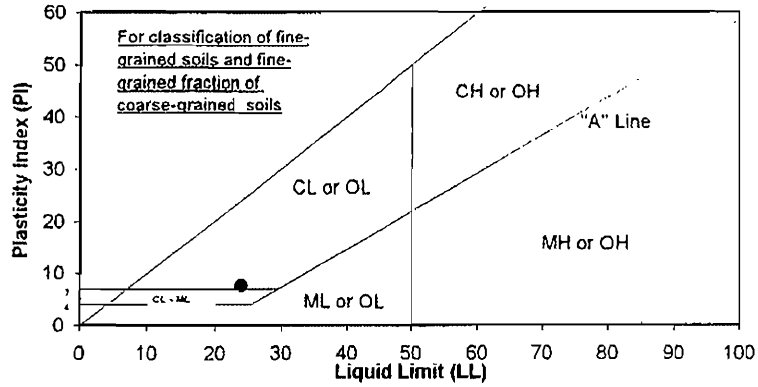
Project No.: 2384095-D-07060-1000

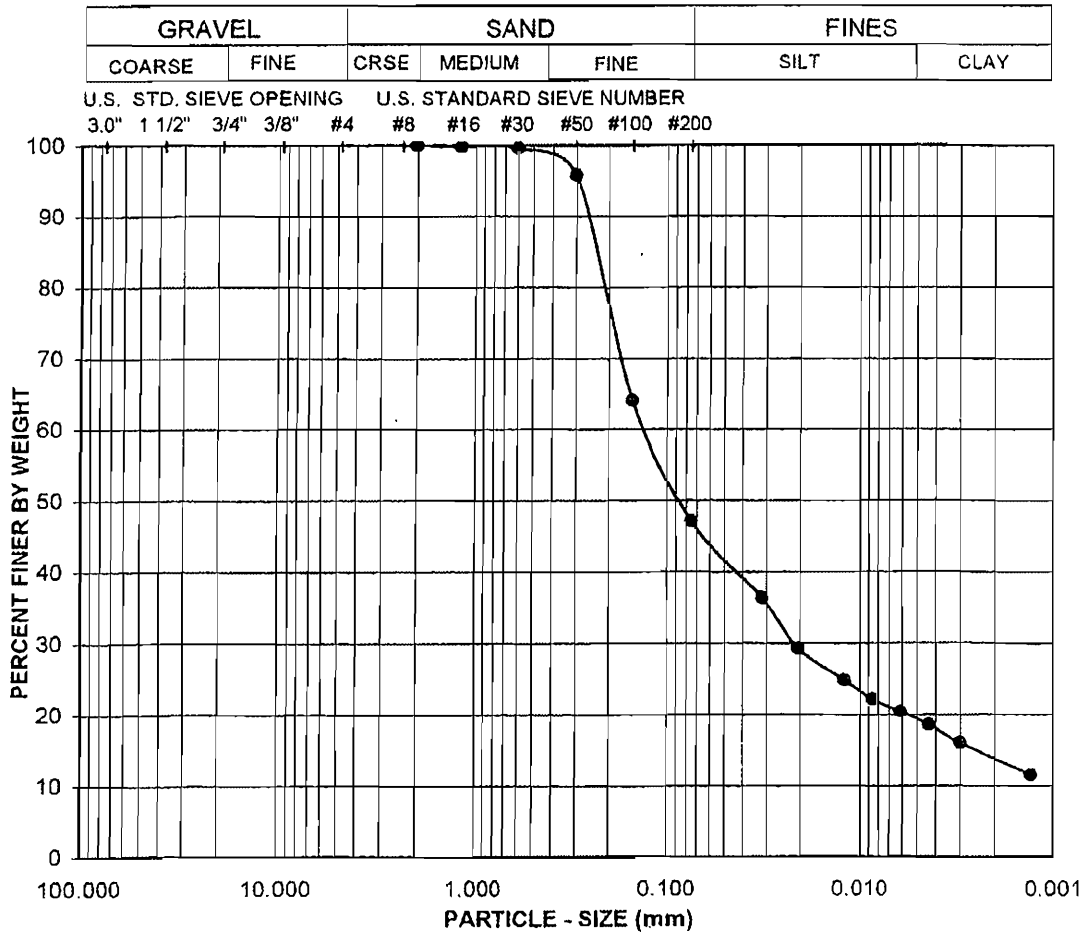
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7A	095-2-132	30.0-31.5	SC	0:53:47	24,16,8

Sample Description:

Dark gray clayey sand (SC)

TERATEST LABS

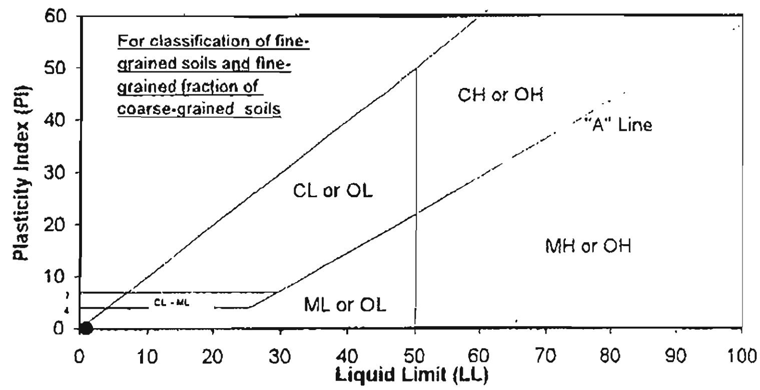
Project No.: 2384095-D-07060-1000

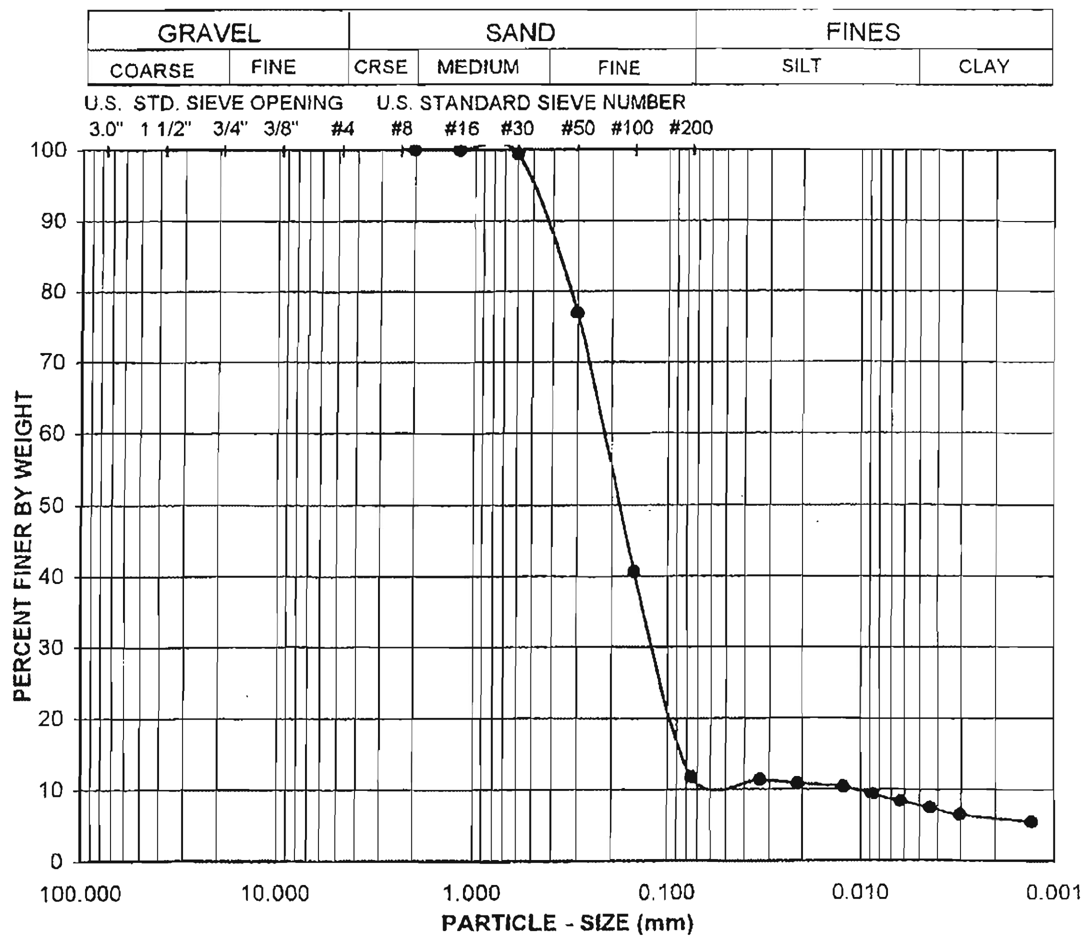
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7A	095-2-133	35.0-37.0	SP-SM	0:88:12	NONPLASTIC

Sample Description:

Dark gray poorly graded sand with silt (SP-SM)

TERATEST LABS

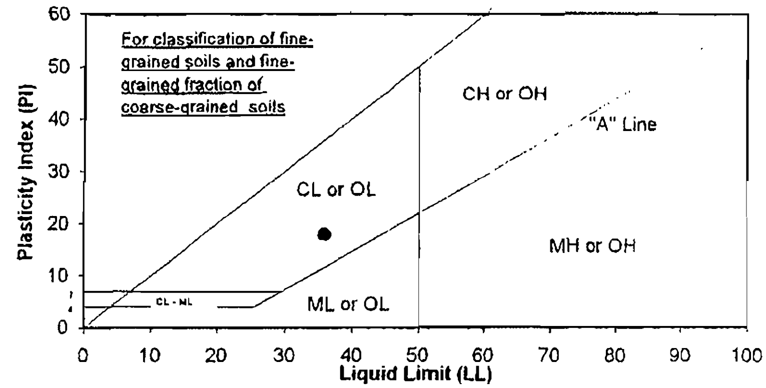
Project No.: 2384095-D-07060-1000

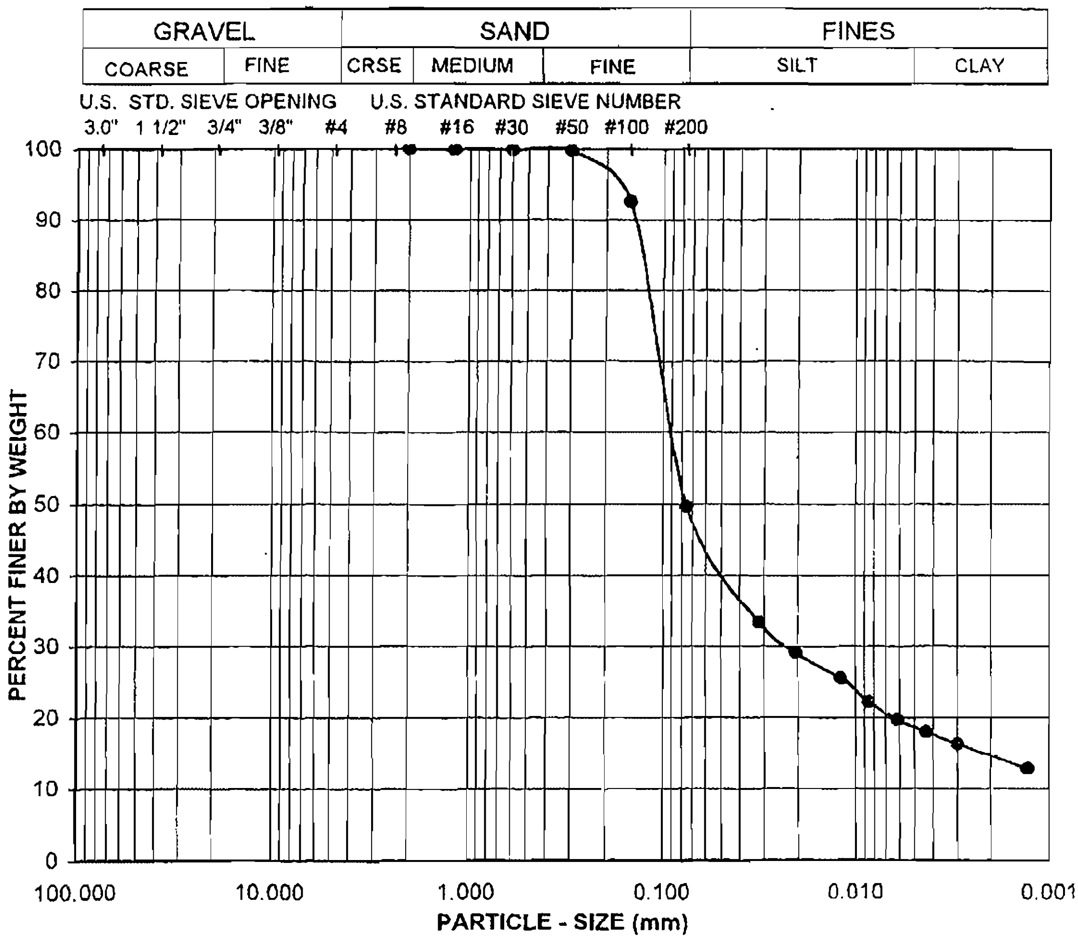
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-11	095-2-116	35.0-37.0	s(CL)	0:50:50	36,18,18

Sample Description:

Dark gray sandy lean clay s(CL)

TERATEST LABS

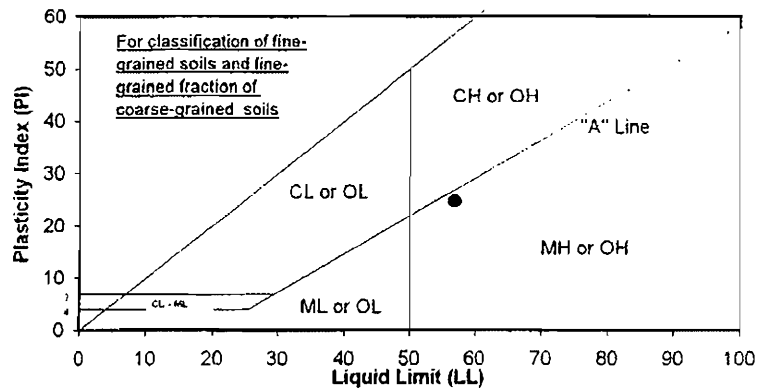
Project No.: 2384095-D-07060-1000

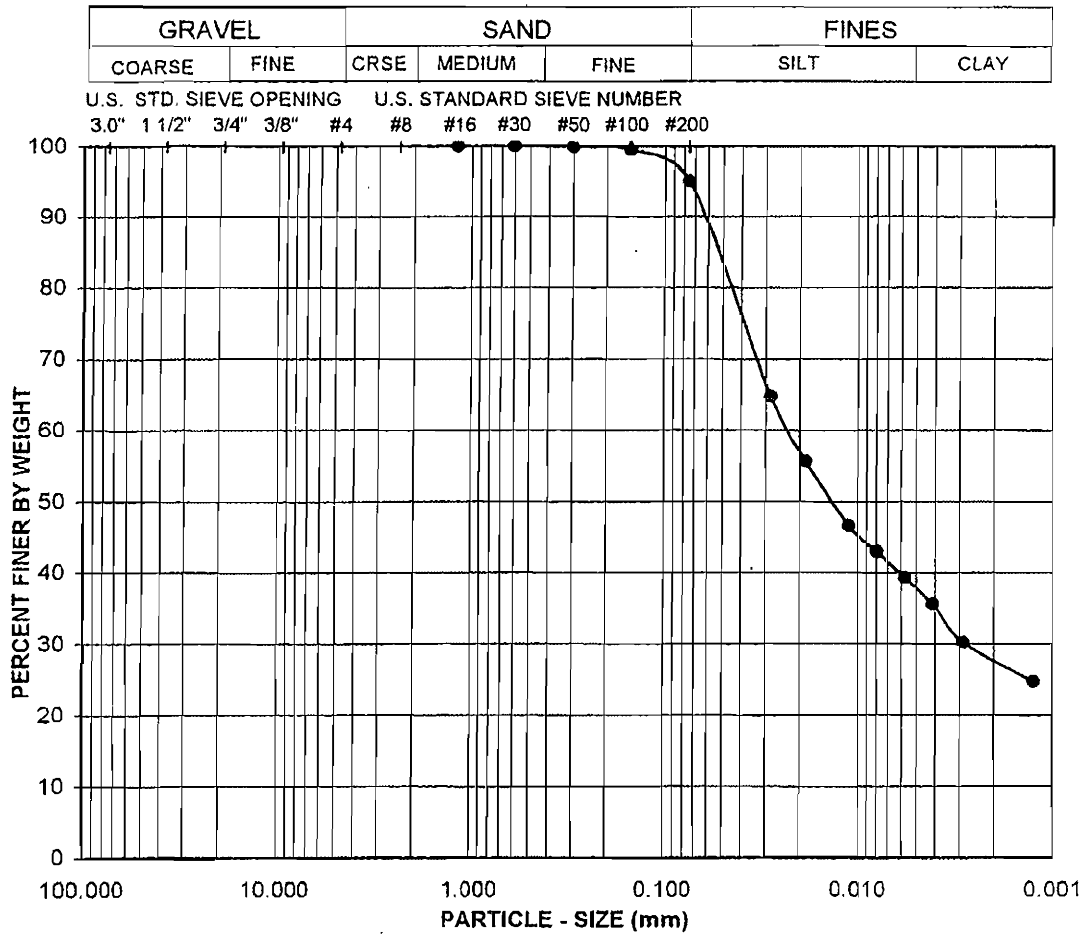
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-11	095-2-118	45.0-47.0	MH	0:5:95	57,32,25

Sample Description:

Dark gray elastic silt (MH)

TERATEST LABS

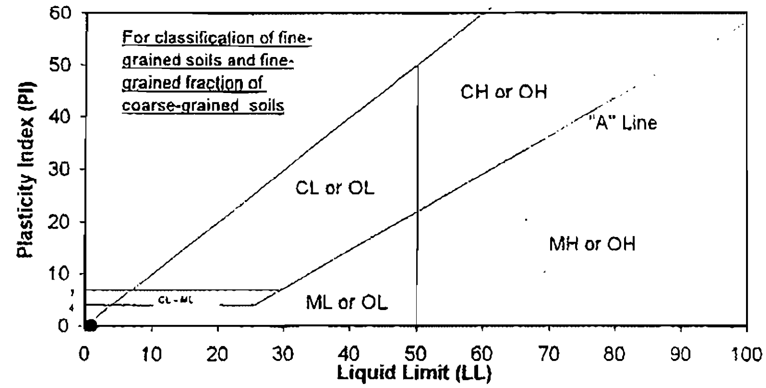
Project No.: 2384095-D-07060-1000

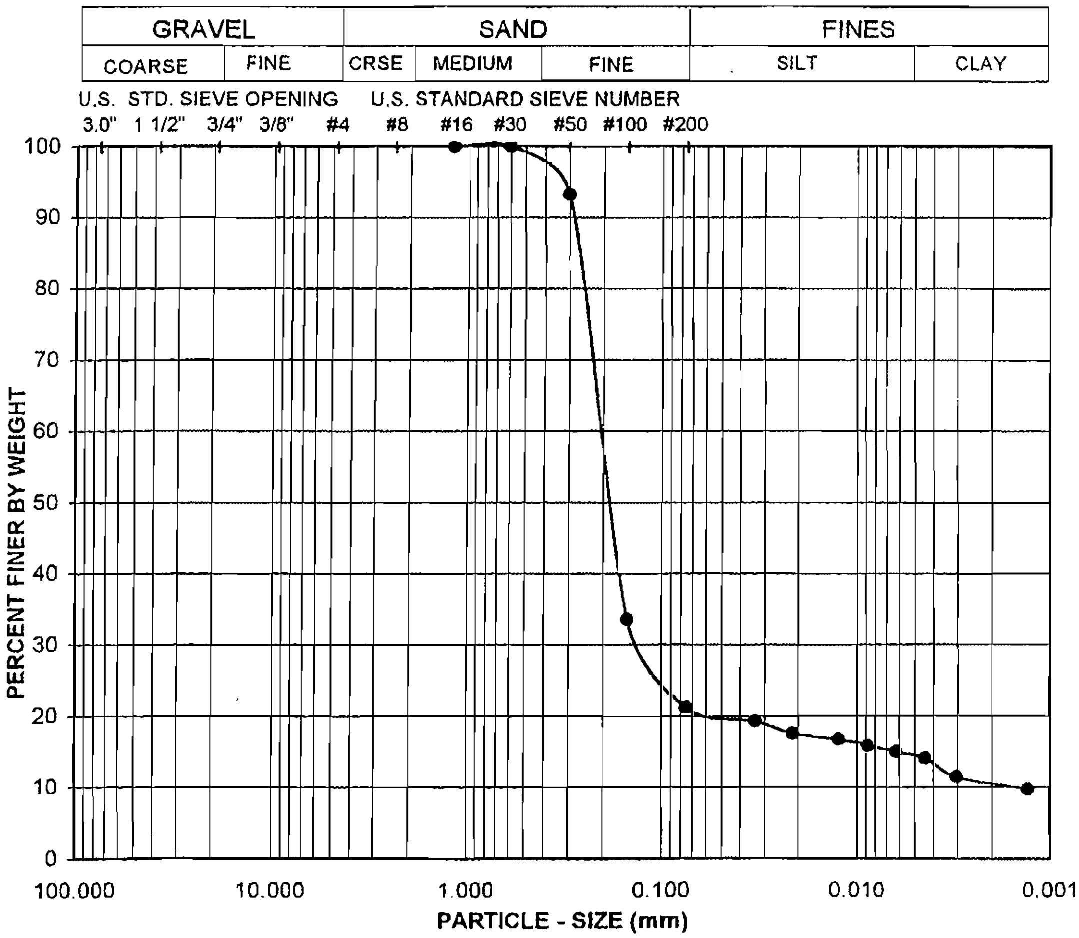
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-11	095-2-119	55.0-57.0	SM	0:79:21	NONPLASTIC

Sample Description:

Dark olive silty sand (SM)

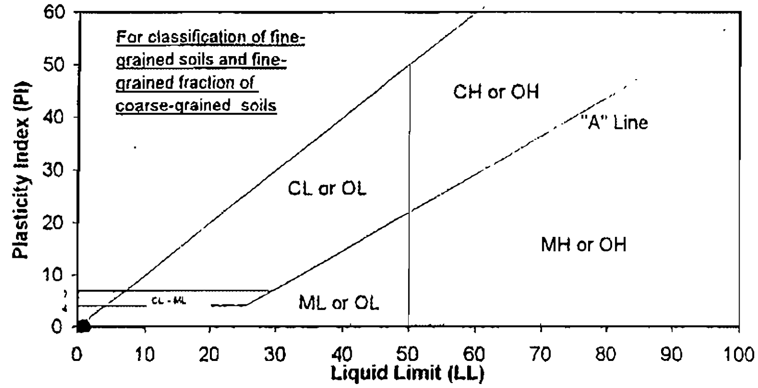
TERATEST LABS

Project No.:	2384095-D-07060-1000
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	

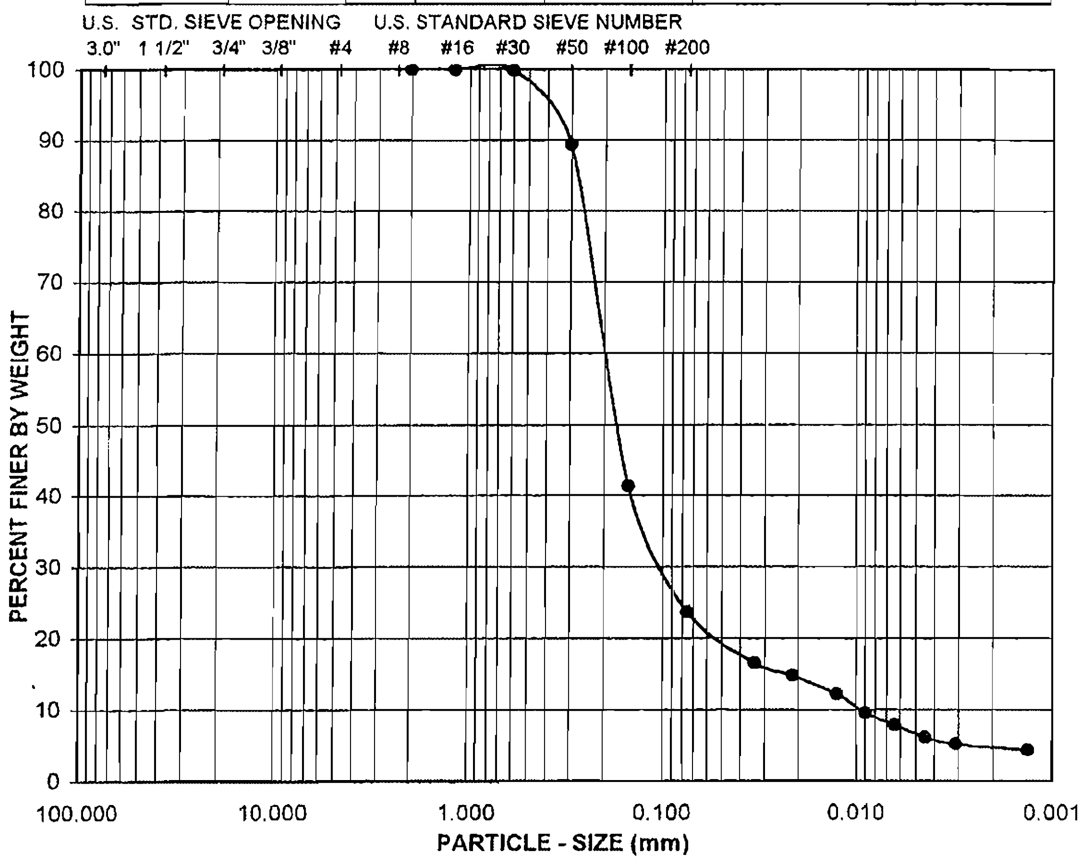
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-11	095-2-120	70.0-72.0	SM	0:76:24	NONPLASTIC

Sample Description:

Dark gray silty sand (SM)

TERATEST LABS

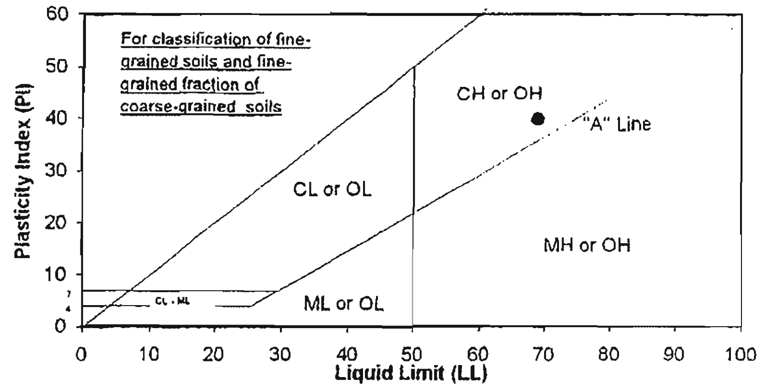
Project No.: 2384095-D-07060-1000

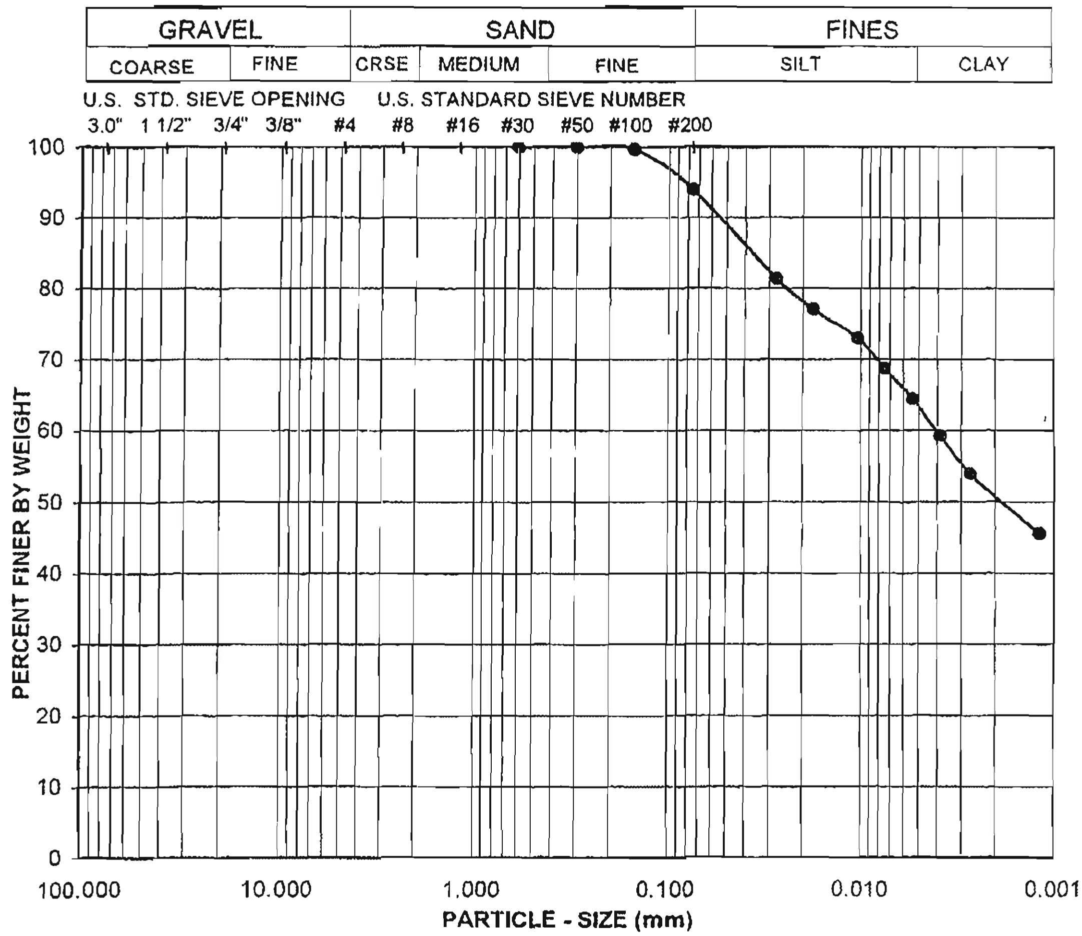
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-11	095-2-125	110.0-112.0	CH	0:6:94	69,29,40

Sample Description:

Olive gray fat clay (CH)

TERATEST LABS

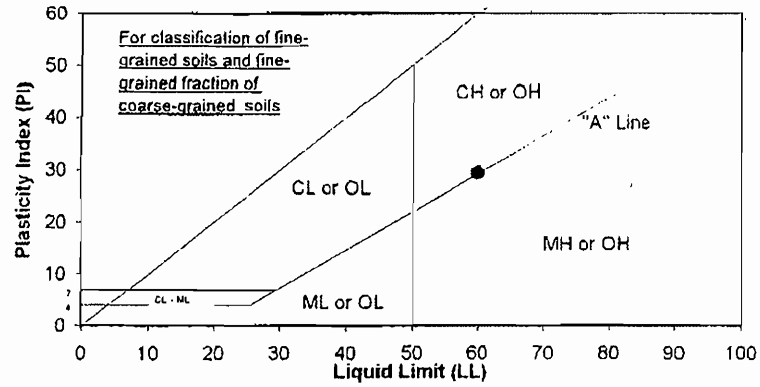
Project No.: 2384095-D-07060-1000

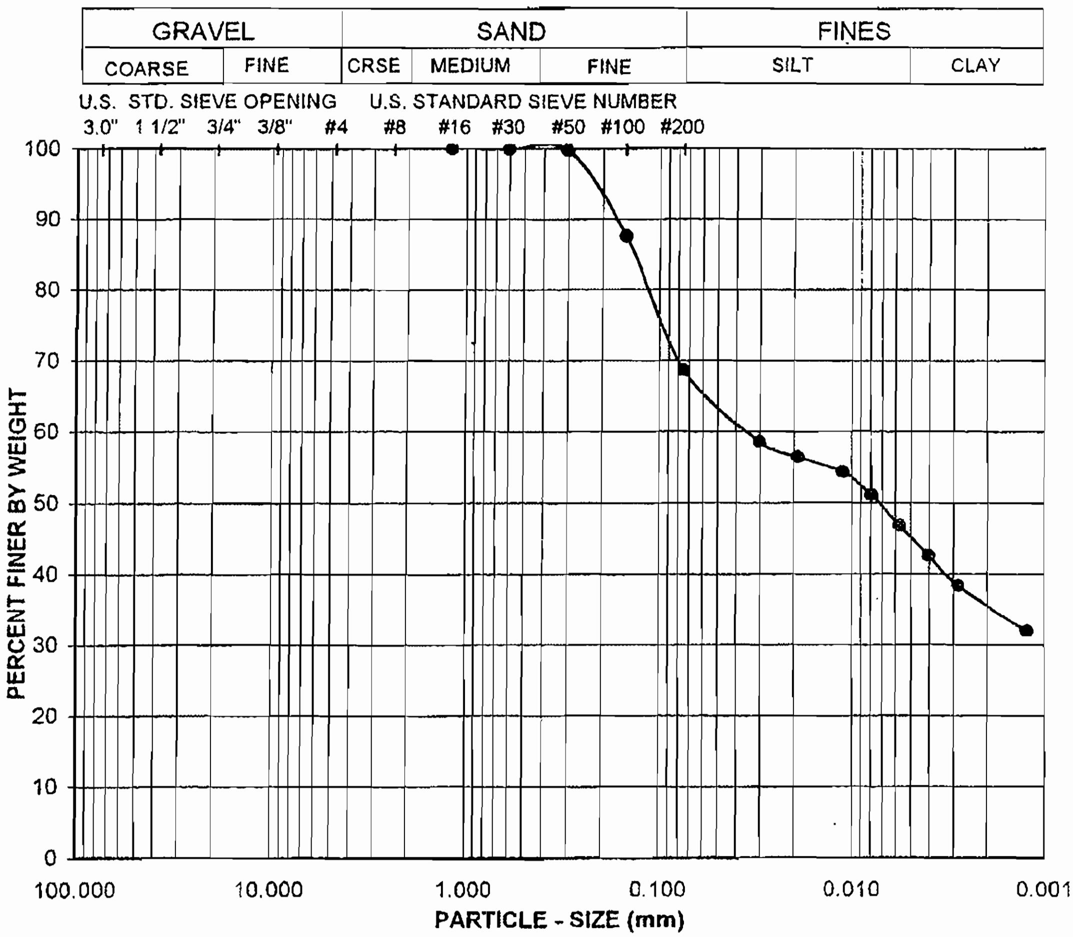
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-11	095-2-126	120.0-122.0	s(CH)	0:31:69	60,31,29

Sample Description:

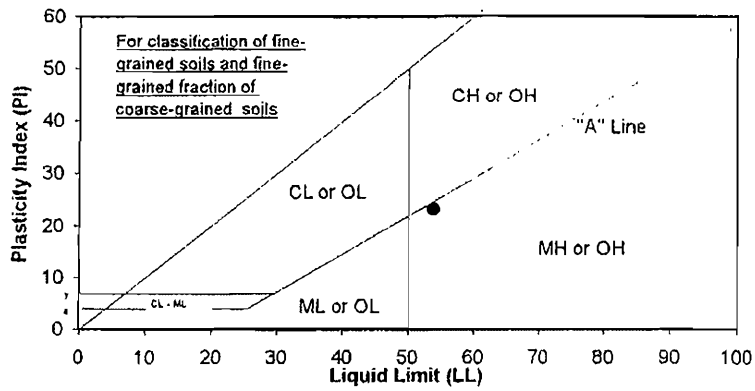
Dark gray sandy fat clay s(CH)

TERATEST LABS	Project No.: 2384095-D-07060-1000 Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

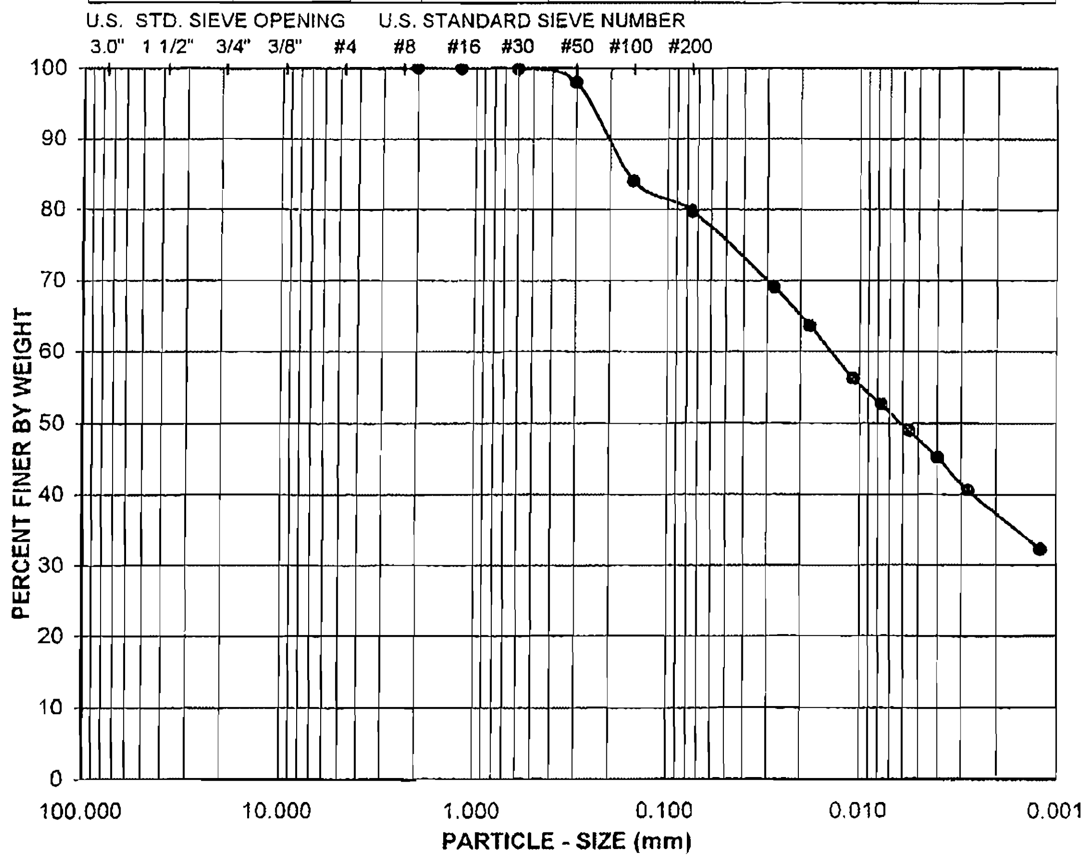
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-12	095-2-059	30.0-31.5	(MH)s	0:20:80	54,31,23

Sample Description:

Olive, elastic silt with sand (MH)s

TERATEST LABS

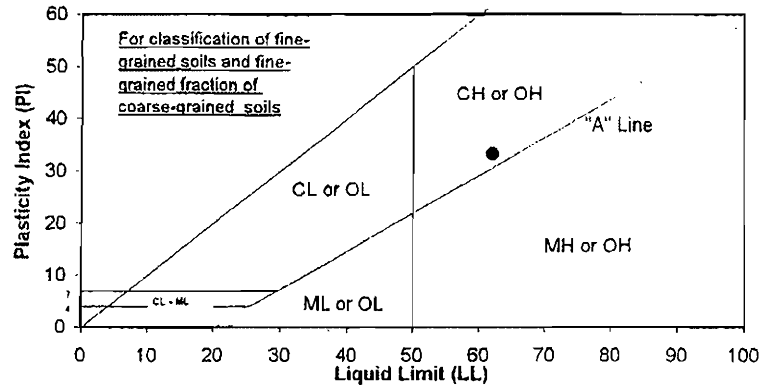
Project No.: 2384095-D-07060-1000

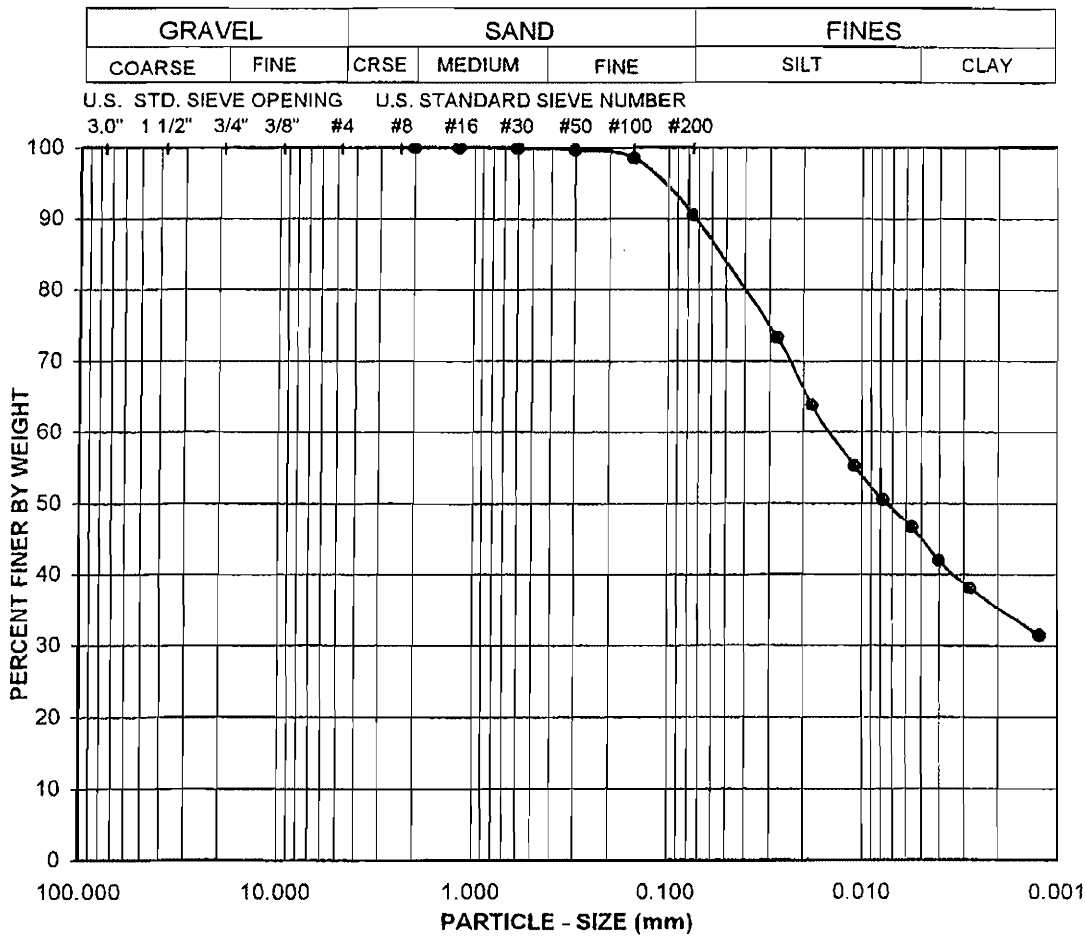
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-12	095-2-061	45.0-46.5	CH	0:9:91	62,29,33

Sample Description:

Dark gray fat clay (CH)

TERATEST LABS

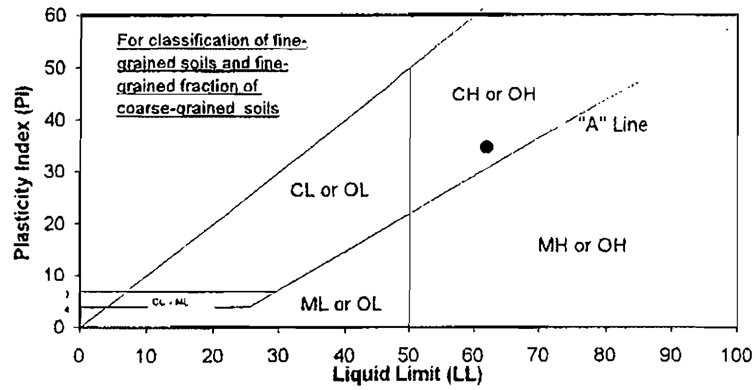
Project No.: 2384095-D-07060-1000

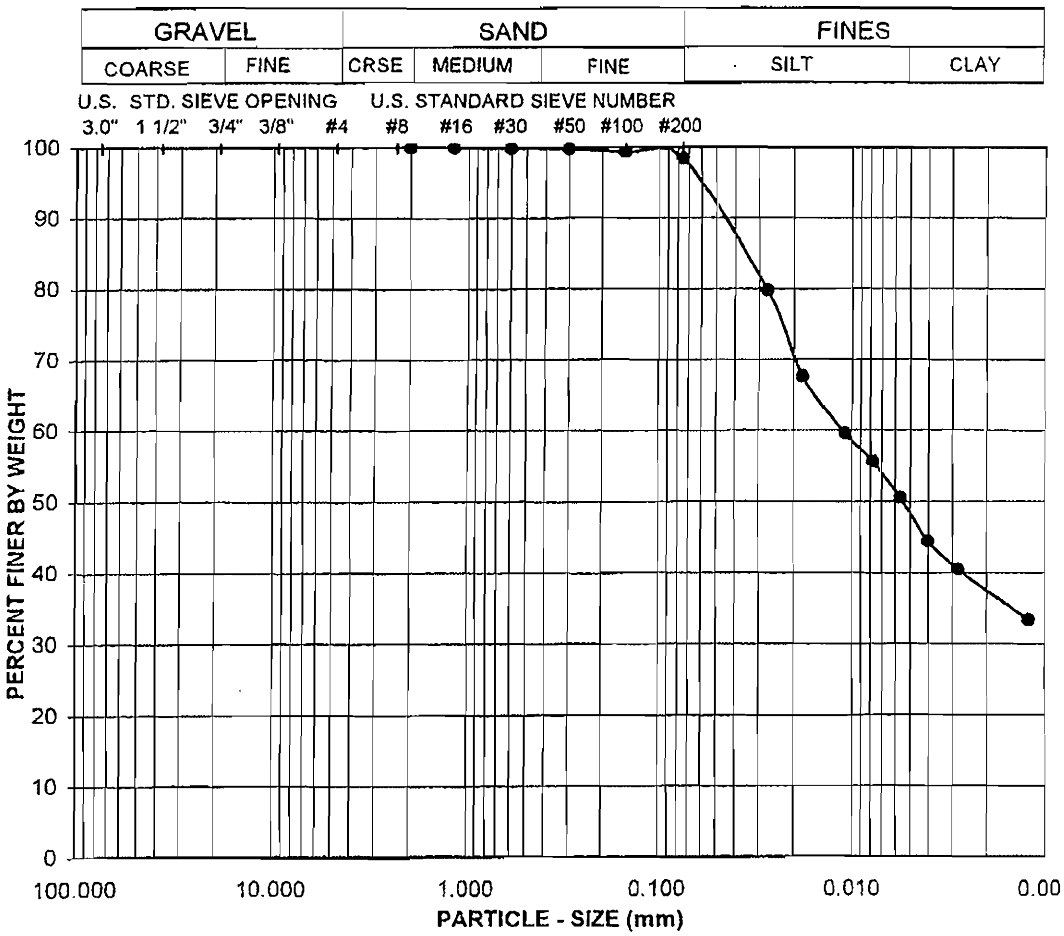
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-12	095-2-066	55.0-56.5	CH	0:2:98	62,27,35

Sample Description:

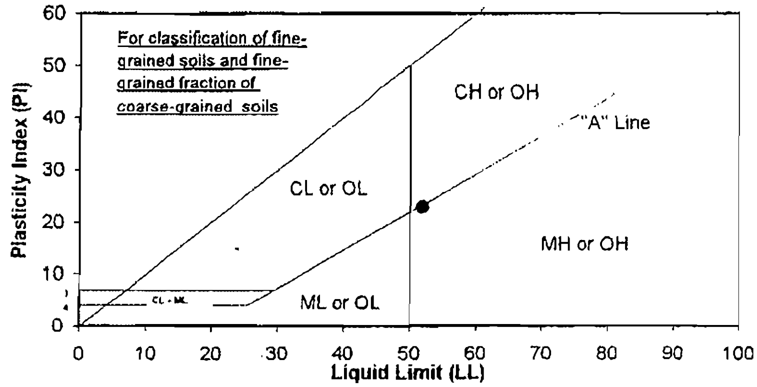
Dark gray fat clay (CH)

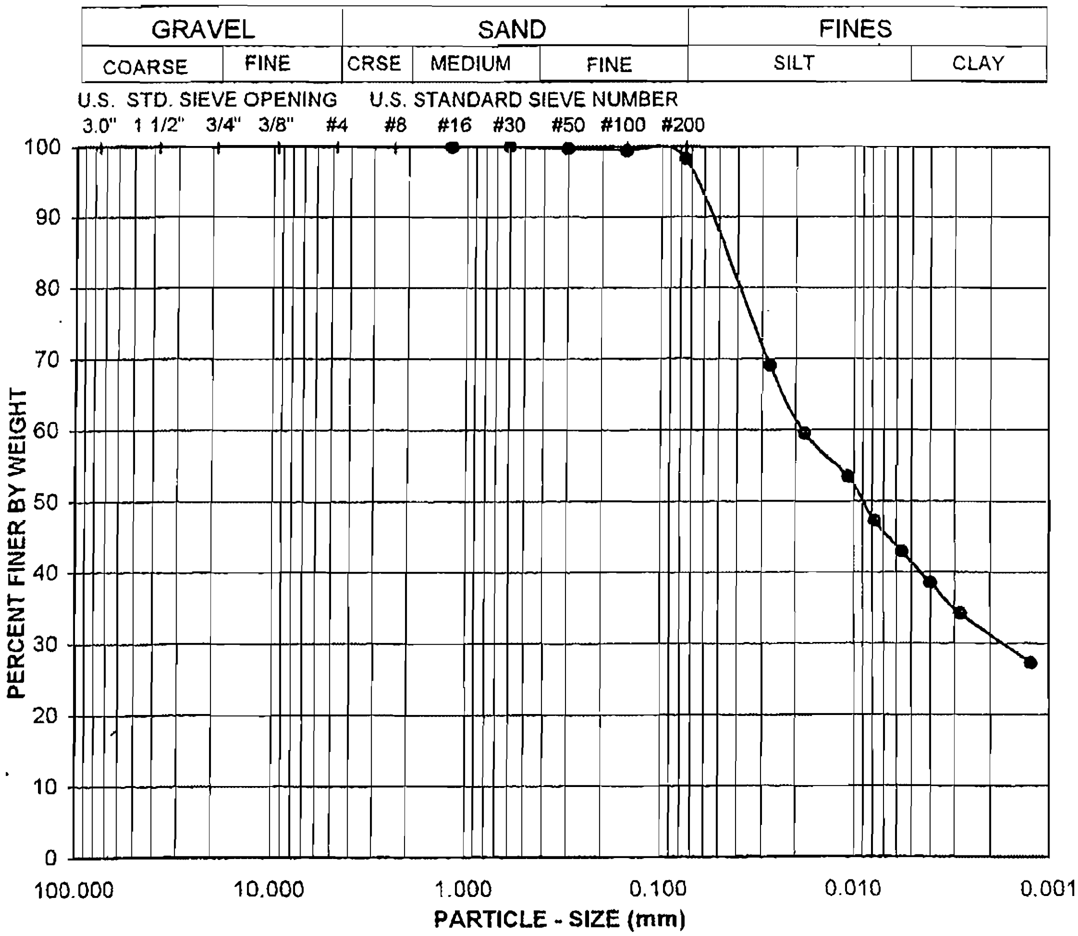
TERATEST LABS	Project No.: 2384095-D-07060-1000 Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02





LOCATION	SAMPLE ID	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-12	095-2-067	72.0-74.0	MH/CH	0:2:98	52,29,23

Sample Description:

Dark gray elastic / fat clay (MH/CH)

TERATEST LABS	Project No.: 2384095-D-07060-1000 Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

06-02

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/17/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	05/30/02
Location:	B-1	Checked By:	ZF		
Sample ID:	095-02-001	Depth (ft.)	5.0		

Visual Sample Description: Olive, poorly graded sand with silt (SP-SM)

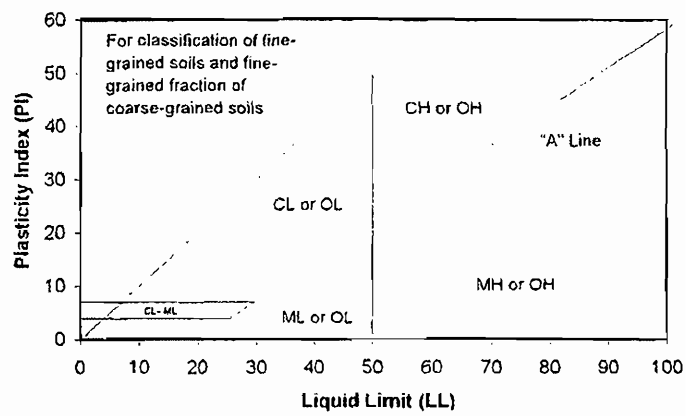
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			33	23	17	
Wet Wt. of Soil + Cont. (gm)						
Dry Wt. of Soil + Cont. (gm)		NONPLASTIC				
Wt. of Container (gm)						
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Liquid Limit	
Plastic Limit	**#DIV/0!**
Plasticity Index	**#DIV/0!**
USCS Classification	**SP-SM**

PI at "A" - Line = 0.73(LL-20) = -14.6

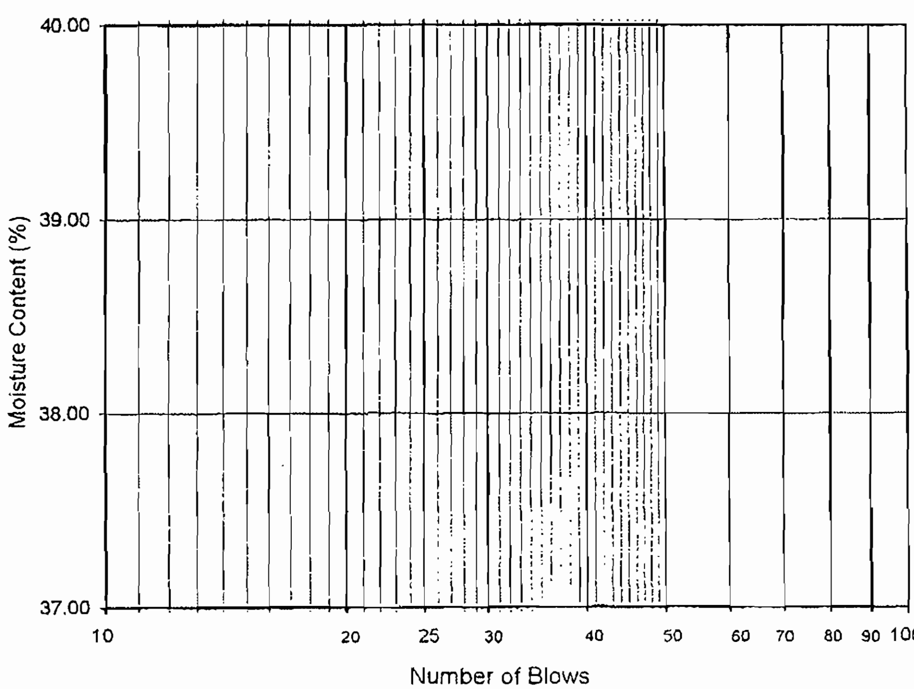
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation Multipoint - Wet
- [X] Dry Preparation Multipoint - Dry
- [X] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/31/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-5	Checked By:	LF		
Sample ID:	095-02-019	Depth (ft.)	5.0-7.0		

Visual Sample Description: Very dark gray, silty sand (SM)

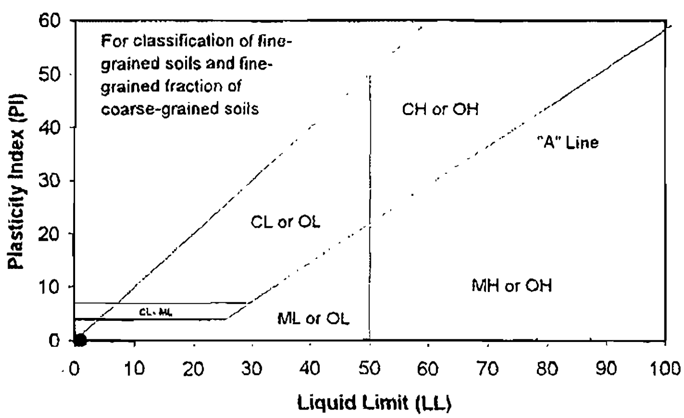
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]					9	
Wet Wt. of Soil + Cont. (gm)					20.91	
Dry Wt. of Soil + Cont. (gm)		NONPLASTIC			16.70	
Wt. of Container (gm)					1.10	
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	26.99	

Liquid Limit	**NP**
Plastic Limit	**#DIV/0!**
Plasticity Index	**#DIV/0!**
USCS Classification	**NP**

PI at "A" - Line = 0.73(LL-20) = -14.6

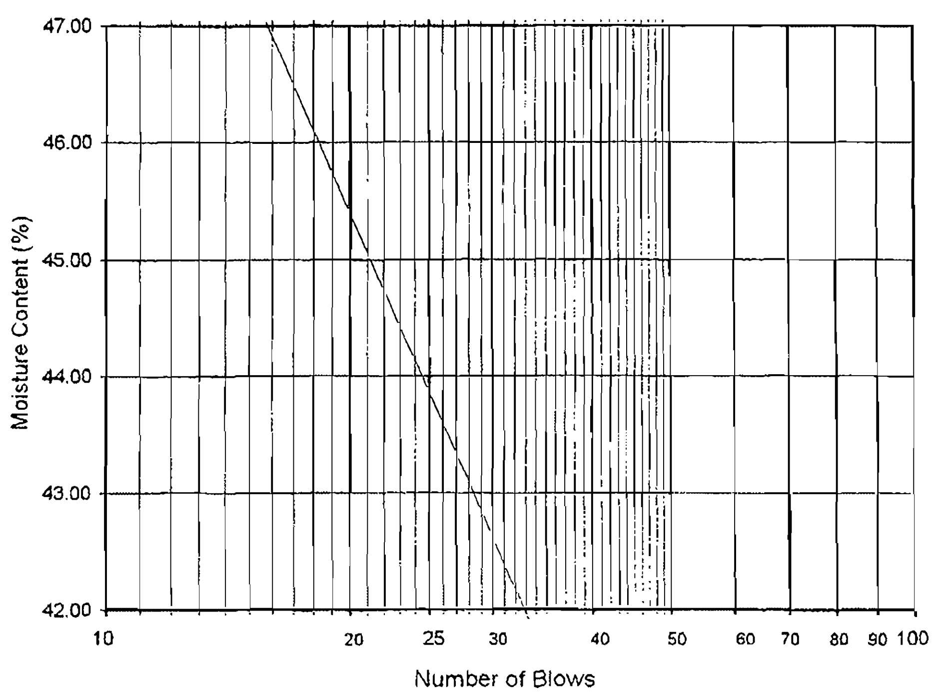
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/31/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-5	Checked By:	LF		
Sample ID:	095-02-020	Depth (ft.)	15.0-17.0		

Visual Sample Description: Olive, silty sand (SM)

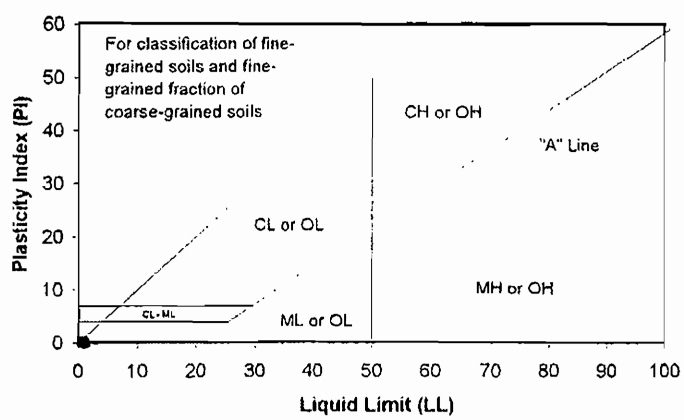
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]					7	
Wet Wt. of Soil + Cont. (gm)					19.60	
Dry Wt. of Soil + Cont. (gm)		NONPLASTIC			16.92	
Wt. of Container (gm)					1.03	
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	16.87	

Liquid Limit	**NP**
Plastic Limit	**#DIV/0!**
Plasticity Index	**#DIV/0!**
USCS Classification	**NP**

PI at "A" - Line = 0.73(LL-20) = -14.6

One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



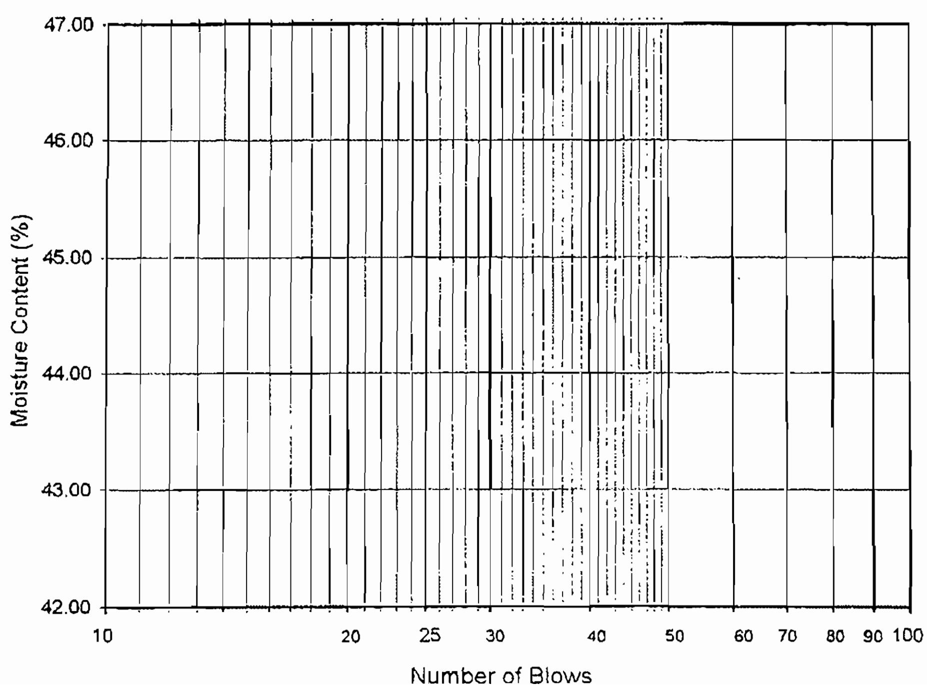
PROCEDURES USED

[ ] Wet Preparation
Multipoint - Wet

[X] Dry Preparation
Multipoint - Dry

[X] Procedure A
Multipoint Test

[ ] Procedure B
One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/31/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-5	Checked By:	LF		
Sample ID:	095-02-021	Depth (ft.)	20.5-21.0		

Visual Sample Description: Olive, sandy silty clay s(CL-ML)

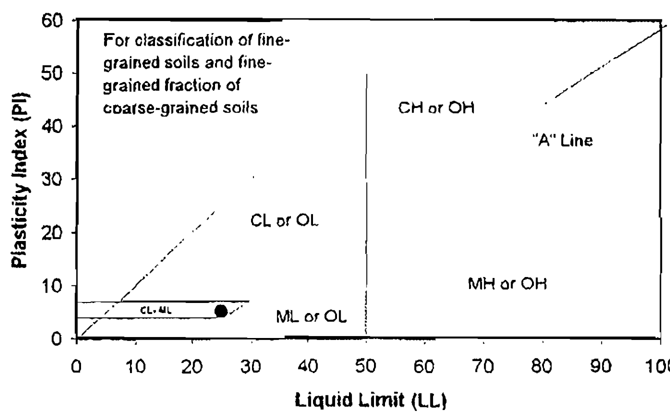
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			31	24	18	
Wet Wt. of Soil + Cont. (gm)	13.50	13.72	16.76	16.03	17.02	
Dry Wt. of Soil + Cont. (gm)	11.43	11.62	13.70	13.05	13.77	
Wt. of Container (gm)	1.07	1.02	1.06	1.07	1.11	
Moisture Content (%) [Wn]	19.98	19.81	24.21	24.87	25.67	

Liquid Limit	**25**
Plastic Limit	**20**
Plasticity Index	**5**
USCS Classification	**CL-ML**

PI at "A" - Line = 0.73(LL-20) = 3.65

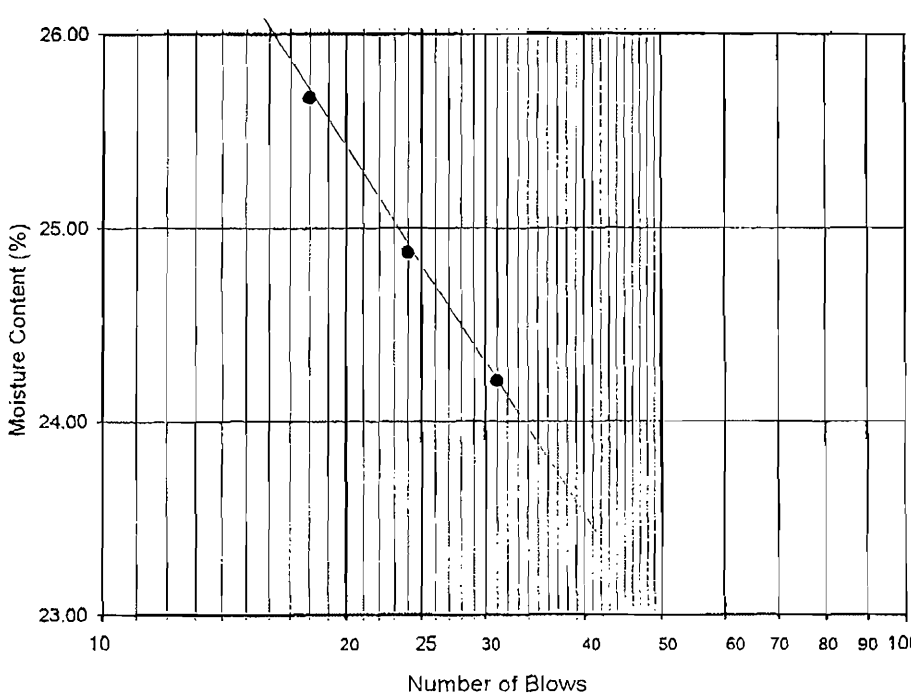
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERRATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/17/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	05/30/02
Location:	B-5	Checked By:	LF		
Sample ID:	095-02-022	Depth (ft.)	30.0-31.5		

Visual Sample Description: Olive, lean clay (CL)

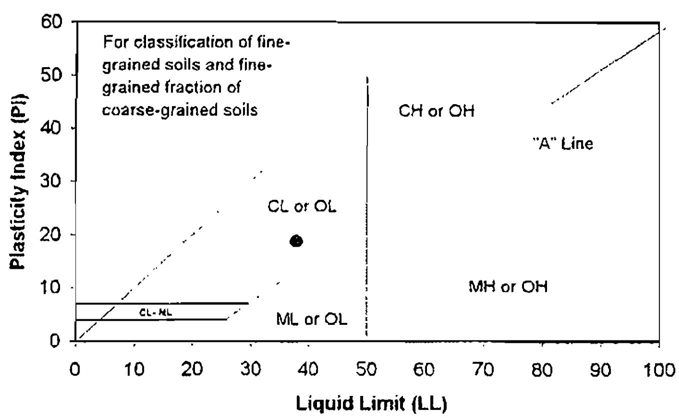
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			33	23	17	
Wet Wt. of Soil + Cont. (gm)	16.94	17.03	17.74	19.53	18.63	
Dry Wt. of Soil + Cont. (gm)	14.35	14.43	13.21	14.40	13.64	
Wt. of Container (gm)	1.01	1.00	1.05	1.03	1.03	
Moisture Content (%) [Wn]	19.42	19.36	37.25	38.37	39.57	

Liquid Limit	**38**
Plastic Limit	**19**
Plasticity Index	**19**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 13.14

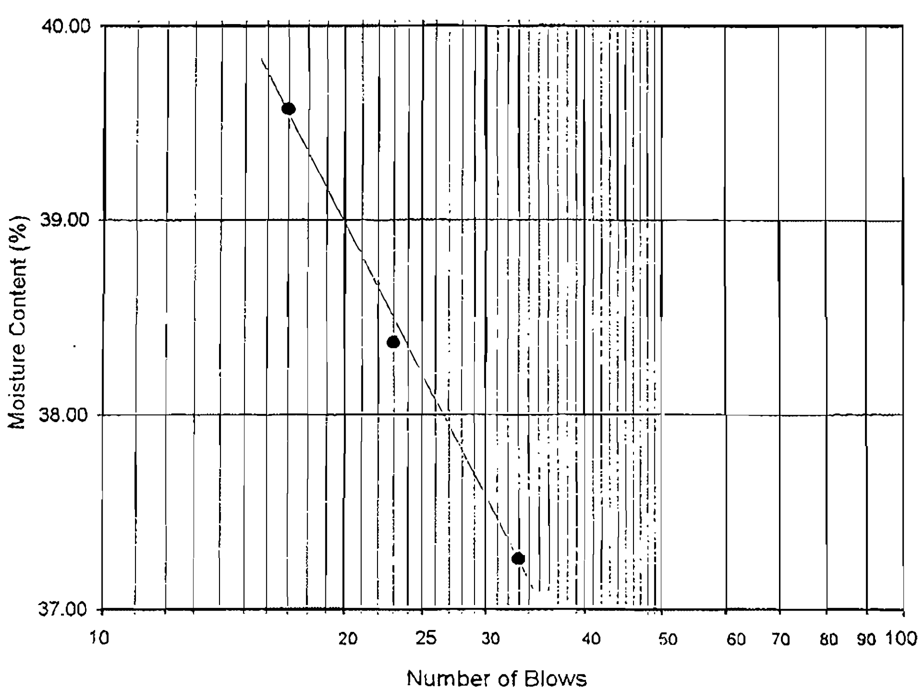
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS

ASTM D 4318

TERATEST LABS

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	ACS	Date:	05/28/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-5	Checked By:	LF		
Sample ID:	095-02-023	Depth (ft.)	50.0-51.5		

Visual Sample Description: Olive, lean clay (CL)

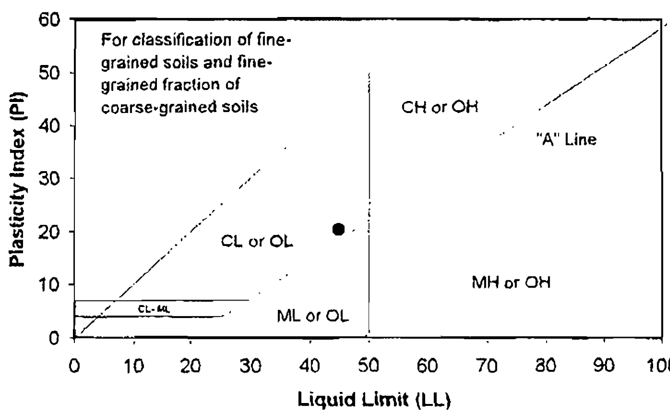
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			31	21	15	
Wet Wt. of Soil + Cont. (gm)	8.80	8.57	19.41	19.32	18.82	
Dry Wt. of Soil + Cont. (gm)	7.25	7.08	13.78	13.61	13.15	
Wt. of Container (gm)	0.99	1.06	1.09	1.07	1.03	
Moisture Content (%) [Wn]	24.76	24.75	44.37	45.53	46.78	

Liquid Limit	**45**
Plastic Limit	**25**
Plasticity Index	**20**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 18.25

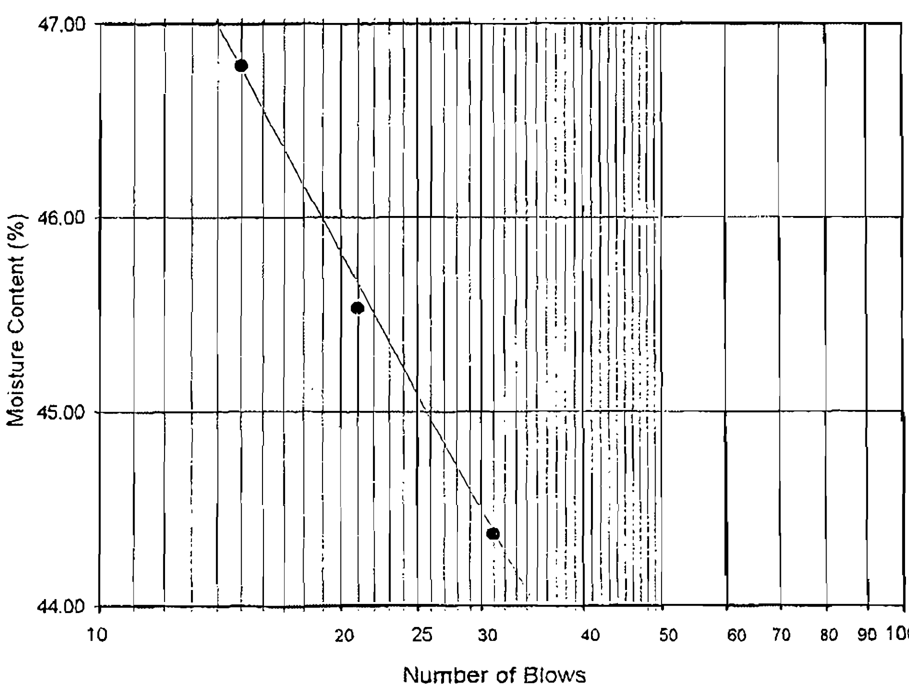
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS

ASTM D 4318

TERRATEST LABS

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/30/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-5	Checked By:	ZF		
Sample ID:	095-02-024	Depth (ft.)	70.0-71.5		

Visual Sample Description: Olive, fat clay (CH)

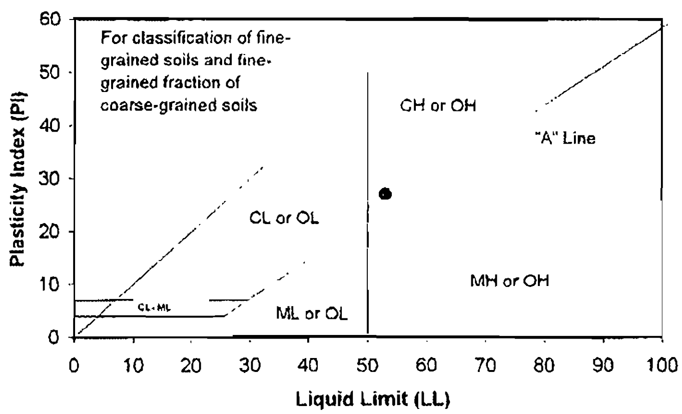
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			35	28	18	
Wet Wt. of Soil + Cont. (gm)	16.38	15.62	17.50	16.71	17.59	
Dry Wt. of Soil + Cont. (gm)	13.18	12.57	11.98	11.32	11.77	
Wt. of Container (gm)	1.02	1.02	1.10	1.00	1.09	
Moisture Content (%) [Wn]	26.32	26.41	50.74	52.23	54.49	

Liquid Limit	**53**
Plastic Limit	**26**
Plasticity Index	**27**
USCS Classification	**CH**

PI at "A" - Line = 0.73(LL-20) = 24.09

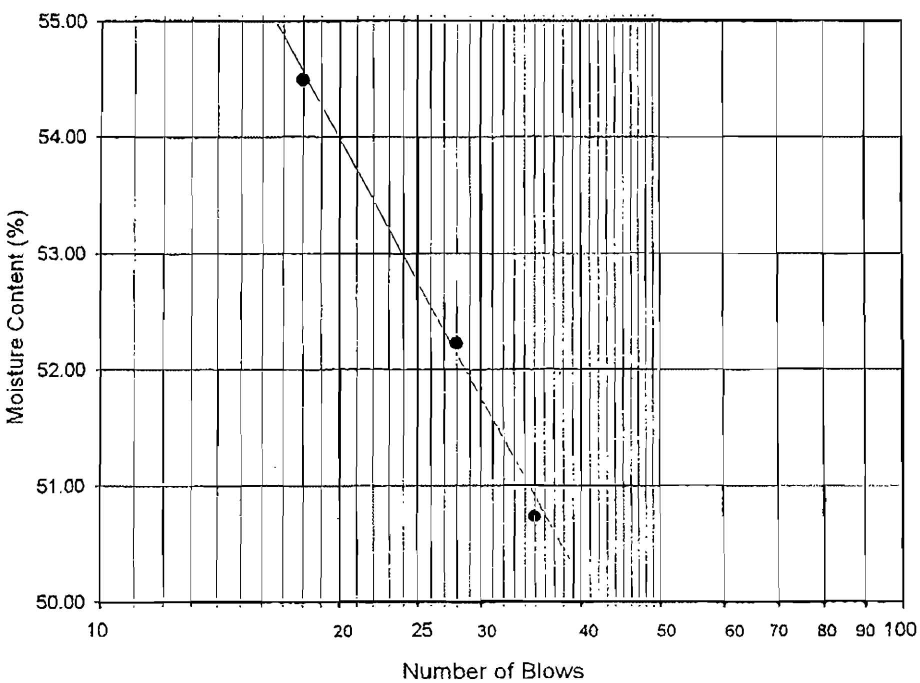
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/31/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-6	Checked By:	LF		
Sample ID:	095-02-027	Depth (ft.)	7.0-9.0		

Visual Sample Description: Olive, clayey sand (SC)

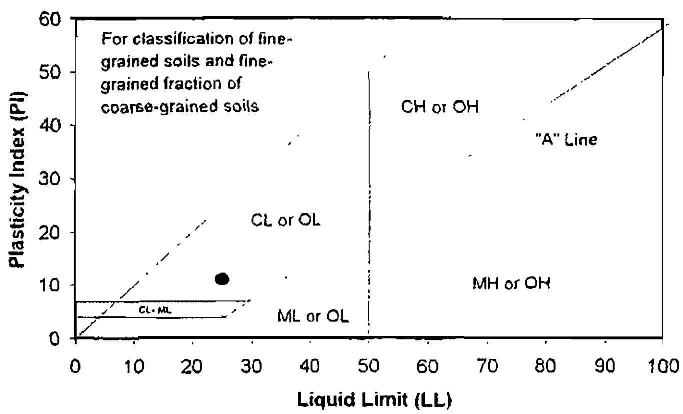
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			31	24	17	
Wet Wt. of Soil + Cont. (gm)	15.18	14.90	19.38	18.55	17.92	
Dry Wt. of Soil + Cont. (gm)	13.47	13.19	15.81	15.04	14.42	
Wt. of Container (gm)	1.12	1.00	1.01	0.99	1.10	
Moisture Content (%) [Wn]	13.85	14.03	24.12	24.98	26.28	

Liquid Limit	**25**
Plastic Limit	**14**
Plasticity Index	**11**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 3.65

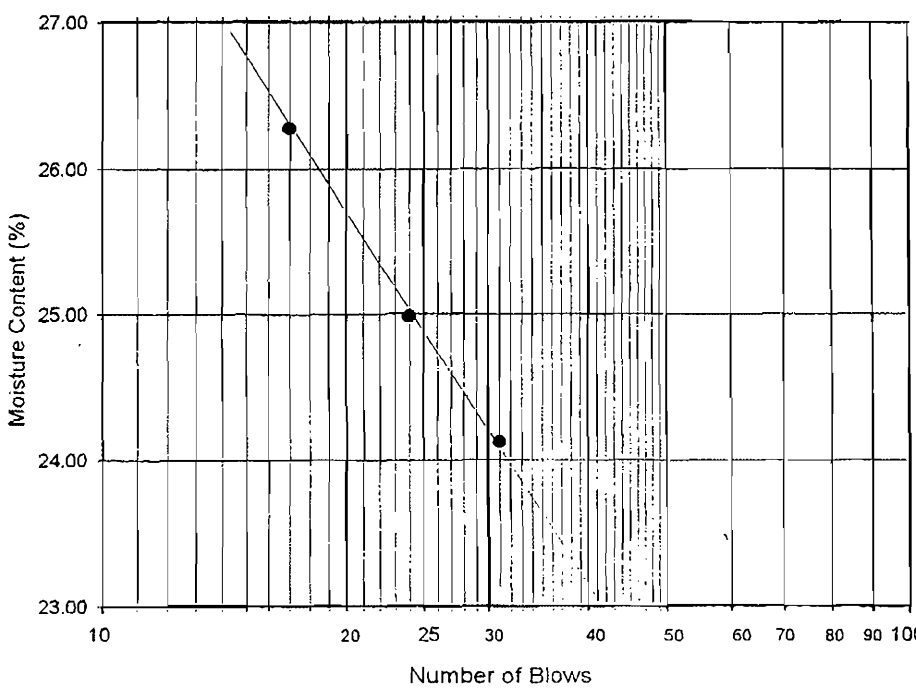
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation — Multipoint - Wet
- [X] Dry Preparation — Multipoint - Dry
- [X] Procedure A — Multipoint Test
- [ ] Procedure B — One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	06/03/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-6	Checked By:	ZF		
Sample ID:	095-02-028	Depth (ft.)	15.0-17.0		

Visual Sample Description: Olive, sandy lean clay s(CL)

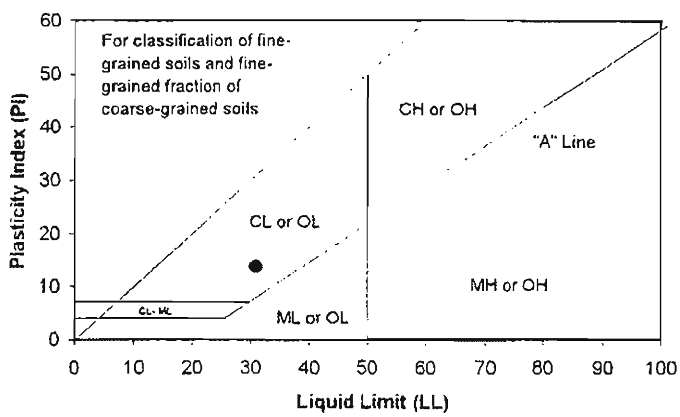
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			32	27	18	
Wet Wt. of Soil + Cont. (gm)	15.85	15.64	17.16	18.04	18.66	
Dry Wt. of Soil + Cont. (gm)	13.67	13.49	13.48	14.06	14.41	
Wt. of Container (gm)	1.10	1.00	1.11	1.06	1.09	
Moisture Content (%) [Wn]	17.34	17.21	29.75	30.62	31.91	

Liquid Limit	**31**
Plastic Limit	**17**
Plasticity Index	**14**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 8.03

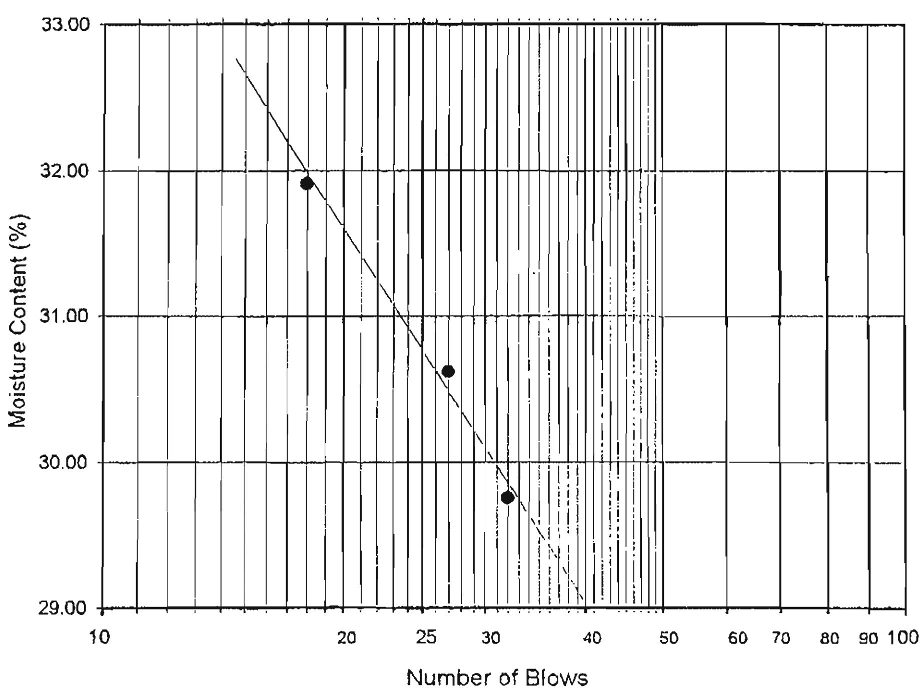
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation — Multipoint - Wet
- [x] Dry Preparation — Multipoint - Dry
- [x] Procedure A — Multipoint Test
- [ ] Procedure B — One-point Test



ATTERBERG LIMITS

ASTM D 4318

TERATEST LABS

Project Name:	Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda, CA	Tested By:	RA	Date:	05/31/02
Project No. :	2384095-D-07060	Input By:	RA	Date:	06/05/02
Location:	B-6	Checked By:	LF		
Sample ID:	095-02-029	Depth (ft.)	41.0-42.5		

Visual Sample Description: Olive, clayey sand (SC)

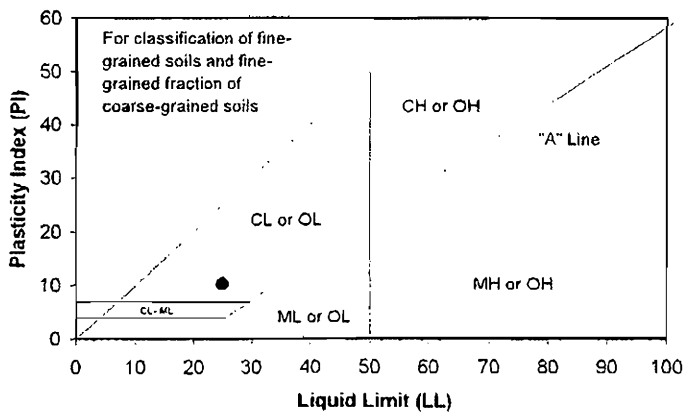
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			32	26	19	
Wet Wt. of Soil + Cont. (gm)	16.15	16.84	16.84	18.77	21.40	
Dry Wt. of Soil + Cont. (gm)	14.22	14.81	13.72	15.23	17.19	
Wt. of Container (gm)	1.06	1.02	1.06	1.09	0.97	
Moisture Content (%) [Wn]	14.67	14.72	24.64	25.04	25.96	

Liquid Limit	**25**
Plastic Limit	**15**
Plasticity Index	**10**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 3.65

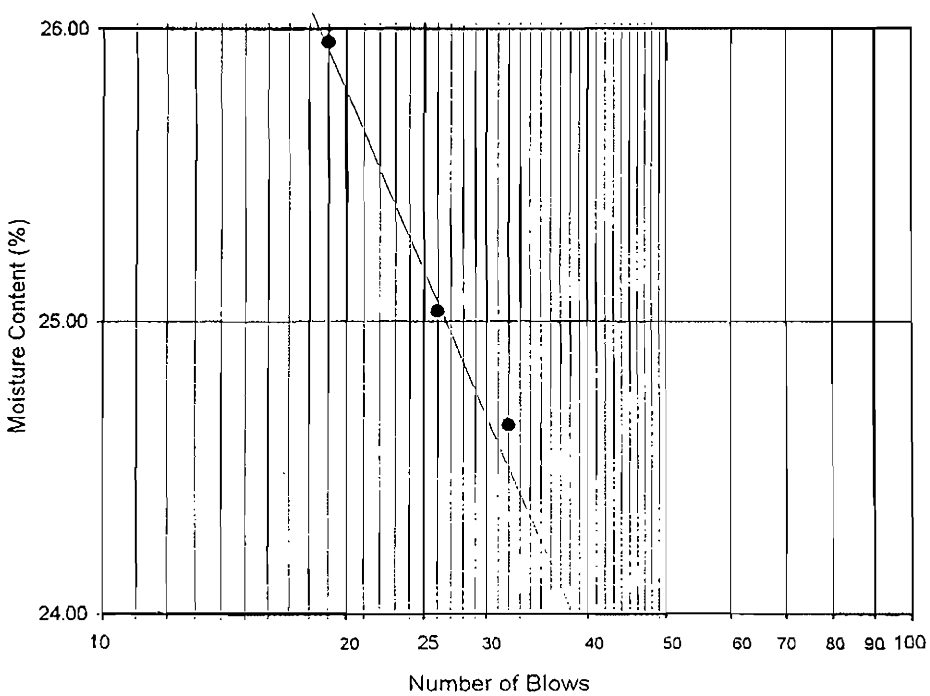
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS

ASTM D 4318

TERATEST LABS

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	RA	Date:	06/05/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-7A	Checked By:	LF		
Sample ID:	095-2-131	Depth (ft.)	25.0-27.0		

Visual Sample Description: Dark gray poorly graded sand with silt (SP-SM) and shell fragments

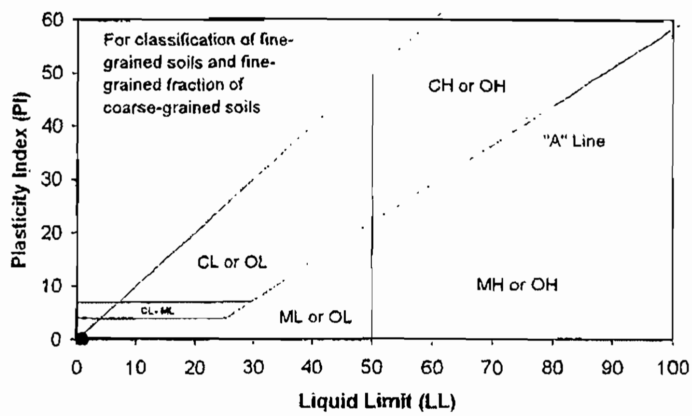
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]						
Wet Wt. of Soil + Cont. (gm)	Cannot be rolled					
Dry Wt. of Soil + Cont. (gm)	NONPLASTIC					
Wt. of Container (gm)						
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Liquid Limit	**NP**
Plastic Limit	**#DIV/0!**
Plasticity Index	**#DIV/0!**
USCS Classification	**NP**

PI at "A" - Line = 0.73(LL-20) = -14.6

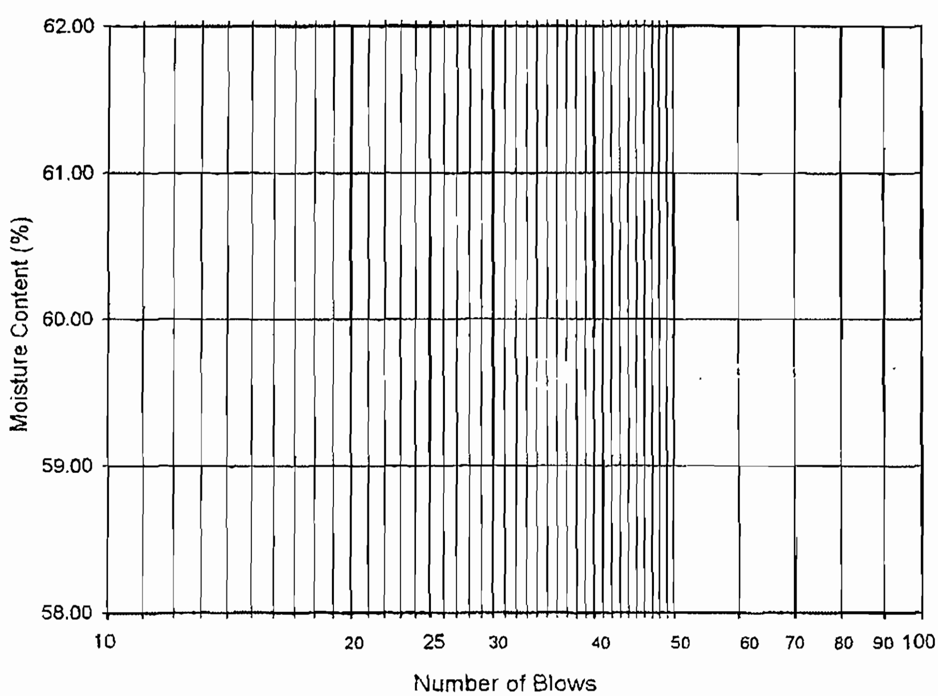
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS
ASTM D 4318

TERATEST LABS

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	VJ	Date:	06/15/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-7A	Checked By:	LF		
Sample ID:	095-2-132	Depth (ft.)	30.0-31.5		

Visual Sample Description: Dark gray clayey sand (SC)

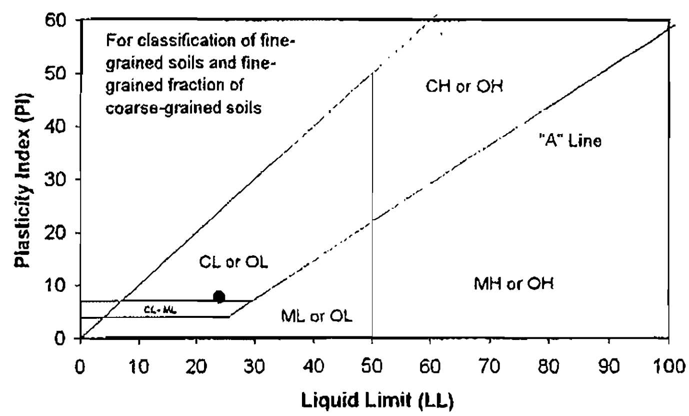
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			28	20	15	
Wet Wt. of Soil + Cont. (gm)	12.39	13.18	16.50	14.58	15.97	
Dry Wt. of Soil + Cont. (gm)	10.80	11.48	13.52	11.90	12.90	
Wt. of Container (gm)	1.08	1.03	0.99	1.06	1.01	
Moisture Content (%) [Wn]	16.36	16.27	23.78	24.72	25.82	

Liquid Limit	**24**
Plastic Limit	**16**
Plasticity Index	**8**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 2.92

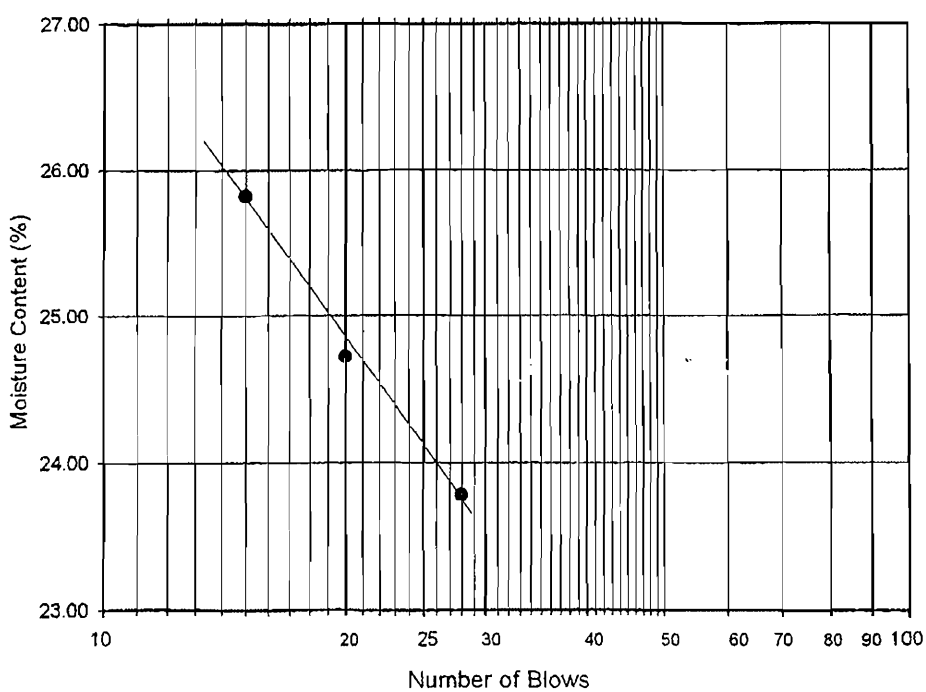
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation Multipoint - Wet
- [X] Dry Preparation Multipoint - Dry
- [X] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name: Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA Tested By: RA Date: 06/05/02

Project No. : 2384095-D-07060-1000 Input By: LF Date: 06/19/02

Location: B-7A Checked By: LF

Sample ID: 095-2-133 Depth (ft.) 35.0-37.0

Visual Sample Description: Dark gray poorly graded sand with silt (SP-SM)

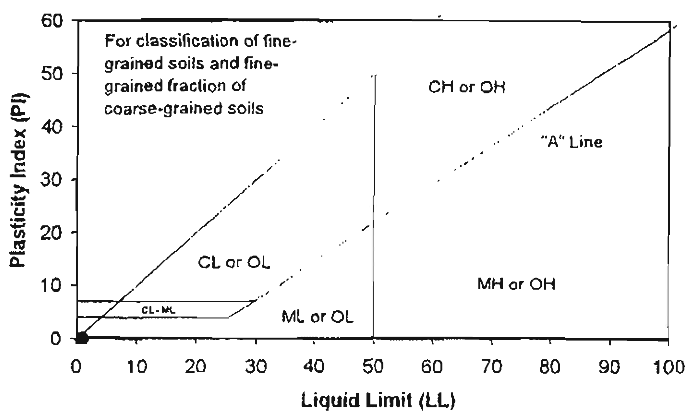
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]						
Wet Wt. of Soil + Cont. (gm)	Cannot be rolled					
Dry Wt. of Soil + Cont. (gm)	NONPLASTIC					
Wt. of Container (gm)						
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Liquid Limit	NP
Plastic Limit	#DIV/0!
Plasticity Index	#DIV/0!
USCS Classification	NP

PI at "A" - Line = 0.73(LL-20) = -14.6

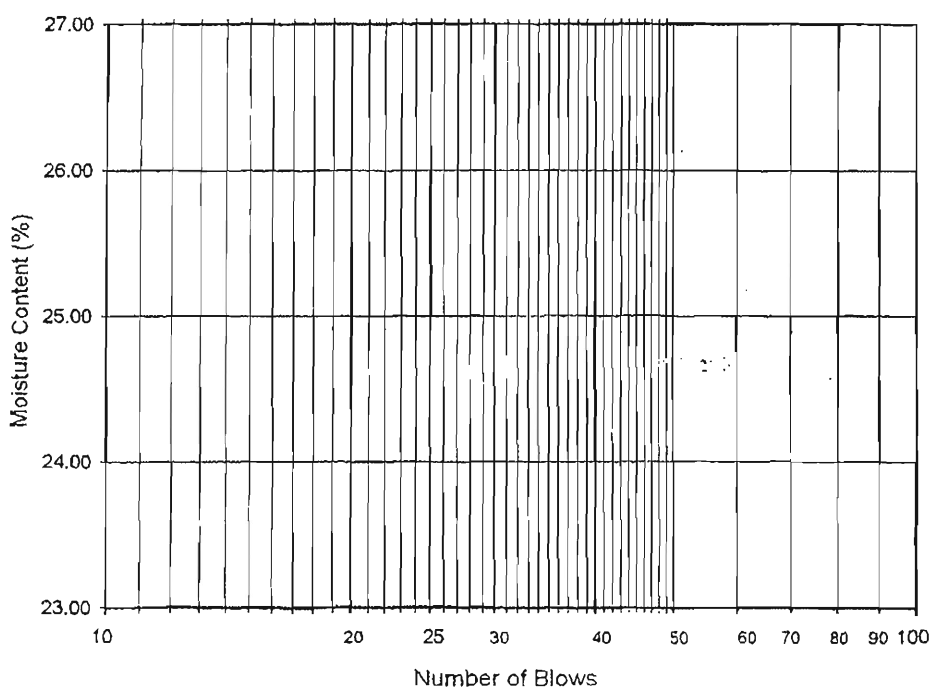
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation Multipoint - Wet
- [X] Dry Preparation Multipoint - Dry
- [X] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	RA	Date:	06/10/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-11	Checked By:	LF		
Sample ID:	095-2-116	Depth (ft.)	35.0-37.0		

Visual Sample Description: Dark gray sandy lean clay s(CL)

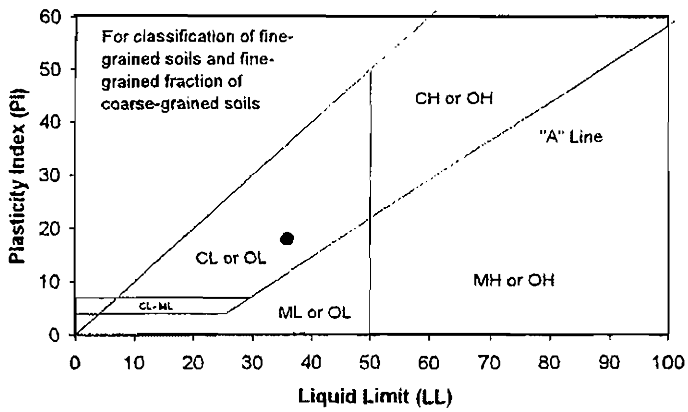
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			30	22	16	
Wet Wt. of Soil + Cont. (gm)	14.84	13.64	14.68	21.20	18.69	
Dry Wt. of Soil + Cont. (gm)	12.72	11.72	11.09	15.80	13.79	
Wt. of Container (gm)	1.00	1.05	1.05	1.06	1.11	
Moisture Content (%) [Wn]	18.09	17.99	35.76	36.64	38.64	

Liquid Limit	**36**
Plastic Limit	**18**
Plasticity Index	**18**
USCS Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 11.68

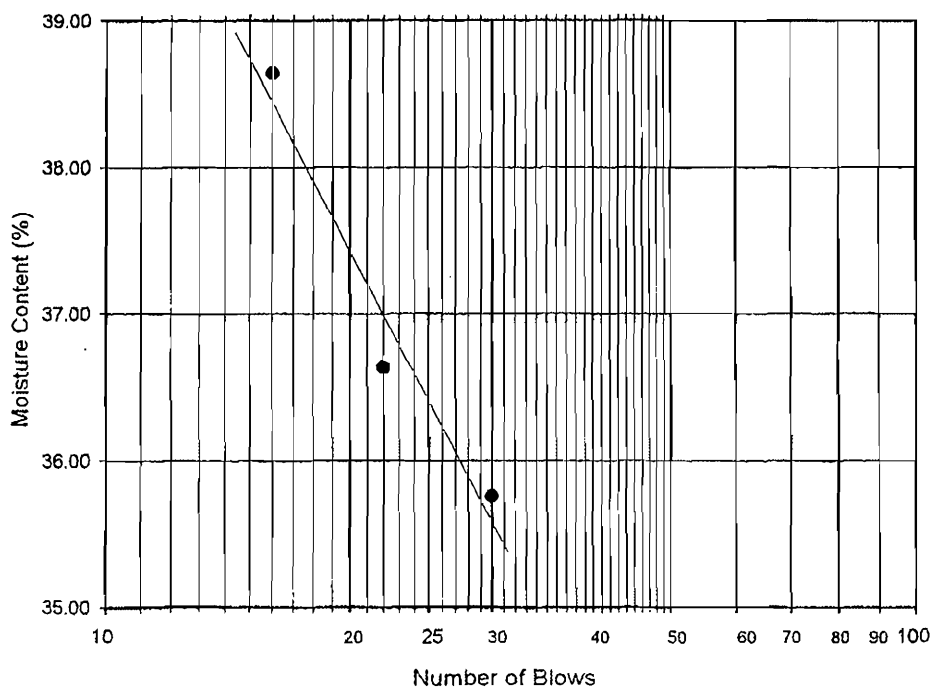
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	VJ	Date:	06/15/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-11	Checked By:	ZF		
Sample ID:	095-2-118	Depth (ft.)	45.0-47.0		

Visual Sample Description: Dark gray elastic silt (MH)

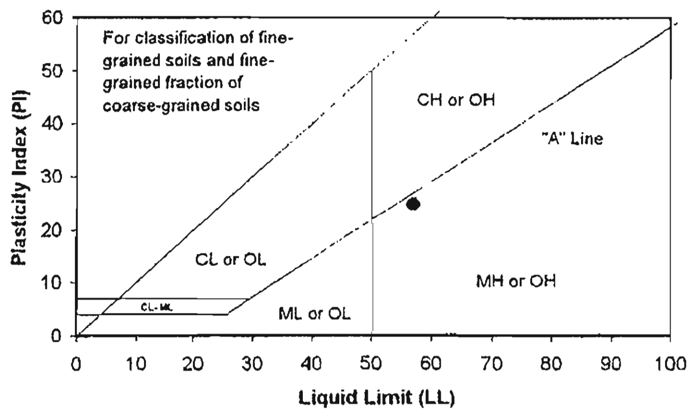
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			33	24	17	
Wet Wt. of Soil + Cont. (gm)	8.26	9.94	13.44	13.19	13.79	
Dry Wt. of Soil + Cont. (gm)	6.49	7.77	9.02	8.74	9.07	
Wt. of Container (gm)	1.01	1.05	1.07	1.02	1.11	
Moisture Content (%) [Wn]	32.30	32.29	55.60	57.64	59.30	

Liquid Limit	**57**
Plastic Limit	**32**
Plasticity Index	**25**
USCS Classification	**MH**

PI at "A" - Line = 0.73(LL-20) = 27.01

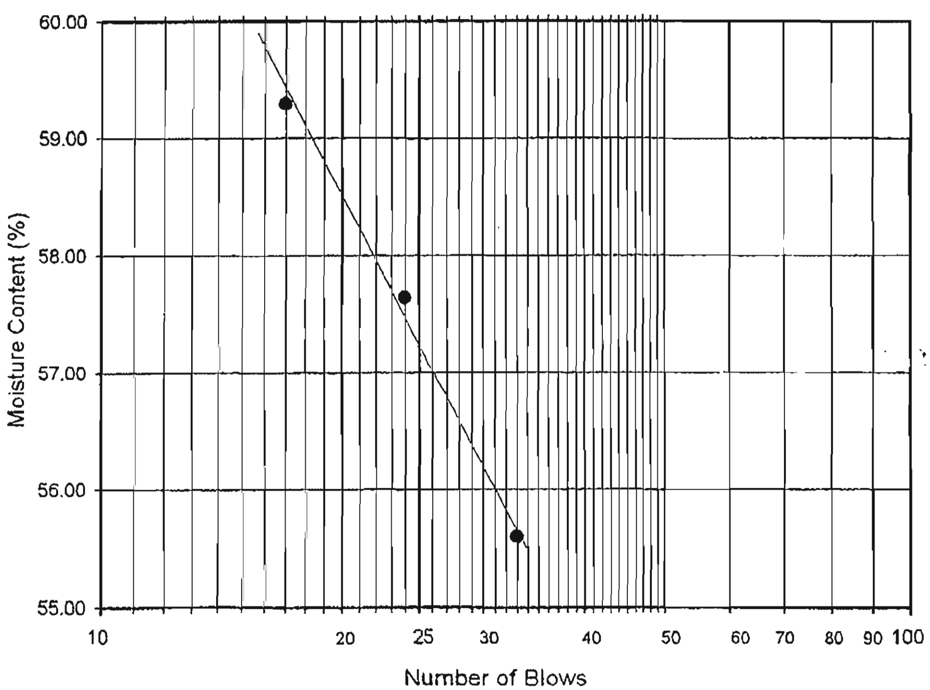
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation Multipoint - Wet
- [X] Dry Preparation Multipoint - Dry
- [X] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



ATTERBERG LIMITS

ASTM D 4318

TERATEST LABS

Project Name: Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA
Tested By: VJ Date: 06/15/02

Project No. : 2384095-D-07060-1000
Input By: LF Date: 06/19/02

Location: B-11
Checked By: LF

Sample ID: 095-2-119
Depth (ft.) 55.0-57.0

Visual Sample Description: Dark olive silty sand (SM)

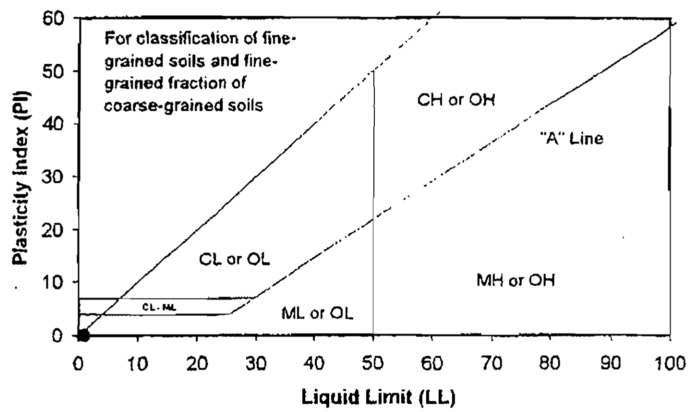
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			5			
Wet Wt. of Soil + Cont. (gm)	Cannot be rolled		17.80	Cannot get > 5 blows		
Dry Wt. of Soil + Cont. (gm)	NONPLASTIC		15.24	NONPLASTIC		
Wt. of Container (gm)			1.02			
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	18.00	#DIV/0!	#DIV/0!	

Liquid Limit	**NP**
Plastic Limit	**#DIV/0!**
Plasticity Index	**#DIV/0!**
USCS Classification	**NP**

PI at "A" - Line = 0.73(LL-20) = -14.6

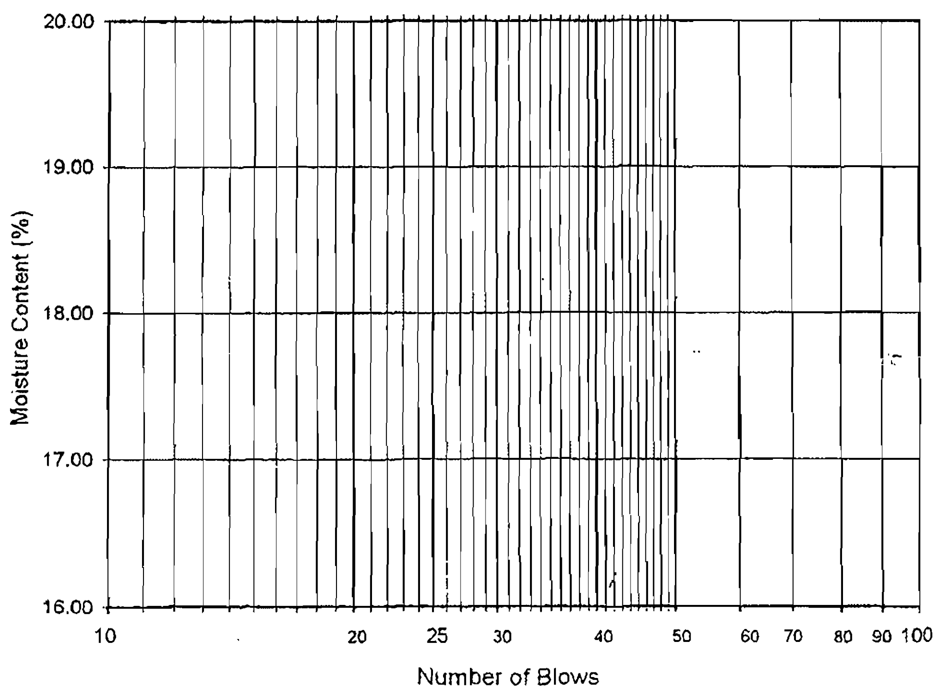
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name: Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA — Tested By: RA — Date: 06/04/02

Project No. : 2384095-D-07060-1000 — Input By: LF — Date: 06/19/02

Location: B-11 — Checked By: LF

Sample ID: 095-2-120 — Depth (ft.) 70.0-72.0

Visual Sample Description: Dark gray silty sand (SM)

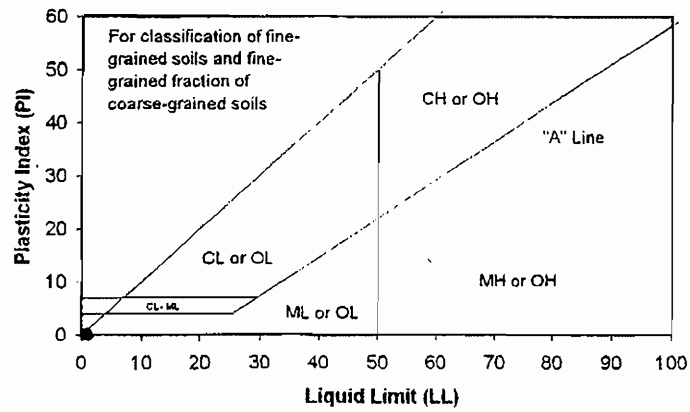
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]						
Wet Wt. of Soil + Cont. (gm)	Cannot be rolled					
Dry Wt. of Soil + Cont. (gm)	NONPLASTIC					
Wt. of Container (gm)						
Moisture Content (%) [Wn]	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Liquid Limit	NP
Plastic Limit	#DIV/0!
Plasticity Index	#DIV/0!
USCS Classification	NP

PI at "A" - Line = 0.73(LL-20) = -14.6

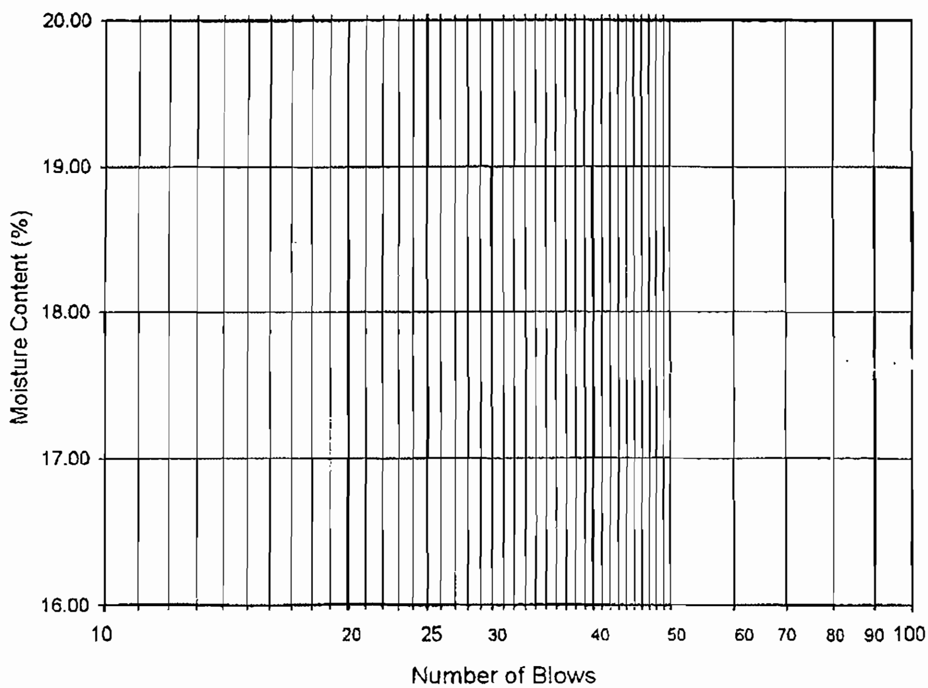
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	ACS	Date:	06/05/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-11	Checked By:	LF		
Sample ID:	095-2-125	Depth (ft.)	110.0-112.0		

Visual Sample Description: Olive gray fat clay (CH)

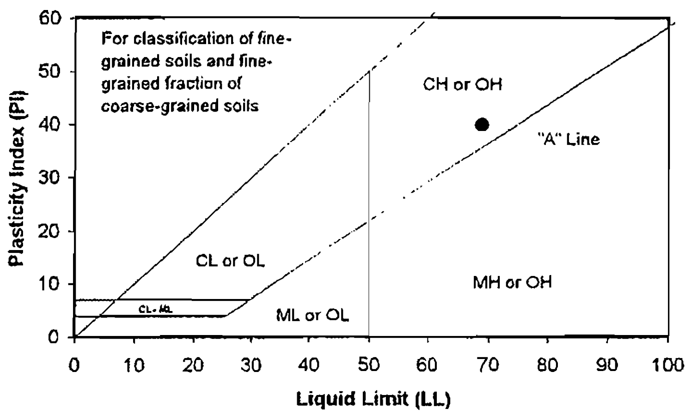
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			36	23	14	
Wet Wt. of Soil + Cont. (gm)	8.86	8.91	16.83	16.98	17.54	
Dry Wt. of Soil + Cont. (gm)	7.10	7.15	10.54	10.41	10.55	
Wt. of Container (gm)	1.02	1.11	1.10	1.03	1.05	
Moisture Content (%) [Wn]	28.95	29.14	66.63	70.04	73.58	

Liquid Limit	69
Plastic Limit	29
Plasticity Index	40
USCS Classification	CH

PI at "A" - Line = 0.73(LL-20) = 35.77

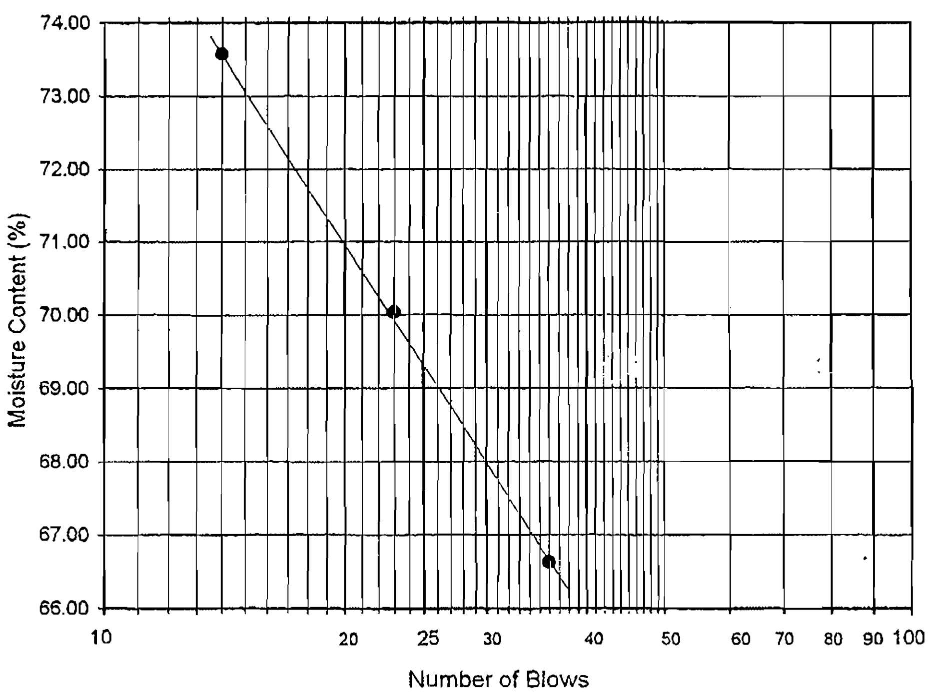
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	VJ	Date:	06/15/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-11	Checked By:	LF		
Sample ID:	095-2-126	Depth (ft.)	120.0-122.0		

Visual Sample Description: Dark gray sandy fat clay s(CH)

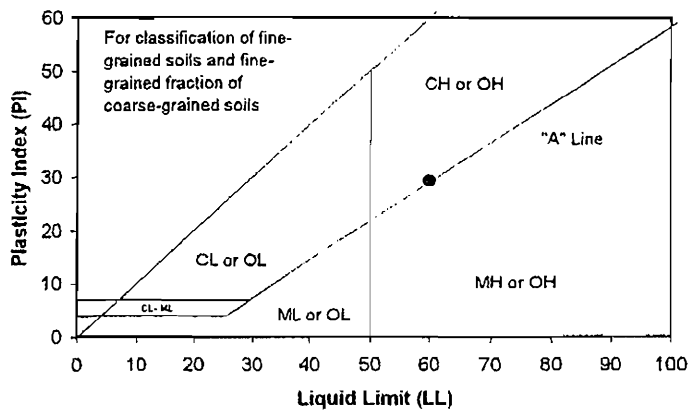
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			34	27	19	
Wet Wt. of Soil + Cont. (gm)	10.08	10.49	14.30	16.47	14.37	
Dry Wt. of Soil + Cont. (gm)	7.96	8.27	9.45	10.73	9.32	
Wt. of Container (gm)	1.00	1.07	1.10	0.98	1.04	
Moisture Content (%) [Wn]	30.46	30.83	58.08	58.87	60.99	

Liquid Limit	**60**
Plastic Limit	**31**
Plasticity Index	**29**
USCS Classification	**CH**

PI at "A" - Line = 0.73(LL-20) = 29.2

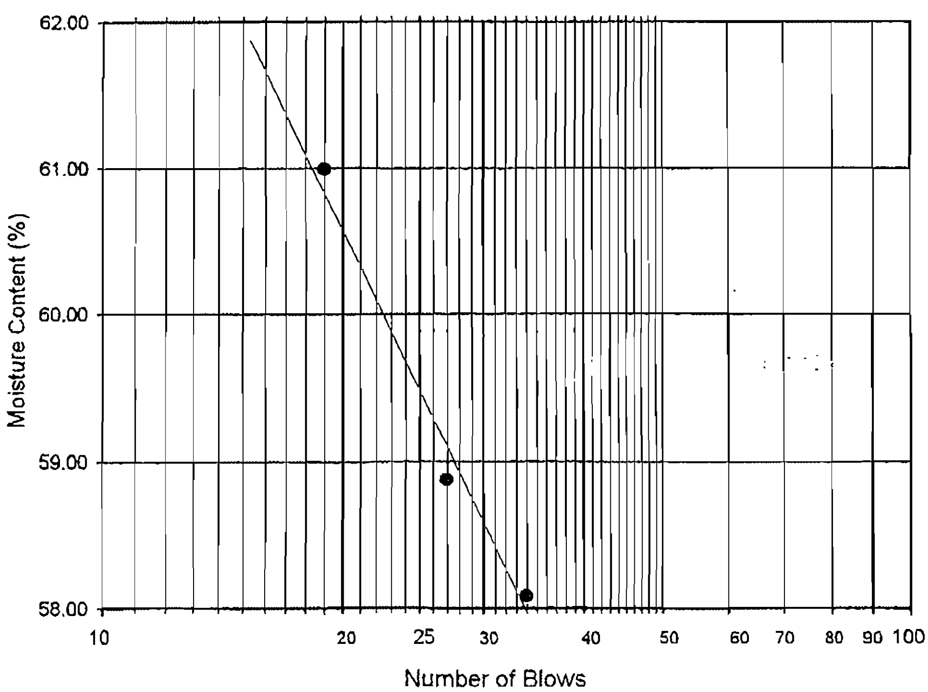
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	ACS	Date:	06/15/02
Project No. :	2384095-D-07060-1000	Input By:	RA	Date:	06/18/02
Location:	B-12	Checked By:	LF		
Sample ID:	095-2-059	Depth (ft.)	30.0-31.5		

Visual Sample Description: Olive, elastic silt with sand (MH)s

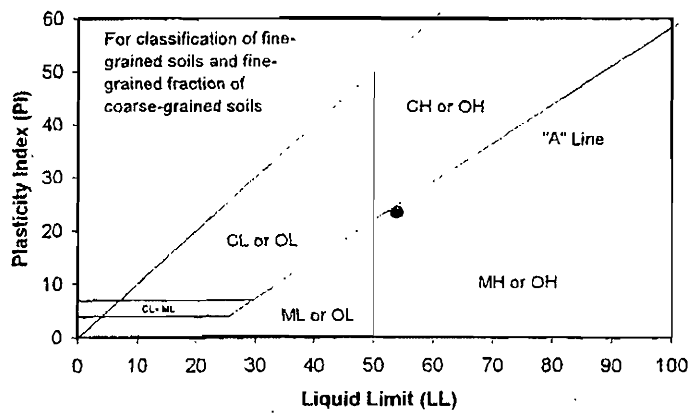
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			33	26	19	
Wet Wt. of Soil + Cont. (gm)	11.50	11.73	16.46	17.04	18.08	
Dry Wt. of Soil + Cont. (gm)	9.05	9.22	11.17	11.44	12.00	
Wt. of Container (gm)	1.08	1.02	1.04	1.02	1.01	
Moisture Content (%) [Wn]	30.74	30.61	52.22	53.74	55.32	

Liquid Limit	**54**
Plastic Limit	**31**
Plasticity Index	**23**
USCS Classification	**MH**

PI at "A" - Line = 0.73(LL-20) = 24.82

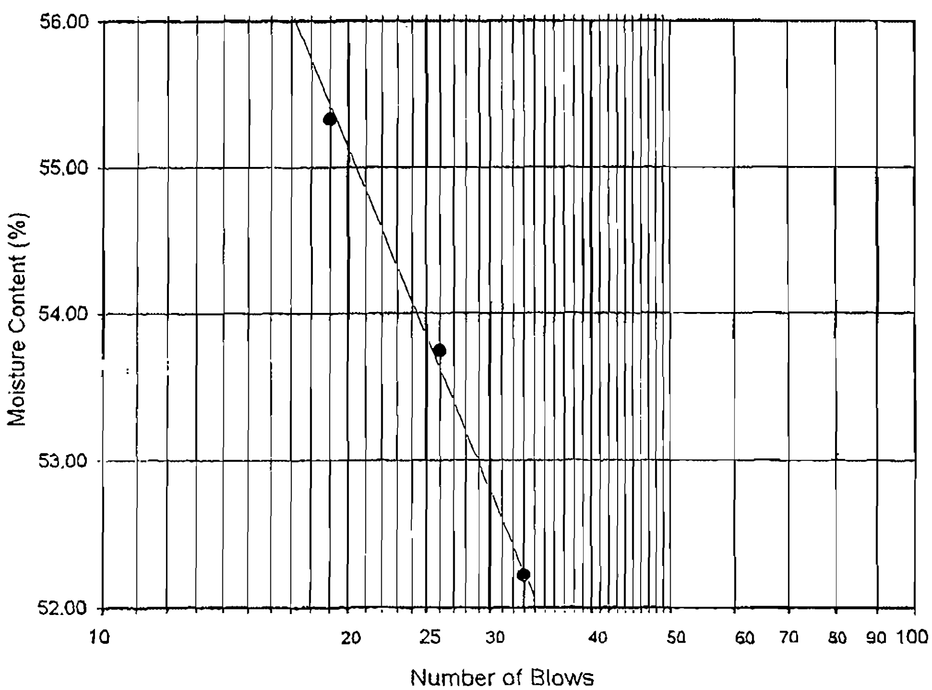
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  . Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERRATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	ACS	Date:	06/15/02
Project No. :	2384095-D-07060-1000	Input By:	RA	Date:	06/18/02
Location:	B-12	Checked By:	LF		
Sample ID:	095-2-061	Depth (ft.)	45.0-46.5		

Visual Sample Description: Dark gray fat clay (CH)

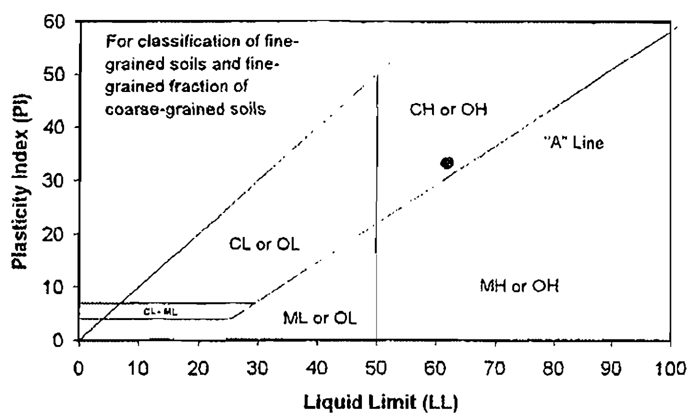
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			27	22	17	
Wet Wt. of Soil + Cont. (gm)	9.64	9.11	18.38	18.40	17.31	
Dry Wt. of Soil + Cont. (gm)	7.74	7.30	11.78	11.76	10.96	
Wt. of Container (gm)	1.03	1.08	1.01	1.14	1.06	
Moisture Content (%) [Wn]	28.32	29.10	61.28	62.52	64.14	

Liquid Limit	**62**
Plastic Limit	**29**
Plasticity Index	**33**
USCS Classification	**CH**

PI at "A" - Line = 0.73(LL-20) = 30.66

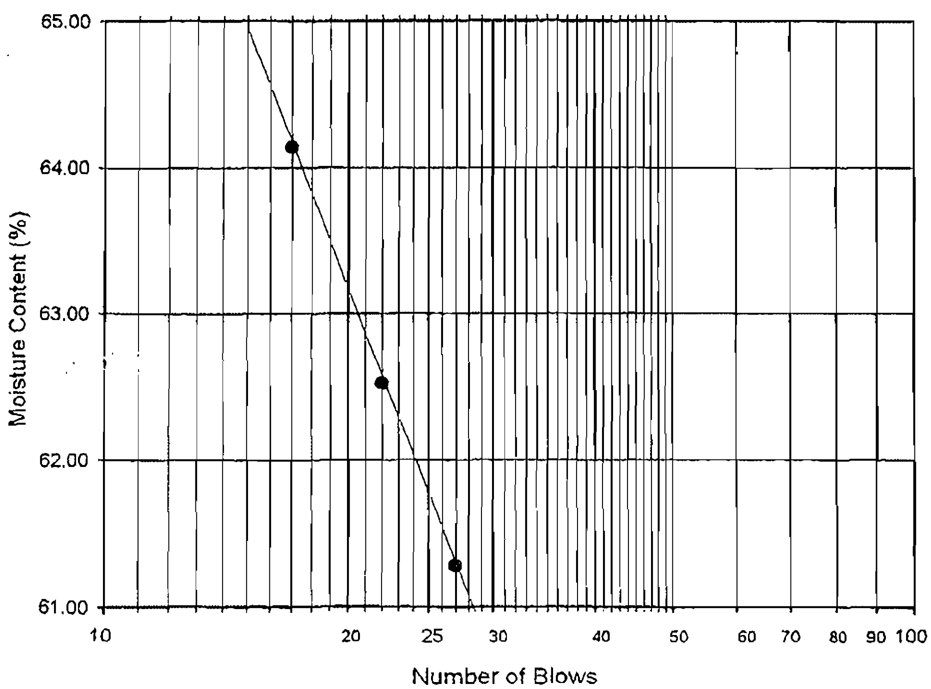
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation Multipoint - Wet
- [X] Dry Preparation Multipoint - Dry
- [X] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



TERRATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	ACS	Date:	06/05/02
Project No. :	2384095-D-07060-1000	Input By:	RA	Date:	06/18/02
Location:	B-12	Checked By:	LF		
Sample ID:	095-2-066	Depth (ft.)	55.0-56.5		

Visual Sample Description: Dark gray fat clay (CH)

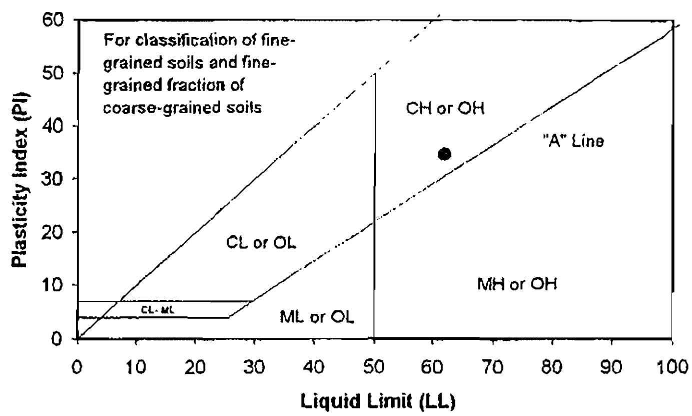
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			33	24	17	
Wet Wt. of Soil + Cont. (gm)	16.07	16.09	15.99	16.38	14.65	
Dry Wt. of Soil + Cont. (gm)	12.85	12.87	10.37	10.53	9.39	
Wt. of Container (gm)	1.07	1.10	1.03	1.11	1.08	
Moisture Content (%) [Wn]	27.33	27.36	60.17	62.10	63.30	

Liquid Limit	**62**
Plastic Limit	**27**
Plasticity Index	**35**
USCS Classification	**CH**

PI at "A" - Line = 0.73(LL-20) = 30.66

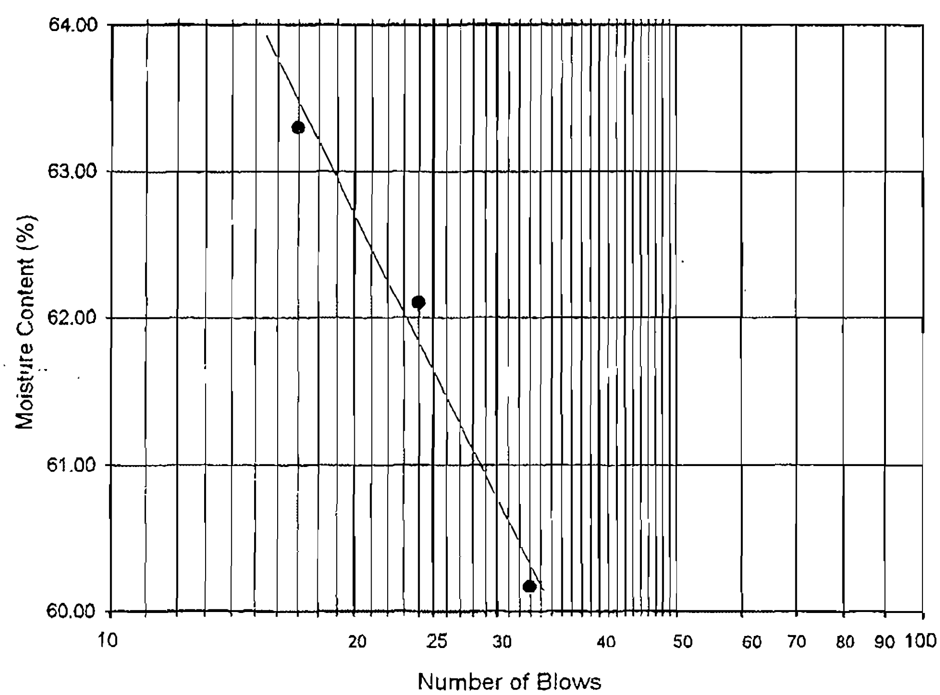
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



TERATEST LABS

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA	Tested By:	VJ	Date:	06/15/02
Project No. :	2384095-D-07060-1000	Input By:	LF	Date:	06/19/02
Location:	B-12	Checked By:	LF		
Sample ID:	095-2-067	Depth (ft.)	72.0-74.0		

Visual Sample Description: Dark gray elastic / fat clay (MH/CH)

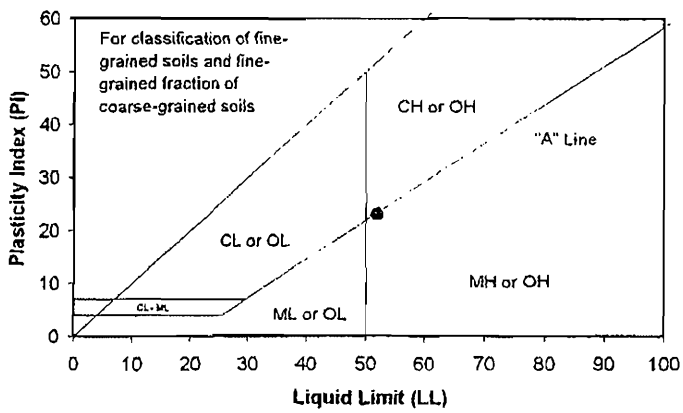
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			22	18	28	
Wet Wt. of Soil + Cont. (gm)	9.09	10.70	11.72	12.60	11.67	
Dry Wt. of Soil + Cont. (gm)	7.30	8.52	8.05	8.60	8.08	
Wt. of Container (gm)	1.08	1.09	1.01	1.08	1.12	
Moisture Content (%) [Wn]	28.78	29.34	52.13	53.19	51.58	

Liquid Limit	**52**
Plastic Limit	**29**
Plasticity Index	**23**
USCS Classification	**MH/CH**

PI at "A" - Line = 0.73(LL-20) = 23.36

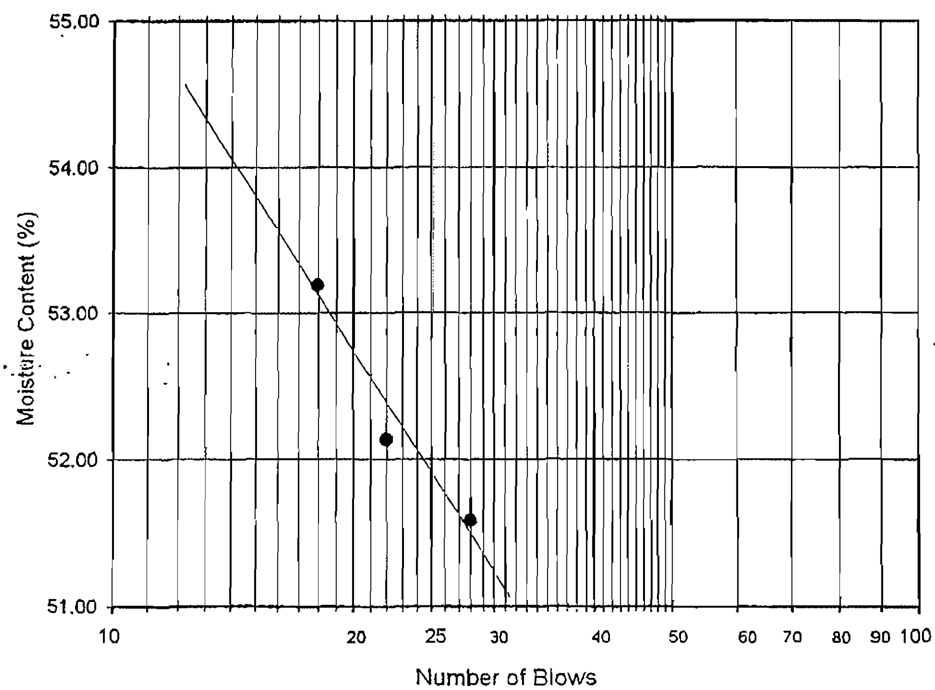
One - Point Liquid Limit Calculation

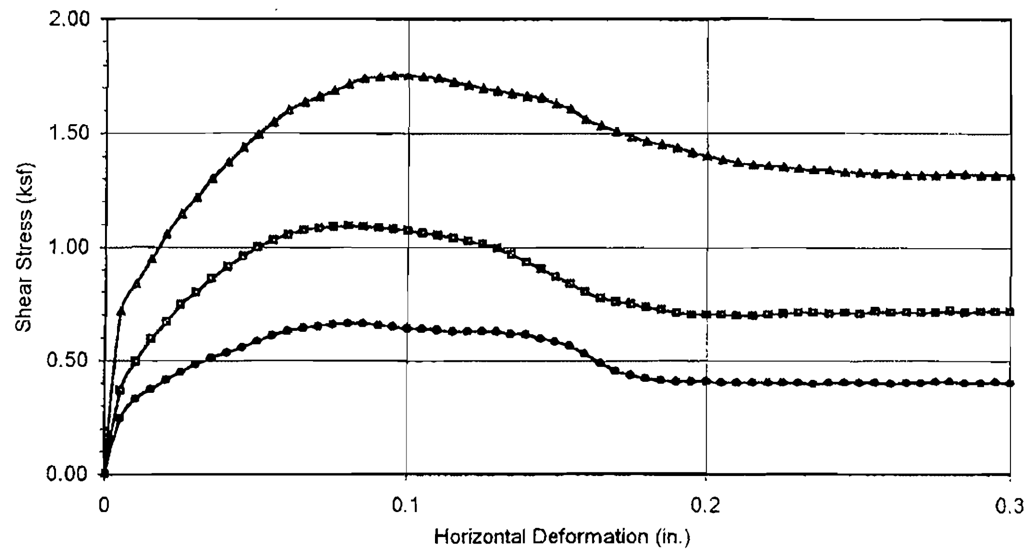
$LL = Wn(N/25)^{0.121}$

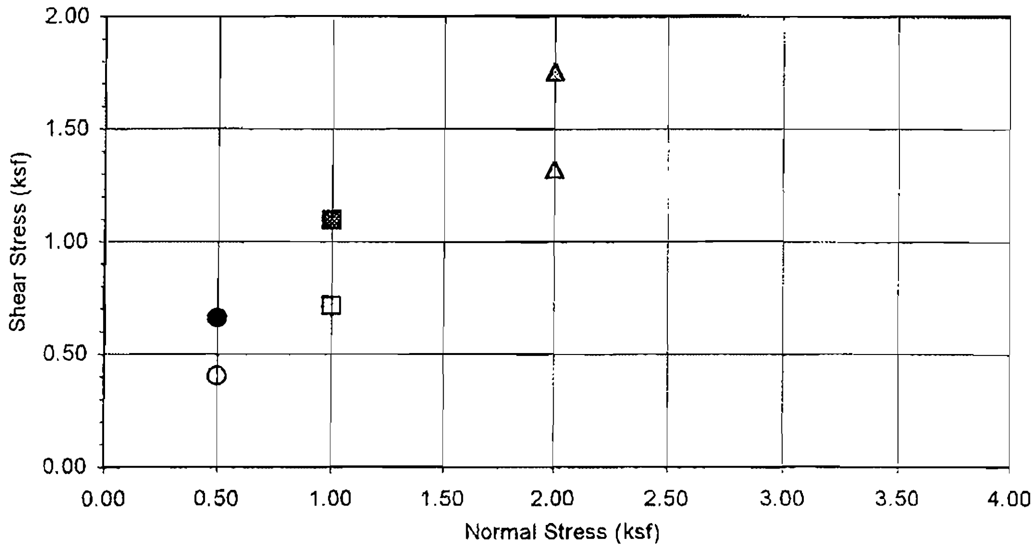


PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test







Normal Stress (kip/ft²)	0.500	1.000	2.000
Peak Shear Stress (kip/ft²)	● 0.662	▩ 1.093	▲ 1.754
Shear Stress @ End of Test (ksf)	○ 0.402	□ 0.715	△ 1.319
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	1.927	1.927	1.927
Initial Moisture Content (%)	19.27	19.27	19.27
Dry Density (pcf)	110.5	112.1	111.2
Saturation (%)	99.0	103.3	100.8
Soil Height Before Shearing (in.)	0.9944	0.9791	0.9613
Final Moisture Content (%)	18.6	18.3	18.1

TERRATEST LABS

DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Location:	B-1
Sample ID:	095-2-003
Depth (ft)	15.0
Sample Type:	2"x 6" Sleeve
Soil Description:	Olive brown, silty sand (SM)

Project No.: 2384095-D-07060

Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda,CA

05-02

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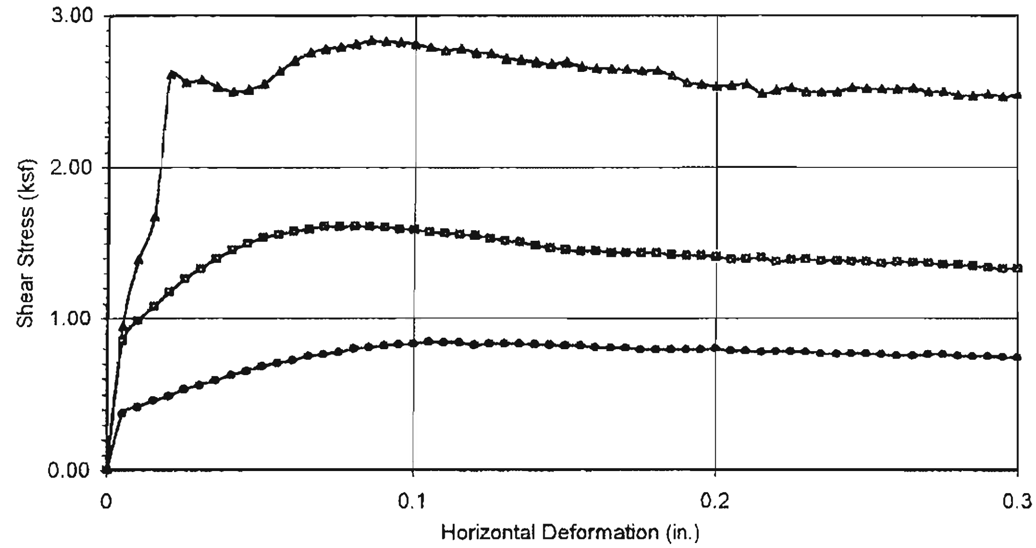
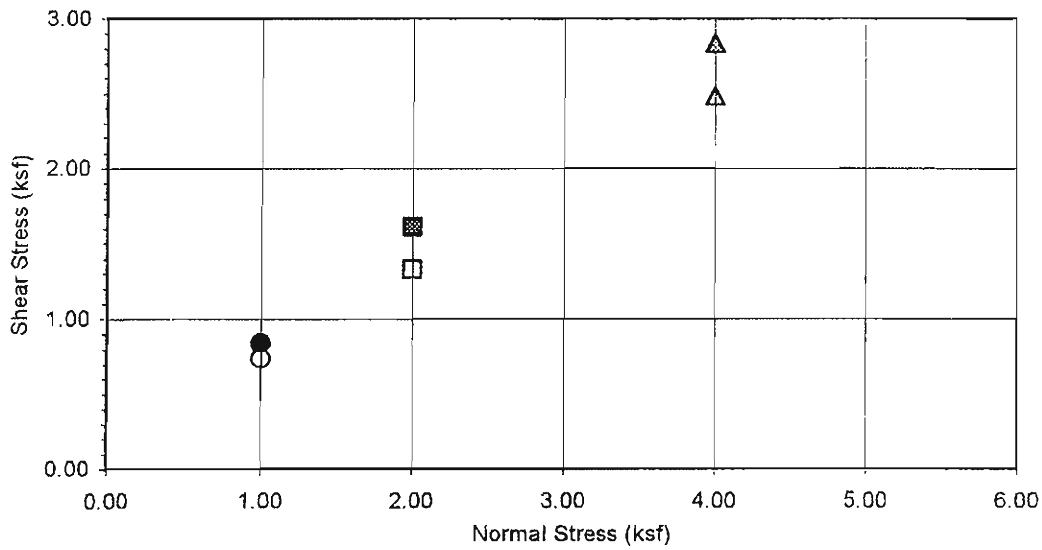




Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.843	▩ 1.613	◬ 2.833
Shear Stress @ End of Test (ksf)	○ 0.740	□ 1.328	△ 2.481
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	1.927	1.927	1.927
Initial Moisture Content (%)	9.38	9.38	9.38
Dry Density (pcf)	113.4	117.5	117.9
Saturation (%)	52.0	58.3	58.9
Soil Height Before Shearing (in.)	0.9892	0.9810	0.9702
Final Moisture Content (%)	23.6	22.1	20.9

TERATEST LABS

DIRECT SHEAR TEST RESULTS

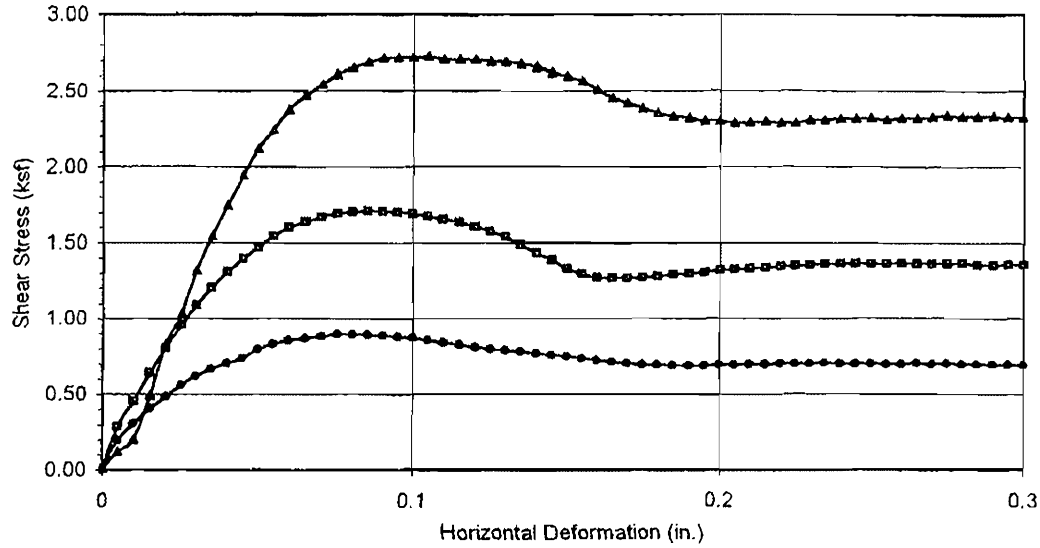
Consolidated Undrained

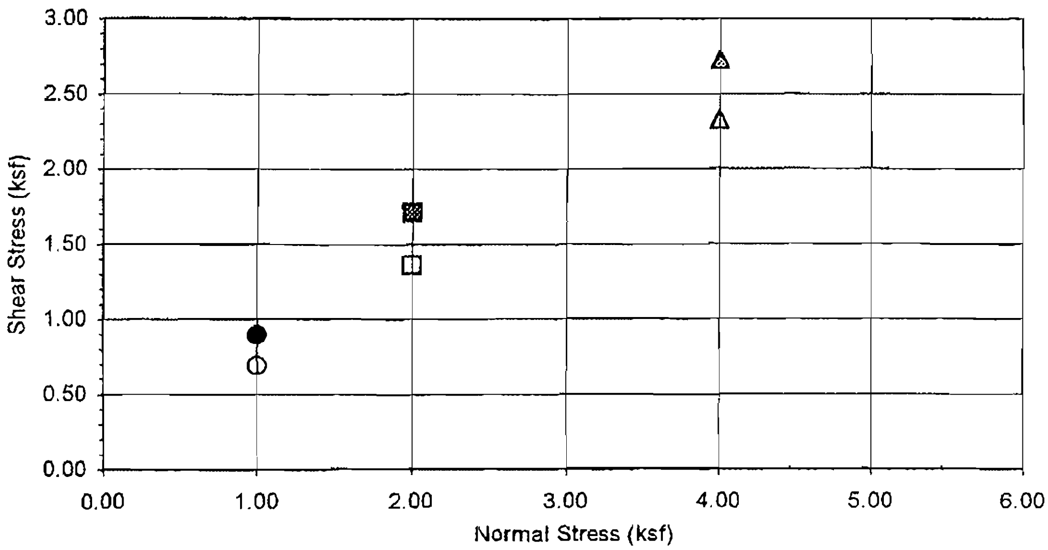
Location: B-6
Sample ID: 095-2-030
Depth (ft) 50.0-51.5
Sample Type: 2"x 6" Sleeve
Soil Description: Dark gray, silty sand (SM)

Project No.: 2384095-D-07060
Geotechnical Evaluation, IR Site 2, Offshore, Alameda Point, Alameda,CA

05-02

DS B6@50.xls

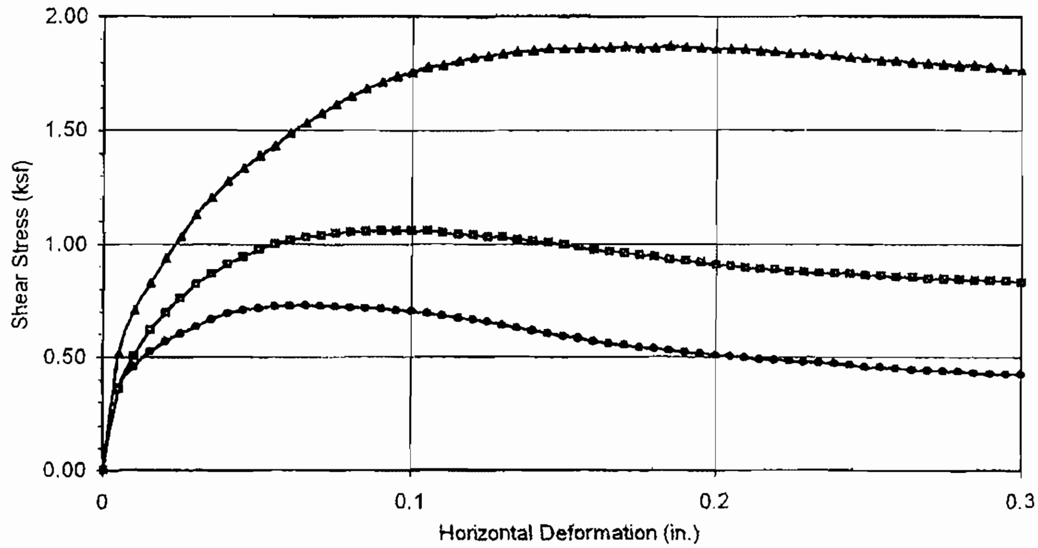


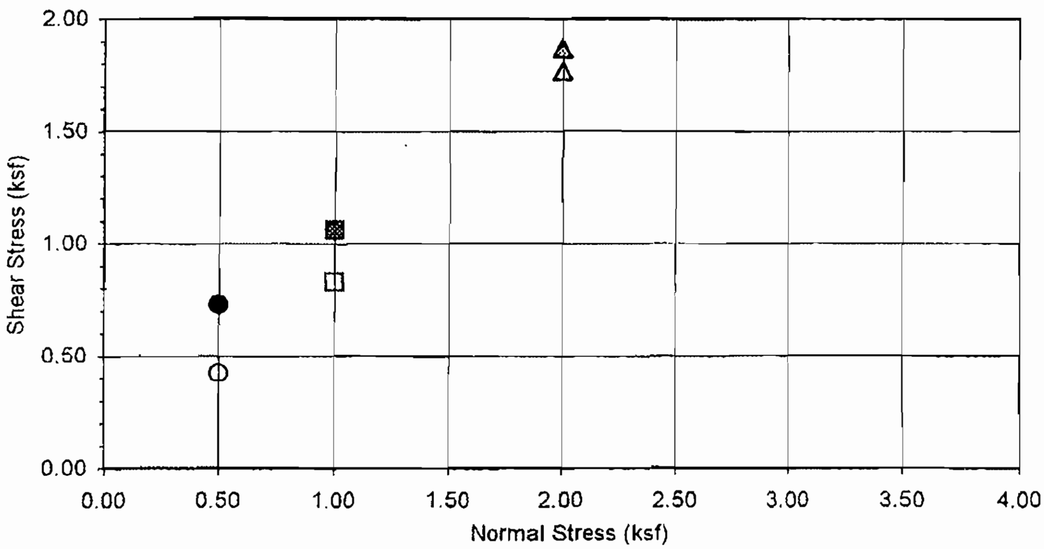


Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.892	▩ 1.709	▲ 2.725
Shear Stress @ End of Test (ksf)	○ 0.689	□ 1.356	△ 2.323
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	21.65	21.65	21.65
Dry Density (pcf)	106.1	106.8	106.6
Saturation (%)	99.4	101.1	100.6
Soil Height Before Shearing (in.)	0.9883	0.9835	0.9704
Final Moisture Content (%)	22.8	20.8	21.5

TERATEST LABS	**DIRECT SHEAR TEST RESULTS** *Consolidated Undrained*	Location: B-7A Sample ID: 095-2-134 Depth (ft) 40.0-41.5 Sample Type: 2.5"x 6" Sleeve Soil Description: Dark gray silty sand (SM)	Project No.: 2384095-D-07060-1000 Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda, CA 06-02

DS 095-2-134 B-7A @ 40-41.5.xls





Normal Stress (kip/ft²)	0.500	1.000	2.000
Peak Shear Stress (kip/ft²)	● 0.730	▩ 1.060	◬ 1.868
Shear Stress @ End of Test (ksf)	○ 0.424	□ 0.829	△ 1.768
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.45	22.45	22.45
Dry Density (pcf)	90.5	90.7	96.9
Saturation (%)	70.3	70.5	82.0
Soil Height Before Shearing (in.)	0.9949	0.9902	0.9627
Final Moisture Content (%)	45.7	42.2	32.3

TERATEST LABS

DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Location: B-11
Sample ID: 095-2-110
Depth (ft) 5.0-6.5
Sample Type: 2.5"x 6" Sleeve
Soil Description: Dark olive gray clayey sand (SC) with some gravel

Project No.: 2384095-D-07060-1000
Geotechnical Evaluation, IR Site 2, Alameda Point, Alameda,CA

06-02

DS 095-2-110 B-11 @ 5-6.5.xls

Appendix C
(on CD only)

SHAKE2000 Wave Propagation Analyses

Section A-A’

```
SHAKE2000 - Input File Information
Option 1 - Dynamic Soil Properties Set No. 2
    1
    7
   10    Fill        G/Gmax - SAND, Average (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3
         1       .98       .95       .89       .73       .52       .29       .14
       .06       .04
   10    Fill        Damping for SAND, Average (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3
        .5        .8       1.7      3.45       6.5      10.7      16.5      21.9
      25.7        26
   10    YB Mud      G/Gmax - Young Bay Mud (Sun et al, EERC-88/15)
     .0001      .001      .003       .01       .03        .1        .3         1
         3        10
         1         1      .991     .9416     .8398     .6472     .4512     .3036
      .135      .085
   10    YB Mud      Damping for Young Bay Mud
     .0001      .001      .003       .01       .03        .1        .3         1
         3        10
      1.56      1.56      1.56      1.87      2.64      5.44      10.3     17.73
        24        27
   11    Merritt SandG/Gmax - SAND, Upper Bound (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3        10
         1         1       .99       .96       .85      .655       .37       .19
      .085       .05      .035
   11    Merritt SandDamping for SAND, Lower Bound (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3        10
        .3        .4        .7       1.4       2.7         5       9.8      15.5
      20.7        22        23
   20    OB Mud      G/Gmax - Soil with PI=30, OCR=1-15 (Vucetic & Dobry, JGE 1/91)
      .001      .002      .003      .004      .005      .006      .008      .009
       .01       .02       .03       .04       .07        .1        .2        .3
        .4        .6        .8         1
         1      .995      .985       .97       .96       .95      .925       .91
        .9       .82      .745        .7        .6       .53       .42       .35
      .305       .24      .205      .165
   20    OB Mud      Damping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)
      .002      .003      .004      .005      .006      .008       .01       .02
       .03       .04       .05       .06       .08        .1        .2        .3
        .4        .5        .7         1
       1.7       2.1       2.5       2.6       2.9       3.3       3.7      5.05
       5.7       6.4       6.9       7.3       8.1       8.7      10.8      12.3
      13.3      14.1      15.6      16.9
   20    Alameda ClayG/Gmax - Soil with PI=30, OCR=1-15 (Vucetic & Dobry, JGE 1/91)
      .001      .002      .003      .004      .005      .006      .008      .009
       .01       .02       .03       .04       .07        .1        .2        .3
        .4        .6        .8         1
         1      .995      .985       .97       .96       .95      .925       .91
        .9       .82      .745        .7        .6       .53       .42       .35
      .305       .24      .205      .165
   20    Alameda ClayDamping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)
      .002      .003      .004      .005      .006      .008       .01       .02
       .03       .04       .05       .06       .08        .1        .2        .3
        .4        .5        .7         1
       1.7       2.1       2.5       2.6       2.9       3.3       3.7      5.05
       5.7       6.4       6.9       7.3       8.1       8.7      10.8      12.3
      13.3      14.1      15.6      16.9
   10    Alameda Sand'G/Gmax Deep Cohesionless Soils - Depth 251-500 feet (75-150 meters)
(EPRI, 1993
     .0001     .0003     .0011     .0032       .01     .0314     .1002     .3153
         1         3
         1         1     .9988     .9853     .9285     .7929     .5749     .3258
     .1422       .09
   10    Alameda Sand'Damping Deep Cohesionless Soils - Depth 251-500 feet (75-150 meters)
(EPRI, 199
     .0001     .0003      .001     .0031       .01     .0311     .0996     .3212
    1.0091         3
     .7617     .8465      .852    1.1821    1.9317    3.5443    7.0453   12.6693
```

```
   19.1239      22.9
    8    Bedrock     G/Gmax - ROCK (Schnabel 1973)
     .0001     .0003      .001      .003       .01       .03        .1         1
         1         1       .99       .95        .9       .81      .725       .55
    5    Bedrock     Damping for ROCK (Schnabel 1973)
     .0001      .001       .01        .1         1
        .4        .8       1.5         3       4.6
    7    1    2    3    4    5    6    7
Option 2 - Soil Profile Set No. 2
    2
    2   17     Soil Profile South
    1    1     10                 .05       .11             656
    2    1     15                 .05       .11             656
    3    1     19                 .05       .11             656
    4    2     11                 .05       .105            656
    5    3     5                  .05       .125            656
    6    3     20                 .05       .125           1353
    7    3     10                 .05       .125           1353
    8    3     15                 .05       .125            688
    9    4     23                 .05       .11             826
   10    4     20                 .05       .11             902
   11    4     9.5                .05       .11             678
   12    4     19.5               .05       .11             995
   13    4     22                 .05       .11             800
   14    4     41                 .05       .11             895
   15    5     15                 .05       .125            950
   16    6     155                .05       .125           1500
   17    7                        .02       .14            2550
Option 3 - Motion: E.NIS_FN - Scaling Factor: 1
    3
  4096 8192       .01     (8F9.6)  E.NIS_FN
C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk
         1                  25    8    8
Option 4 - Assignment of Object Motion to a Specific Sublayer Set No. 2
    4
   17    0
Option 5 - Number of Iterations & Strain Ratio Set No. 2
    5
        10       .65
Option 6 - Soil Profile No. 2 South - Layers 1 to 15
    6
    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
    0    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    1    1    1    1    1    1    1    0    0    0    0    0    0    0    0
Option 6 - Soil Profile No. 2 South - Layers 16 to 17
    6
   16   17
    1    1
    0    0
Option 7 - Stress & Strain Time Histories for Layer 2
    7
    2    1    1      2048          Stress History Layer No. 2
    2    0    1      2048          Strain History Layer No. 2
Option 7 - Stress & Strain Time Histories for Layer 3
    7
    3    1    1      2048          Stress History Layer No. 3
    3    0    1      2048          Strain History Layer No. 3
Option 7 - Stress & Strain Time Histories for Layer 4
    7
    4    1    1      2048          Stress History Layer No. 4
    4    0    1      2048          Strain History Layer No. 4
Option 7 - Stress & Strain Time Histories for Layer 5
    7
    5    1    1      2048          Stress History Layer No. 5
    5    0    1      2048          Strain History Layer No. 5
Option 9 - Response Spectrum Set No. 2
    9
    1    0
    1    0      32.2
       .05
Option 10 - Amplification Spectrum Set No. 2
   10
   17    0    1    0      .125Amplification Spectrum
```

```
Execution will stop when program encounters 0
    0
```

```
 *******************************************************
 * SHAKE: PROGRAM FOR EARTHQUAKE RESPONSE ANAL. HORIZONTAL *
 *     LAYERED SITES by Per Schnable & John Lysmer - 1970  *
 * ------------------------------------------------------- *
 * SHAKE85: IBM PC SHAKE VERSION S.S.(Willie) Lai,Jan 1985 *
 * ------------------------------------------------------- *
 * SHAKE88 :New modulus reduction curves for clays added   *
 *      using results from Sun et al (1988) by J. I. Sun   *
 *      & Ramin Golesorkhi February 26, 1988               *
 *  -------------------------------------------------------*
 * SHAKE90/91: Adjust last iteration; Input now is either  *
 *      Gmax or max Vs; up to 13 materials can be specified*
 *      by user; up to 50 Layers can be specified; object  *
 *      motion can be read in from a separate file and can *
 *      user specified format; Different periods for res-  *
 *      ponse spectral calculations;options are renumbered;*
 *      and general cleanup by: J. I. Sun, I. M. Idriss &  *
 *      P. Dirrim June 1990 - February 1991                *
 *  ------------------------------------------------------ *
 * SHAKE91: General cleanup and finalization of input out- *
 *      output format ... etc by: I. M. Idriss Dec. 1991   *
 *  ------------------------------------------------------ *
 * SHAKE2000: Fix the incorrect output of Tot. Stress in   *
 * Option 2. Changed path of ground motion file in         *
 * SHAKE91.  Control file to input file names.  Modified   *
 * by Jerald M. LaVassar & Gustavo A. Ordonez (July 2011)  *
 *          RUN DATE 11/03/2011                            *
 *          RUN TIME 10:29                                 *
 *******************************************************
 MAX. NUMBER OF TERMS IN FOURIER TRANSFORM =     32768
 NECESSARY LENGTH OF BLANK COMMON X        =    204819

1******   OPTION  1  ***  READ RELATION BETWEEN SOIL PROPERTIES AND STRAIN

 *********************
  MATERIAL TYPE NO.  1
 *********************

 CURVE NO.   1:     Fill        G/Gmax - SAND, Average (Seed & Idriss 1970)
 CURVE NO.   2:     Fill        Damping for SAND, Average (Seed & Idriss 197


      CURVE NO.  1            CURVE NO.  2
  ==================       ==================
    STRAIN    G/GMAX          STRAIN    DAMPING
  --------   -------        --------  --------
    0.0001     1.000          0.0001      0.50
    0.0003     0.980          0.0003      0.80
    0.0010     0.950          0.0010      1.70
    0.0030     0.890          0.0030      3.45
    0.0100     0.730          0.0100      6.50
    0.0300     0.520          0.0300     10.70
    0.1000     0.290          0.1000     16.50
    0.3000     0.140          0.3000     21.90
    1.0000     0.060          1.0000     25.70
    3.0000     0.040          3.0000     26.00

 *********************
  MATERIAL TYPE NO.  2
 *********************

 CURVE NO.   3:     YB Mud      G/Gmax - Young Bay Mud (Sun et al, EERC-88/1
 CURVE NO.   4:     YB Mud      Damping for Young Bay Mud


      CURVE NO.  3            CURVE NO.  4
  ==================       ==================
    STRAIN    G/GMAX          STRAIN    DAMPING
  --------   -------        --------  --------
    0.0001     1.000          0.0001      1.56
```

0.0010	1.000	0.0010	1.56
0.0030	0.991	0.0030	1.56
0.0100	0.942	0.0100	1.87
0.0300	0.840	0.0300	2.64
0.1000	0.647	0.1000	5.44
0.3000	0.451	0.3000	10.30
1.0000	0.304	1.0000	17.73
3.0000	0.135	3.0000	24.00
10.0000	0.085	10.0000	27.00

****
MATERIAL TYPE NO. 3
****

CURVE NO. 5: Merritt SandG/Gmax - SAND, Upper Bound (Seed & Idriss 19
CURVE NO. 6: Merritt SandDamping for SAND, Lower Bound (Seed & Idriss

CURVE NO. 5 STRAIN	G/GMAX	CURVE NO. 6 STRAIN	DAMPING
0.0001	1.000	0.0001	0.30
0.0003	1.000	0.0003	0.40
0.0010	0.990	0.0010	0.70
0.0030	0.960	0.0030	1.40
0.0100	0.850	0.0100	2.70
0.0300	0.655	0.0300	5.00
0.1000	0.370	0.1000	9.80
0.3000	0.190	0.3000	15.50
1.0000	0.085	1.0000	20.70
3.0000	0.050	3.0000	22.00
10.0000	0.035	10.0000	23.00

****
MATERIAL TYPE NO. 4
****

CURVE NO. 7: OB Mud G/Gmax - Soil with PI=30, OCR=1-15 (Vucetic
CURVE NO. 8: OB Mud Damping - Soil with PI=30, OCR=1-8 (Vucetic

CURVE NO. 7 STRAIN	G/GMAX	CURVE NO. 8 STRAIN	DAMPING
0.0010	1.000	0.0020	1.70
0.0020	0.995	0.0030	2.10
0.0030	0.985	0.0040	2.50
0.0040	0.970	0.0050	2.60
0.0050	0.960	0.0060	2.90
0.0060	0.950	0.0080	3.30
0.0080	0.925	0.0100	3.70
0.0090	0.910	0.0200	5.05
0.0100	0.900	0.0300	5.70
0.0200	0.820	0.0400	6.40
0.0300	0.745	0.0500	6.90
0.0400	0.700	0.0600	7.30
0.0700	0.600	0.0800	8.10
0.1000	0.530	0.1000	8.70
0.2000	0.420	0.2000	10.80
0.3000	0.350	0.3000	12.30
0.4000	0.305	0.4000	13.30
0.6000	0.240	0.5000	14.10
0.8000	0.205	0.7000	15.60
1.0000	0.165	1.0000	16.90

****
MATERIAL TYPE NO. 5
****

CURVE NO. 9: Alameda ClayG/Gmax - Soil with PI=30, OCR=1-15 (Vucetic
CURVE NO. 10: Alameda ClayDamping - Soil with PI=30, OCR=1-8 (Vucetic

CURVE NO. 9		CURVE NO. 10	
STRAIN	G/GMAX	STRAIN	DAMPING
0.0010	1.000	0.0020	1.70
0.0020	0.995	0.0030	2.10
0.0030	0.985	0.0040	2.50
0.0040	0.970	0.0050	2.60
0.0050	0.960	0.0060	2.90
0.0060	0.950	0.0080	3.30
0.0080	0.925	0.0100	3.70
0.0090	0.910	0.0200	5.05
0.0100	0.900	0.0300	5.70
0.0200	0.820	0.0400	6.40
0.0300	0.745	0.0500	6.90
0.0400	0.700	0.0600	7.30
0.0700	0.600	0.0800	8.10
0.1000	0.530	0.1000	8.70
0.2000	0.420	0.2000	10.80
0.3000	0.350	0.3000	12.30
0.4000	0.305	0.4000	13.30
0.6000	0.240	0.5000	14.10
0.8000	0.205	0.7000	15.60
1.0000	0.165	1.0000	16.90

****
MATERIAL TYPE NO. 6
****

CURVE NO. 11: Alameda Sand'G/Gmax Deep Cohesionless Soils - Depth 251-
CURVE NO. 12: Alameda Sand'Damping Deep Cohesionless Soils - Depth 251

CURVE NO. 11		CURVE NO. 12	
STRAIN	G/GMAX	STRAIN	DAMPING
0.0001	1.000	0.0001	0.76
0.0003	1.000	0.0003	0.85
0.0011	0.999	0.0010	0.85
0.0032	0.985	0.0031	1.18
0.0100	0.928	0.0100	1.93
0.0314	0.793	0.0311	3.54
0.1002	0.575	0.0996	7.05
0.3153	0.326	0.3212	12.67
1.0000	0.142	1.0091	19.12
3.0000	0.090	3.0000	22.90

****
MATERIAL TYPE NO. 7
****

CURVE NO. 13: Bedrock G/Gmax - ROCK (Schnabel 1973)
CURVE NO. 14: Bedrock Damping for ROCK (Schnabel 1973)

CURVE NO. 13		CURVE NO. 14	
STRAIN	G/GMAX	STRAIN	DAMPING
0.0001	1.000	0.0001	0.40
0.0003	1.000	0.0010	0.80
0.0010	0.990	0.0100	1.50
0.0030	0.950	0.1000	3.00
0.0100	0.900	1.0000	4.60

```
    0.0300     0.810         0.0000      0.00
    0.1000     0.725         0.0000      0.00
    1.0000     0.550         0.0000      0.00

1******   OPTION  2  ***  READ SOIL PROFILE
 NEW SOIL PROFILE NO.     2      IDENTIFICATION  Soil Profile South
 NUMBER OF LAYERS                  17          DEPTH TO BEDROCK        410.00
```

NO.	TYPE	THICKNESS (FT)	DEPTH (FT)	TOTAL PRESS. (KSF)	MODULUS (KSF)	DAMPING	UNIT WT. (KCF)	SHEAR VEL (FPS)
1	1	10.0000	5.0000	0.55	1470.	0.050	0.110	656.0
2	1	15.0000	17.5000	1.92	1470.	0.050	0.110	656.0
3	1	19.0000	34.5000	3.79	1470.	0.050	0.110	656.0
4	2	11.0000	49.5000	5.42	1403.	0.050	0.105	656.0
5	3	5.0000	57.5000	6.31	1671.	0.050	0.125	656.0
6	3	20.0000	70.0000	7.87	7106.	0.050	0.125	1353.0
7	3	10.0000	85.0000	9.74	7106.	0.050	0.125	1353.0
8	3	15.0000	97.5000	11.31	1838.	0.050	0.125	688.0
9	4	23.0000	116.5000	13.51	2331.	0.050	0.110	826.0
10	4	20.0000	138.0000	15.88	2779.	0.050	0.110	902.0
11	4	9.5000	152.7500	17.50	1570.	0.050	0.110	678.0
12	4	19.5000	167.2500	19.09	3382.	0.050	0.110	995.0
13	4	22.0000	188.0000	21.37	2186.	0.050	0.110	800.0
14	4	41.0000	219.5000	24.84	2736.	0.050	0.110	895.0
15	5	15.0000	247.5000	28.03	3503.	0.050	0.125	950.0
16	6	155.0000	332.5000	38.66	8734.	0.050	0.125	1500.0
17	BASE				28272.	0.020	0.140	2550.0

```
  PERIOD =  1.480 FROM AVERAGE SHEAR VEL. =    1108.


  FREQUENCY    AMPLITUDE
 MAXIMUM AMPLIFICATION =  13.71
 FOR FREQUENCY         =   0.71 C/SEC.
     PERIOD            =   1.41 SEC.

1******   OPTION  3  ***  READ INPUT MOTION

  FILE NAME FOR INPUT MOTION = C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

    NO. OF INPUT ACC. POINTS =  4096
   NO. OF POINTS USED IN FFT =  8192
        NO. OF HEADING LINES =     8
      NO. OF POINTS PER LINE =     8
  TIME STEP FOR INPUT MOTION = 0.010000
     FORMAT FOR TIME HISTORY =      (8F9.6)
     EARTHQUAKE IDENTIFICATION =   E.NIS_FN


 *****HEADER*****
Source File: C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.acc
SHAKE2000 Conversion:    4096      .01       8         8         9        (8F9.6
Acceleration Units: (g's) - No. Values: 4096 - Time Step: .01 (secs)
Data Format: (8F9.6) - No. Header Lines: 8
PEER NGA Rotated Accelerogram (November 1, 2007)
H1 for rotation: KOBE 01/16/95 2046, NISHI-AKASHI, 090 (CUE)
rotation angle - clockwise   230.0
4096   0.01000 NPTS, DT
 **  FIRST AND LAST 5 LINES OF INPUT MOTION *****

     1 -0.000001-0.000001-0.000001-0.000001-0.000001 0.000000-0.000001-0.000001
     2 -0.000001 0.000001 0.000005 0.000007 0.000001-0.000001 0.000006 0.000003
     3 -0.000005-0.000009-0.000020-0.000026-0.000011 0.000001 0.000006 0.000010
     4  0.000011-0.000006-0.000030-0.000042-0.000033-0.000018-0.000003-0.000017
     5 -0.000040-0.000044 0.000027 0.000147 0.000171 0.000062-0.000007 0.000043
   ............INPUT MOTION READ NOT ECHOED...........
   508 -0.000178-0.000172-0.000166-0.000159-0.000151-0.000144-0.000140-0.000136
   509 -0.000132-0.000127-0.000123-0.000119-0.000114-0.000110-0.000105-0.000100
   510 -0.000096-0.000091-0.000086-0.000081-0.000076-0.000072-0.000067-0.000063
   511 -0.000059-0.000055-0.000051-0.000047-0.000043-0.000039-0.000035-0.000031
```

512 -0.000027-0.000023-0.000019-0.000015-0.000012-0.000008-0.000005-0.000001

MAXIMUM ACCELERATION = 0.48357
AT TIME = 7.10 SEC
THE VALUES WILL BE MULTIPLIED BY A FACTOR = 1.000
TO GIVE NEW MAXIMUM ACCELERATION = 0.48357
MEAN SQUARE FREQUENCY = 2.69 C/SEC.
MAX ACCELERATION = 0.48322 FOR FREQUENCIES REMOVED ABOVE 25.00 C/SEC.
1****** OPTION 4 *** READ WHERE OBJECT MOTION IS GIVEN
OBJECT MOTION IN LAYER NUMBER 17 OUTCROPPING

1****** OPTION 5 *** OBTAIN STRAIN COMPATIBLE SOIL PROPERTIES
MAXIMUM NUMBER OF ITERATIONS = 10
FACTOR FOR UNIFORM STRAIN IN TIME DOMAIN = 0.65

EARTHQUAKE - C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

SOIL PROFILE - Soil Profile South

ITERATION NUMBER 1

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	ERROR ---->	<---- SHEAR MODULUS NEW	USED	ERROR ----->	G/Go RATIO
1	1	5.0	0.01775	0.087	0.050	42.5	911.9	1470.1	-61.2	1.000
2	1	17.5	0.06083	0.141	0.050	64.6	565.9	1470.1	-159.8	1.000
3	1	34.5	0.11203	0.171	0.050	70.7	403.5	1470.1	-264.3	1.000
4	2	49.5	0.15107	0.073	0.050	31.2	804.9	1403.3	-74.3	1.000
5	3	57.5	0.13816	0.115	0.050	56.4	529.6	1670.6	-215.4	1.000
6	3	70.0	0.03608	0.057	0.050	12.8	4344.2	7106.4	-63.6	1.000
7	3	85.0	0.04005	0.062	0.050	18.7	4168.5	7106.4	-70.5	1.000
8	3	97.5	0.16364	0.124	0.050	59.5	531.6	1837.5	-245.7	1.000
9	4	116.5	0.12582	0.094	0.050	46.8	1150.3	2330.8	-102.6	1.000
10	4	138.0	0.09166	0.085	0.050	40.9	1520.6	2779.4	-82.8	1.000
11	4	152.8	0.16121	0.101	0.050	50.7	713.3	1570.3	-120.2	1.000
12	4	167.2	0.07393	0.079	0.050	36.6	1993.0	3382.1	-69.7	1.000
13	4	188.0	0.10929	0.090	0.050	44.3	1127.9	2186.3	-93.8	1.000
14	4	219.5	0.08256	0.082	0.050	38.9	1553.2	2736.4	-76.2	1.000
15	5	247.5	0.07372	0.079	0.050	36.5	2066.5	3503.5	-69.5	1.000
16	6	332.5	0.04711	0.048	0.050	-4.3	6260.0	8734.5	-39.5	1.000

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 2

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	ERROR ---->	<---- SHEAR MODULUS NEW	USED	ERROR ----->	G/Go RATIO
1	1	5.0	0.02387	0.098	0.087	11.5	828.7	911.9	-10.0	0.620
2	1	17.5	0.12904	0.178	0.141	20.5	375.2	565.9	-50.9	0.385
3	1	34.5	0.30463	0.219	0.171	22.3	204.3	403.5	-97.5	0.274
4	2	49.5	0.16932	0.078	0.073	6.5	776.4	804.9	-3.7	0.574
5	3	57.5	0.25842	0.147	0.115	22.1	358.2	529.6	-47.8	0.317
6	3	70.0	0.02929	0.049	0.057	-15.9	4685.0	4344.2	7.3	0.611
7	3	85.0	0.03453	0.056	0.062	-10.6	4418.0	4168.5	5.6	0.587
8	3	97.5	0.29352	0.154	0.124	19.7	355.7	531.6	-49.5	0.289
9	4	116.5	0.14038	0.097	0.094	3.4	1109.8	1150.3	-3.6	0.494
10	4	138.0	0.10741	0.089	0.085	5.1	1441.6	1520.6	-5.5	0.547
11	4	152.8	0.23690	0.114	0.101	11.2	613.6	713.3	-16.2	0.454
12	4	167.2	0.08457	0.082	0.079	4.5	1903.7	1993.0	-4.7	0.589
13	4	188.0	0.14279	0.098	0.090	8.3	1035.2	1127.9	-9.0	0.516
14	4	219.5	0.11652	0.092	0.082	10.7	1383.9	1553.2	-12.2	0.568
15	5	247.5	0.09960	0.087	0.079	9.4	1859.6	2066.5	-11.1	0.590
16	6	332.5	0.04952	0.049	0.048	3.0	6178.0	6260.0	-1.3	0.717

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 3

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	----> ERROR	<---- SHEAR MODULUS NEW	USED	-----> ERROR	G/Go RATIO
1	1	5.0	0.01797	0.087	0.098	-12.4	908.5	828.7	8.8	0.564
2	1	17.5	0.13411	0.179	0.178	1.1	367.4	375.2	-2.1	0.255
3	1	34.5	0.38720	0.227	0.219	3.3	180.9	204.3	-13.0	0.139
4	2	49.5	0.11405	0.060	0.078	-29.0	875.3	776.4	11.3	0.553
5	3	57.5	0.26444	0.148	0.147	0.8	351.9	358.2	-1.8	0.214
6	3	70.0	0.02345	0.045	0.049	-10.4	4965.5	4685.0	5.6	0.659
7	3	85.0	0.02811	0.049	0.056	-14.3	4736.7	4418.0	6.7	0.622
8	3	97.5	0.41666	0.169	0.154	9.1	296.5	355.7	-20.0	0.194
9	4	116.5	0.13329	0.096	0.097	-1.6	1129.0	1109.8	1.7	0.476
10	4	138.0	0.10349	0.088	0.089	-1.3	1458.0	1441.6	1.1	0.519
11	4	152.8	0.26616	0.119	0.114	3.6	582.1	613.6	-5.4	0.391
12	4	167.2	0.08556	0.083	0.082	0.4	1896.0	1903.7	-0.4	0.563
13	4	188.0	0.16305	0.102	0.098	3.9	989.1	1035.2	-4.7	0.473
14	4	219.5	0.13901	0.097	0.092	5.5	1307.3	1383.9	-5.9	0.506
15	5	247.5	0.10859	0.089	0.087	2.9	1811.0	1859.6	-2.7	0.531
16	6	332.5	0.04539	0.047	0.049	-5.6	6320.9	6178.0	2.3	0.707

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 4

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	----> ERROR	<---- SHEAR MODULUS NEW	USED	-----> ERROR	G/Go RATIO
1	1	5.0	0.01459	0.079	0.087	-10.0	967.0	908.5	6.1	0.618
2	1	17.5	0.12222	0.175	0.179	-2.6	386.1	367.4	4.8	0.250
3	1	34.5	0.38852	0.227	0.227	0.0	180.6	180.9	-0.2	0.123
4	2	49.5	0.09499	0.053	0.060	-13.2	919.7	875.3	4.8	0.624
5	3	57.5	0.24916	0.145	0.148	-2.1	368.2	351.9	4.4	0.211
6	3	70.0	0.02048	0.042	0.045	-6.8	5136.5	4965.5	3.3	0.699
7	3	85.0	0.02491	0.046	0.049	-5.5	4889.4	4736.7	3.1	0.667
8	3	97.5	0.46985	0.174	0.169	3.0	277.2	296.5	-6.9	0.161
9	4	116.5	0.11580	0.091	0.096	-4.7	1181.0	1129.0	4.4	0.484
10	4	138.0	0.10107	0.087	0.088	-0.8	1468.4	1458.0	0.7	0.525
11	4	152.8	0.27588	0.120	0.119	1.1	572.3	582.1	-1.7	0.371
12	4	167.2	0.08359	0.082	0.083	-0.8	1911.5	1896.0	0.8	0.561
13	4	188.0	0.16596	0.102	0.102	0.5	983.0	989.1	-0.6	0.452
14	4	219.5	0.14379	0.098	0.097	1.0	1292.6	1307.3	-1.1	0.478
15	5	247.5	0.10857	0.089	0.089	0.0	1811.2	1811.0	0.0	0.517
16	6	332.5	0.04669	0.048	0.047	1.8	6274.4	6320.9	-0.7	0.724

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 5

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	----> ERROR	<---- SHEAR MODULUS NEW	USED	-----> ERROR	G/Go RATIO
1	1	5.0	0.01347	0.076	0.079	-4.0	989.6	967.0	2.3	0.658
2	1	17.5	0.11449	0.172	0.175	-1.9	399.2	386.1	3.3	0.263

3	1	34.5	0.38222	0.227	0.227	-0.2	182.2	180.6	0.9	0.123
4	2	49.5	0.08898	0.052	0.053	-2.9	934.4	919.7	1.6	0.655
5	3	57.5	0.23431	0.142	0.145	-2.2	385.0	368.2	4.4	0.220
6	3	70.0	0.01951	0.041	0.042	-2.5	5197.5	5136.5	1.2	0.723
7	3	85.0	0.02365	0.045	0.046	-2.4	4954.7	4889.4	1.3	0.688
8	3	97.5	0.49102	0.176	0.174	1.1	270.2	277.2	-2.6	0.151
9	4	116.5	0.10626	0.089	0.091	-2.9	1212.8	1181.0	2.6	0.507
10	4	138.0	0.09981	0.087	0.087	-0.4	1474.1	1468.4	0.4	0.528
11	4	152.8	0.27824	0.120	0.120	0.3	570.0	572.3	-0.4	0.364
12	4	167.2	0.08181	0.082	0.082	-0.7	1925.7	1911.5	0.7	0.565
13	4	188.0	0.16523	0.102	0.102	-0.1	984.5	983.0	0.2	0.450
14	4	219.5	0.14493	0.098	0.098	0.2	1289.2	1292.6	-0.3	0.472
15	5	247.5	0.10823	0.089	0.089	-0.1	1812.9	1811.2	0.1	0.517
16	6	332.5	0.04763	0.048	0.048	1.2	6241.9	6274.4	-0.5	0.718

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 6

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	----> ERROR	<---- SHEAR NEW	MODULUS USED	-----> ERROR	G/Go RATIO
1	1	5.0	0.01315	0.075	0.076	-1.2	996.2	989.6	0.7	0.673
2	1	17.5	0.11086	0.170	0.172	-0.9	405.6	399.2	1.6	0.272
3	1	34.5	0.37974	0.226	0.227	-0.1	182.8	182.2	0.3	0.124
4	2	49.5	0.08720	0.051	0.052	-0.9	938.9	934.4	0.5	0.666
5	3	57.5	0.22349	0.140	0.142	-1.8	398.0	385.0	3.3	0.230
6	3	70.0	0.01925	0.041	0.041	-0.7	5214.2	5197.5	0.3	0.731
7	3	85.0	0.02317	0.045	0.045	-1.0	4980.5	4954.7	0.5	0.697
8	3	97.5	0.49958	0.177	0.176	0.4	267.4	270.2	-1.0	0.147
9	4	116.5	0.10210	0.088	0.089	-1.4	1227.6	1212.8	1.2	0.520
10	4	138.0	0.09923	0.087	0.087	-0.2	1477.3	1474.1	0.2	0.530
11	4	152.8	0.27851	0.120	0.120	0.0	569.8	570.0	0.0	0.363
12	4	167.2	0.08079	0.081	0.082	-0.4	1934.1	1925.7	0.4	0.569
13	4	188.0	0.16439	0.102	0.102	-0.2	986.3	984.5	0.2	0.450
14	4	219.5	0.14540	0.098	0.098	0.1	1287.8	1289.2	-0.1	0.471
15	5	247.5	0.10821	0.089	0.089	0.0	1813.0	1812.9	0.0	0.517
16	6	332.5	0.04806	0.049	0.048	0.6	6227.1	6241.9	-0.2	0.715

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 7

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING NEW	USED	----> ERROR	<---- SHEAR NEW	MODULUS USED	-----> ERROR	G/Go RATIO
1	1	5.0	0.01306	0.075	0.075	-0.3	998.0	996.2	0.2	0.678
2	1	17.5	0.10916	0.169	0.170	-0.4	408.7	405.6	0.8	0.276
3	1	34.5	0.37966	0.226	0.226	0.0	182.8	182.8	0.0	0.124
4	2	49.5	0.08663	0.051	0.051	-0.3	940.4	938.9	0.2	0.669
5	3	57.5	0.21613	0.138	0.140	-1.3	407.2	398.0	2.3	0.238
6	3	70.0	0.01919	0.041	0.041	-0.2	5218.5	5214.2	0.1	0.734
7	3	85.0	0.02299	0.044	0.045	-0.4	4990.2	4980.5	0.2	0.701
8	3	97.5	0.50319	0.177	0.177	0.2	266.2	267.4	-0.4	0.146
9	4	116.5	0.10037	0.087	0.088	-0.6	1233.9	1227.6	0.5	0.527
10	4	138.0	0.09898	0.087	0.087	-0.1	1478.7	1477.3	0.1	0.532
11	4	152.8	0.27836	0.120	0.120	0.0	569.9	569.8	0.0	0.363
12	4	167.2	0.08029	0.081	0.081	-0.2	1938.2	1934.1	0.2	0.572
13	4	188.0	0.16388	0.102	0.102	-0.1	987.4	986.3	0.1	0.451
14	4	219.5	0.14562	0.098	0.098	0.0	1287.1	1287.8	-0.1	0.471
15	5	247.5	0.10827	0.089	0.089	0.0	1812.7	1813.0	0.0	0.517
16	6	332.5	0.04824	0.049	0.049	0.2	6220.8	6227.1	-0.1	0.713

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 8

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	DAMPING NEW	DAMPING USED	DAMPING ERROR	SHEAR MODULUS NEW	SHEAR MODULUS USED	SHEAR MODULUS ERROR	G/Go RATIO
1	1	5.0	0.01303	0.075	0.075	-0.1	998.7	998.0	0.1	0.679
2	1	17.5	0.10829	0.169	0.169	-0.2	410.3	408.7	0.4	0.278
3	1	34.5	0.37988	0.226	0.226	0.0	182.8	182.8	0.0	0.124
4	2	49.5	0.08642	0.051	0.051	-0.1	941.0	940.4	0.1	0.670
5	3	57.5	0.21123	0.137	0.138	-0.9	413.4	407.2	1.5	0.244
6	3	70.0	0.01917	0.041	0.041	-0.1	5219.8	5218.5	0.0	0.734
7	3	85.0	0.02293	0.044	0.044	-0.1	4993.6	4990.2	0.1	0.702
8	3	97.5	0.50482	0.177	0.177	0.1	265.7	266.2	-0.2	0.145
9	4	116.5	0.09966	0.087	0.087	-0.2	1236.9	1233.9	0.2	0.529
10	4	138.0	0.09889	0.087	0.087	0.0	1479.1	1478.7	0.0	0.532
11	4	152.8	0.27823	0.120	0.120	0.0	570.0	569.9	0.0	0.363
12	4	167.2	0.08007	0.081	0.081	-0.1	1940.0	1938.2	0.1	0.573
13	4	188.0	0.16360	0.102	0.102	-0.1	988.0	987.4	0.1	0.452
14	4	219.5	0.14572	0.098	0.098	0.0	1286.8	1287.1	0.0	0.470
15	5	247.5	0.10832	0.089	0.089	0.0	1812.4	1812.7	0.0	0.517
16	6	332.5	0.04832	0.049	0.049	0.1	6218.3	6220.8	0.0	0.712

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 9

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	DAMPING NEW	DAMPING USED	DAMPING ERROR	SHEAR MODULUS NEW	SHEAR MODULUS USED	SHEAR MODULUS ERROR	G/Go RATIO
1	1	5.0	0.01302	0.075	0.075	0.0	998.9	998.7	0.0	0.679
2	1	17.5	0.10784	0.169	0.169	-0.1	411.2	410.3	0.2	0.279
3	1	34.5	0.38010	0.226	0.226	0.0	182.7	182.8	0.0	0.124
4	2	49.5	0.08633	0.051	0.051	0.0	941.2	941.0	0.0	0.671
5	3	57.5	0.20802	0.136	0.137	-0.6	417.6	413.4	1.0	0.247
6	3	70.0	0.01916	0.041	0.041	0.0	5220.2	5219.8	0.0	0.735
7	3	85.0	0.02291	0.044	0.044	0.0	4994.8	4993.6	0.0	0.703
8	3	97.5	0.50562	0.178	0.177	0.0	265.5	265.7	-0.1	0.145
9	4	116.5	0.09934	0.087	0.087	-0.1	1238.4	1236.9	0.1	0.531
10	4	138.0	0.09887	0.087	0.087	0.0	1479.3	1479.1	0.0	0.532
11	4	152.8	0.27816	0.120	0.120	0.0	570.1	570.0	0.0	0.363
12	4	167.2	0.07998	0.081	0.081	0.0	1940.8	1940.0	0.0	0.574
13	4	188.0	0.16345	0.102	0.102	0.0	988.3	988.0	0.0	0.452
14	4	219.5	0.14576	0.098	0.098	0.0	1286.7	1286.8	0.0	0.470
15	5	247.5	0.10836	0.089	0.089	0.0	1812.2	1812.4	0.0	0.517
16	6	332.5	0.04835	0.049	0.049	0.0	6217.3	6218.3	0.0	0.712

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SOIL PROFILE - Soil Profile South

ITERATION NUMBER 10

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	DAMPING NEW	DAMPING USED	DAMPING ERROR	SHEAR MODULUS NEW	SHEAR MODULUS USED	SHEAR MODULUS ERROR	G/Go RATIO
1	1	5.0	0.01302	0.075	0.075	0.0	999.0	998.9	0.0	0.680
2	1	17.5	0.10760	0.169	0.169	-0.1	411.6	411.2	0.1	0.280

3	1	34.5	0.38026	0.226	0.226	0.0	182.7	182.7	0.0	0.124
4	2	49.5	0.08629	0.051	0.051	0.0	941.3	941.2	0.0	0.671
5	3	57.5	0.20594	0.135	0.136	-0.4	420.4	417.6	0.7	0.250
6	3	70.0	0.01916	0.041	0.041	0.0	5220.4	5220.2	0.0	0.735
7	3	85.0	0.02290	0.044	0.044	0.0	4995.1	4994.8	0.0	0.703
8	3	97.5	0.50605	0.178	0.178	0.0	265.3	265.5	-0.1	0.144
9	4	116.5	0.09918	0.087	0.087	0.0	1239.1	1238.4	0.1	0.531
10	4	138.0	0.09888	0.087	0.087	0.0	1479.2	1479.3	0.0	0.532
11	4	152.8	0.27814	0.120	0.120	0.0	570.1	570.1	0.0	0.363
12	4	167.2	0.07993	0.081	0.081	0.0	1941.2	1940.8	0.0	0.574
13	4	188.0	0.16337	0.102	0.102	0.0	988.5	988.3	0.0	0.452
14	4	219.5	0.14578	0.098	0.098	0.0	1286.6	1286.7	0.0	0.470
15	5	247.5	0.10837	0.089	0.089	0.0	1812.1	1812.2	0.0	0.517
16	6	332.5	0.04836	0.049	0.049	0.0	6216.8	6217.3	0.0	0.712

VALUES IN TIME DOMAIN

LAYER	TYPE	THICKNESS FT	DEPTH FT	MAX STRAIN PRCNT	MAX STRESS PSF	TIME SEC
1	1	10.0000	5.0000	0.02003	200.09	9.40
2	1	15.0000	17.5000	0.16553	680.65	9.42
3	1	19.0000	34.5000	0.58502	1068.81	9.42
4	2	11.0000	49.5000	0.13275	1249.42	11.37
5	3	5.0000	57.5000	0.31682	1323.12	11.38
6	3	20.0000	70.0000	0.02947	1538.57	11.34
7	3	10.0000	85.0000	0.03524	1760.03	8.72
8	3	15.0000	97.5000	0.77853	2066.82	8.73
9	4	23.0000	116.5000	0.15259	1889.56	8.69
10	4	20.0000	138.0000	0.15212	2250.23	10.79
11	4	9.5000	152.7500	0.42790	2439.51	10.79
12	4	19.5000	167.2500	0.12297	2386.70	10.77
13	4	22.0000	188.0000	0.25134	2483.92	10.71
14	4	41.0000	219.5000	0.22427	2885.65	10.67
15	5	15.0000	247.5000	0.16673	3021.53	10.63
16	6	155.0000	332.5000	0.07440	4625.92	8.11

PERIOD = 1.921 FROM AVERAGE SHEAR VEL. =   854.

FREQUENCY   AMPLITUDE
MAXIMUM AMPLIFICATION =   7.10
FOR FREQUENCY   =   0.49 C/SEC.
PERIOD   =   2.04 SEC.

1******   OPTION 6 *** COMPUTE MOTION IN NEW SUBLAYERS

EARTHQUAKE -C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

SOIL DEPOSIT - Soil Profile South

LAYER	DEPTH FT	MAX. ACC. G	TIME SEC	MEAN SQ. FR. C/SEC	ACC. RATIO	QUIET ZONE	TH SAVED ACC. RECORD
OUTCR.	0.0000	0.36158	9.39	1.54		0.000	1024
WITHIN	10.0000	0.35189	9.39	1.53		0.000	1024
WITHIN	25.0000	0.25904	11.37	1.35		0.000	1024
WITHIN	44.0000	0.30675	8.68	1.83		0.000	1024
WITHIN	55.0000	0.31405	8.68	1.84		0.000	1024
WITHIN	60.0000	0.31238	8.68	1.85		0.000	1024
WITHIN	80.0000	0.31158	9.17	1.83		0.000	1024
WITHIN	90.0000	0.30758	9.17	1.81		0.000	0

WITHIN	105.0000	0.40740	8.51	2.26	0.000
0					
WITHIN	128.0000	0.44737	8.50	2.10	0.000
0					
WITHIN	148.0000	0.40924	8.72	2.04	0.000
0					
WITHIN	157.5000	0.42865	8.70	2.26	0.000
0					
WITHIN	177.0000	0.39562	8.69	2.30	0.000
0					
WITHIN	199.0000	0.38188	7.31	2.37	0.000
0					
WITHIN	240.0000	0.43557	8.56	2.48	0.000
0					

1****** OPTION 6 *** COMPUTE MOTION IN NEW SUBLAYERS

EARTHQUAKE -C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

SOIL DEPOSIT - Soil Profile South

LAYER	DEPTH	MAX. ACC.	TIME	MEAN SQ. FR.	ACC.
RATIO TH SAVED					
	FT	G	SEC	C/SEC	QUIET
ZONE ACC. RECORD					
WITHIN	255.0000	0.44460	8.54	2.44	0.000
0					
WITHIN	410.0000	0.31372	7.25	2.91	0.000
0					

1****** OPTION 7 *** COMPUTE STRESS/STRAIN HISTORY

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 2
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Stress History Layer No. 2

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 2
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Strain History Layer No. 2

1****** OPTION 7 *** COMPUTE STRESS/STRAIN HISTORY

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 3
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Stress History Layer No. 3

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 3
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Strain History Layer No. 3

1****** OPTION 7 *** COMPUTE STRESS/STRAIN HISTORY

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 4
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Stress History Layer No. 4

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 4
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Strain History Layer No. 4

1****** OPTION 7 *** COMPUTE STRESS/STRAIN HISTORY

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 5
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Stress History Layer No. 5

COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF LAYER 5
SCALE FOR PLOTTING 0.0000
IDENTIFICATION - Strain History Layer No. 5

1****** OPTION 9 *** COMPUTE RESPONSE SPECTRUM

RESPONSE SPECTRUM ANALYSIS FOR LAYER NUMBER 1
CALCULATED FOR DAMPING 0.050

TIMES AT WHICH MAX. SPECTRAL VALUES OCCUR
TD = TIME FOR MAX. RELATIVE DISP.
TV = TIME FOR MAX. RELATIVE VEL.
TA = TIME FOR MAX. ABSOLUTE ACC.
DAMPING RATIO = 0.050

PER = 0.01	TIMES FOR MAXIMA --	TD = 9.3800	TV = 9.0200	TA = 9.3800
PER = 0.02	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9800	TA = 9.3800
PER = 0.03	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9900	TA = 9.3800
PER = 0.04	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9900	TA = 9.3800
PER = 0.05	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9900	TA = 9.3800
PER = 0.06	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9900	TA = 9.3800
PER = 0.07	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9800	TA = 9.3800
PER = 0.08	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9900	TA = 9.3800
PER = 0.09	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9800	TA = 9.3800
PER = 0.10	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9800	TA = 9.3800
PER = 0.11	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9800	TA = 9.3800
PER = 0.12	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9800	TA = 9.3800
PER = 0.13	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9800	TA = 9.3800
PER = 0.14	TIMES FOR MAXIMA --	TD = 9.3800	TV = 8.9800	TA = 9.3800
PER = 0.15	TIMES FOR MAXIMA --	TD = 9.3900	TV = 8.9800	TA = 9.3900
PER = 0.16	TIMES FOR MAXIMA --	TD = 9.4000	TV = 8.9900	TA = 9.3900
PER = 0.17	TIMES FOR MAXIMA --	TD = 9.3900	TV = 9.0000	TA = 9.3900
PER = 0.18	TIMES FOR MAXIMA --	TD = 9.3800	TV = 9.0000	TA = 9.3800
PER = 0.19	TIMES FOR MAXIMA --	TD = 9.3800	TV = 7.8200	TA = 9.3800
PER = 0.20	TIMES FOR MAXIMA --	TD = 9.3900	TV = 7.8400	TA = 9.3900
PER = 0.21	TIMES FOR MAXIMA --	TD = 9.1100	TV = 7.8500	TA = 9.1000
PER = 0.22	TIMES FOR MAXIMA --	TD = 9.1200	TV = 7.8600	TA = 9.1200
PER = 0.23	TIMES FOR MAXIMA --	TD = 8.8500	TV = 7.8700	TA = 8.8500
PER = 0.24	TIMES FOR MAXIMA --	TD = 8.8700	TV = 7.8800	TA = 8.8700
PER = 0.25	TIMES FOR MAXIMA --	TD = 9.1200	TV = 7.8900	TA = 9.1100
PER = 0.26	TIMES FOR MAXIMA --	TD = 9.1300	TV = 7.8900	TA = 9.1300
PER = 0.27	TIMES FOR MAXIMA --	TD = 9.1400	TV = 8.7300	TA = 9.1400
PER = 0.28	TIMES FOR MAXIMA --	TD = 8.8400	TV = 8.7500	TA = 8.8400
PER = 0.29	TIMES FOR MAXIMA --	TD = 8.8500	TV = 8.7600	TA = 8.8500
PER = 0.30	TIMES FOR MAXIMA --	TD = 8.8600	TV = 8.7700	TA = 8.8600
PER = 0.31	TIMES FOR MAXIMA --	TD = 8.8700	TV = 8.9700	TA = 8.8700
PER = 0.32	TIMES FOR MAXIMA --	TD = 8.8800	TV = 8.9900	TA = 8.8800
PER = 0.33	TIMES FOR MAXIMA --	TD = 9.1100	TV = 9.0000	TA = 9.1100
PER = 0.34	TIMES FOR MAXIMA --	TD = 9.1200	TV = 9.0000	TA = 9.1100
PER = 0.35	TIMES FOR MAXIMA --	TD = 9.1200	TV = 9.0000	TA = 9.1100
PER = 0.36	TIMES FOR MAXIMA --	TD = 9.1200	TV = 9.0000	TA = 9.1100
PER = 0.37	TIMES FOR MAXIMA --	TD = 9.1200	TV = 9.0100	TA = 9.1200
PER = 0.38	TIMES FOR MAXIMA --	TD = 9.1300	TV = 9.0100	TA = 9.1200
PER = 0.39	TIMES FOR MAXIMA --	TD = 9.1300	TV = 9.0200	TA = 9.1300
PER = 0.40	TIMES FOR MAXIMA --	TD = 9.1400	TV = 9.0300	TA = 9.1300
PER = 0.41	TIMES FOR MAXIMA --	TD = 9.1500	TV = 9.2700	TA = 9.1500
PER = 0.42	TIMES FOR MAXIMA --	TD = 9.1700	TV = 9.2800	TA = 9.1600
PER = 0.43	TIMES FOR MAXIMA --	TD = 9.4200	TV = 9.3000	TA = 9.4100
PER = 0.44	TIMES FOR MAXIMA --	TD = 9.6700	TV = 9.5500	TA = 9.4300
PER = 0.45	TIMES FOR MAXIMA --	TD = 9.6900	TV = 9.5700	TA = 9.6800
PER = 0.46	TIMES FOR MAXIMA --	TD = 9.7100	TV = 9.5900	TA = 9.7000
PER = 0.47	TIMES FOR MAXIMA --	TD = 9.7200	TV = 9.6000	TA = 9.7200
PER = 0.48	TIMES FOR MAXIMA --	TD = 9.7400	TV = 9.6200	TA = 9.7300
PER = 0.49	TIMES FOR MAXIMA --	TD = 9.7500	TV = 9.6300	TA = 9.7500
PER = 0.50	TIMES FOR MAXIMA --	TD = 9.7700	TV = 9.6400	TA = 9.7600
PER = 0.51	TIMES FOR MAXIMA --	TD = 9.7800	TV = 9.6600	TA = 9.7700
PER = 0.52	TIMES FOR MAXIMA --	TD = 9.7900	TV = 9.9200	TA = 9.7800
PER = 0.53	TIMES FOR MAXIMA --	TD = 9.8000	TV = 9.9300	TA = 9.7900
PER = 0.54	TIMES FOR MAXIMA --	TD = 9.8100	TV = 9.9400	TA = 9.8000
PER = 0.55	TIMES FOR MAXIMA --	TD = 9.8200	TV = 9.9500	TA = 9.8100
PER = 0.56	TIMES FOR MAXIMA --	TD = 9.8200	TV = 9.9600	TA = 9.8100
PER = 0.57	TIMES FOR MAXIMA --	TD = 9.8300	TV = 9.9600	TA = 9.8200
PER = 0.58	TIMES FOR MAXIMA --	TD = 9.8300	TV = 9.9700	TA = 9.8200
PER = 0.60	TIMES FOR MAXIMA --	TD = 9.8300	TV = 9.9800	TA = 9.8300
PER = 0.62	TIMES FOR MAXIMA --	TD = 9.8400	TV = 9.9800	TA = 9.8300
PER = 0.64	TIMES FOR MAXIMA --	TD = 9.8500	TV = 9.7000	TA = 9.8400
PER = 0.66	TIMES FOR MAXIMA --	TD = 9.8700	TV = 9.7100	TA = 9.8600

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PER = 0.68     TIMES FOR MAXIMA --   TD =  9.9000   TV =  9.7400   TA =  9.8900
PER = 0.70     TIMES FOR MAXIMA --   TD = 12.1500   TV = 12.3200   TA = 12.1400
PER = 0.72     TIMES FOR MAXIMA --   TD = 12.1900   TV = 12.0200   TA = 12.1800
PER = 0.74     TIMES FOR MAXIMA --   TD = 11.8800   TV = 12.0500   TA = 11.8600
PER = 0.76     TIMES FOR MAXIMA --   TD = 11.9100   TV = 12.0800   TA = 11.9000
PER = 0.78     TIMES FOR MAXIMA --   TD = 11.9300   TV = 11.7600   TA = 11.9200
PER = 0.80     TIMES FOR MAXIMA --   TD = 11.9500   TV = 11.7700   TA = 11.9400
PER = 0.82     TIMES FOR MAXIMA --   TD = 11.9600   TV = 11.7800   TA = 11.9500
PER = 0.84     TIMES FOR MAXIMA --   TD = 11.9700   TV = 11.7900   TA = 11.9600
PER = 0.86     TIMES FOR MAXIMA --   TD = 11.9800   TV = 11.8000   TA = 11.9700
PER = 0.88     TIMES FOR MAXIMA --   TD = 11.6100   TV = 11.8100   TA = 11.6000
PER = 0.90     TIMES FOR MAXIMA --   TD = 11.6200   TV = 11.8100   TA = 11.6000
PER = 0.92     TIMES FOR MAXIMA --   TD = 11.6300   TV = 11.8200   TA = 11.6100
PER = 0.94     TIMES FOR MAXIMA --   TD = 11.6400   TV = 11.8300   TA = 11.6200
PER = 0.96     TIMES FOR MAXIMA --   TD = 11.6500   TV = 11.8400   TA = 11.6300
PER = 0.98     TIMES FOR MAXIMA --   TD = 11.6500   TV = 11.8400   TA = 11.6300
PER = 1.00     TIMES FOR MAXIMA --   TD = 11.6500   TV = 11.8400   TA = 11.6300
PER = 1.05     TIMES FOR MAXIMA --   TD = 11.6400   TV = 11.8400   TA = 11.6200
PER = 1.10     TIMES FOR MAXIMA --   TD = 11.6400   TV = 11.8500   TA = 11.6300
PER = 1.15     TIMES FOR MAXIMA --   TD = 11.6500   TV = 11.8600   TA = 11.6400
PER = 1.20     TIMES FOR MAXIMA --   TD = 11.6600   TV = 11.8600   TA = 11.6400
PER = 1.25     TIMES FOR MAXIMA --   TD = 16.7400   TV = 11.8700   TA = 16.7200
PER = 1.30     TIMES FOR MAXIMA --   TD = 16.8300   TV = 17.1500   TA = 16.8100
PER = 1.35     TIMES FOR MAXIMA --   TD = 11.6700   TV = 17.2300   TA = 11.6500
PER = 1.40     TIMES FOR MAXIMA --   TD = 11.6900   TV = 11.9100   TA = 11.6700
PER = 1.45     TIMES FOR MAXIMA --   TD = 11.7000   TV = 11.4700   TA = 11.6800
PER = 1.50     TIMES FOR MAXIMA --   TD = 11.7200   TV = 11.4800   TA = 11.6900
PER = 1.55     TIMES FOR MAXIMA --   TD = 11.7300   TV = 11.4800   TA = 11.7100
PER = 1.60     TIMES FOR MAXIMA --   TD = 11.7500   TV = 11.4900   TA = 11.7200
PER = 1.65     TIMES FOR MAXIMA --   TD = 11.7700   TV = 11.5000   TA = 11.7400
PER = 1.70     TIMES FOR MAXIMA --   TD = 11.8000   TV = 11.5000   TA = 11.7700
PER = 1.75     TIMES FOR MAXIMA --   TD = 11.8300   TV = 11.5200   TA = 11.8000
PER = 1.80     TIMES FOR MAXIMA --   TD = 11.8800   TV = 11.5300   TA = 11.8500
PER = 1.85     TIMES FOR MAXIMA --   TD = 11.9700   TV = 11.5400   TA = 11.9400
PER = 1.90     TIMES FOR MAXIMA --   TD = 12.0700   TV = 11.5600   TA = 12.0400
PER = 1.95     TIMES FOR MAXIMA --   TD = 12.1300   TV = 11.5700   TA = 12.1000
PER = 2.00     TIMES FOR MAXIMA --   TD = 12.1800   TV = 11.5800   TA = 12.1500
PER = 2.05     TIMES FOR MAXIMA --   TD = 12.2200   TV = 11.5900   TA = 12.1900
PER = 2.10     TIMES FOR MAXIMA --   TD = 11.2900   TV = 11.6000   TA = 11.2600
PER = 2.15     TIMES FOR MAXIMA --   TD = 11.3200   TV = 11.6100   TA = 11.2800
PER = 2.20     TIMES FOR MAXIMA --   TD = 11.3400   TV = 11.6200   TA = 11.3000
PER = 2.25     TIMES FOR MAXIMA --   TD = 18.0900   TV = 18.6100   TA = 18.0500
PER = 2.30     TIMES FOR MAXIMA --   TD = 18.1900   TV = 17.6700   TA = 18.1600
PER = 2.35     TIMES FOR MAXIMA --   TD = 17.1600   TV = 17.7200   TA = 17.1200
PER = 2.40     TIMES FOR MAXIMA --   TD = 17.2200   TV = 17.7500   TA = 17.1800
PER = 2.50     TIMES FOR MAXIMA --   TD = 17.3300   TV = 16.8100   TA = 17.2900
PER = 2.60     TIMES FOR MAXIMA --   TD = 17.4200   TV = 16.8500   TA = 17.3800
PER = 2.70     TIMES FOR MAXIMA --   TD = 17.4900   TV = 16.8800   TA = 17.4400
PER = 2.80     TIMES FOR MAXIMA --   TD = 16.4600   TV = 16.9100   TA = 16.4100
PER = 2.90     TIMES FOR MAXIMA --   TD = 16.5000   TV = 11.0900   TA = 16.4500
PER = 3.00     TIMES FOR MAXIMA --   TD = 11.3800   TV = 11.0900   TA = 11.3300
PER = 3.10     TIMES FOR MAXIMA --   TD = 11.3800   TV = 11.0900   TA = 11.3300
PER = 3.20     TIMES FOR MAXIMA --   TD = 11.3800   TV = 11.0900   TA = 11.3300
PER = 3.30     TIMES FOR MAXIMA --   TD = 11.3800   TV = 11.0900   TA = 11.3300
PER = 3.40     TIMES FOR MAXIMA --   TD = 11.3900   TV = 11.0900   TA = 11.3400
PER = 3.50     TIMES FOR MAXIMA --   TD = 11.3900   TV = 11.0900   TA = 11.3400
PER = 3.60     TIMES FOR MAXIMA --   TD = 11.4000   TV = 11.0900   TA = 11.3500
PER = 3.70     TIMES FOR MAXIMA --   TD = 11.4100   TV = 11.0900   TA = 11.3500
PER = 3.80     TIMES FOR MAXIMA --   TD = 11.4200   TV = 11.0900   TA = 11.3600
PER = 3.90     TIMES FOR MAXIMA --   TD = 11.4200   TV = 11.0900   TA = 11.3600
PER = 4.00     TIMES FOR MAXIMA --   TD = 11.4300   TV = 11.1000   TA = 11.3700
PER = 4.10     TIMES FOR MAXIMA --   TD = 11.4300   TV = 11.1000   TA = 11.3700
PER = 4.20     TIMES FOR MAXIMA --   TD = 11.4400   TV = 11.1000   TA = 11.3700
PER = 4.30     TIMES FOR MAXIMA --   TD = 11.4500   TV = 11.1000   TA = 11.3800
PER = 4.40     TIMES FOR MAXIMA --   TD = 16.4800   TV = 11.1000   TA = 11.3800
PER = 4.50     TIMES FOR MAXIMA --   TD = 16.5100   TV = 11.1000   TA = 16.4400
PER = 4.60     TIMES FOR MAXIMA --   TD = 16.5300   TV = 11.1100   TA = 16.4600
PER = 4.70     TIMES FOR MAXIMA --   TD = 16.5600   TV = 11.1100   TA = 16.4800
PER = 4.80     TIMES FOR MAXIMA --   TD = 16.5800   TV = 11.1100   TA = 16.5000
PER = 4.90     TIMES FOR MAXIMA --   TD = 16.6100   TV = 11.1100   TA = 16.5300
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PER = 5.00     TIMES FOR MAXIMA --   TD = 16.6300   TV = 11.1100   TA = 16.5500
PER = 5.10     TIMES FOR MAXIMA --   TD = 16.6500   TV = 11.1100   TA = 16.5700
PER = 5.20     TIMES FOR MAXIMA --   TD = 16.6700   TV = 11.1100   TA = 16.5900
PER = 5.40     TIMES FOR MAXIMA --   TD = 16.7000   TV = 11.1100   TA = 16.6100
PER = 5.60     TIMES FOR MAXIMA --   TD = 15.3600   TV = 11.1100   TA = 15.2900
PER = 5.80     TIMES FOR MAXIMA --   TD = 15.4000   TV = 11.1200   TA = 15.3200
PER = 6.00     TIMES FOR MAXIMA --   TD = 15.4300   TV = 11.1200   TA = 15.3500
PER = 6.20     TIMES FOR MAXIMA --   TD = 15.4700   TV = 11.1200   TA = 15.3700
PER = 6.40     TIMES FOR MAXIMA --   TD = 15.5000   TV = 11.1200   TA = 15.3900
PER = 6.60     TIMES FOR MAXIMA --   TD = 15.5300   TV = 11.1200   TA = 15.4100
PER = 6.80     TIMES FOR MAXIMA --   TD = 15.5500   TV = 11.1200   TA = 15.4300
PER = 7.00     TIMES FOR MAXIMA --   TD = 15.5700   TV = 11.1200   TA = 15.4500
PER = 7.30     TIMES FOR MAXIMA --   TD = 10.7500   TV = 11.1200   TA = 10.6900
PER = 7.60     TIMES FOR MAXIMA --   TD = 10.7500   TV = 11.1200   TA = 10.7000
PER = 8.00     TIMES FOR MAXIMA --   TD = 10.7600   TV = 11.1200   TA = 10.7000
PER = 8.50     TIMES FOR MAXIMA --   TD = 10.7600   TV = 11.1200   TA = 10.7000
PER = 9.00     TIMES FOR MAXIMA --   TD = 10.7700   TV = 11.1200   TA = 10.7000
PER = 9.50     TIMES FOR MAXIMA --   TD = 10.7700   TV = 11.1200   TA = 10.7000
PER =10.00     TIMES FOR MAXIMA --   TD = 10.7700   TV = 11.1200   TA = 10.7000
PER =10.50     TIMES FOR MAXIMA --   TD = 10.7800   TV = 11.1200   TA = 10.7000
 SPECTRAL VALUES--
 (Acceleration of gravity used =   32.20)
                        Soil Profile South              DAMPING RATIO = 0.050
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NO. FREQ.	PERIOD	REL. DISP.	REL. VEL.	PSU.REL.VEL.	ABS. ACC.	PSU.ABS.ACC.
1 100.00	0.01	0.00003	0.00033	0.01851	0.36154	0.36128
2 50.00	0.02	0.00012	0.00144	0.03705	0.36158	0.36152
3 33.33	0.03	0.00027	0.00323	0.05570	0.36239	0.36229
4 25.00	0.04	0.00047	0.00577	0.07448	0.36346	0.36331
5 20.00	0.05	0.00074	0.00905	0.09343	0.36483	0.36463
6 16.67	0.06	0.00108	0.01309	0.11262	0.36651	0.36626
7 14.29	0.07	0.00147	0.01795	0.13211	0.36860	0.36828
8 12.50	0.08	0.00193	0.02358	0.15188	0.37079	0.37046
9 11.11	0.09	0.00247	0.03005	0.17216	0.37352	0.37326
10 10.00	0.10	0.00307	0.03781	0.19272	0.37623	0.37605
11 9.09	0.11	0.00375	0.04617	0.21416	0.38001	0.37990
12 8.33	0.12	0.00451	0.05657	0.23590	0.38333	0.38359
13 7.69	0.13	0.00535	0.06651	0.25840	0.38751	0.38786
14 7.14	0.14	0.00631	0.08520	0.28318	0.39538	0.39470
15 6.67	0.15	0.00746	0.10385	0.31237	0.40645	0.40635
16 6.25	0.16	0.00833	0.12221	0.32717	0.39940	0.39901
17 5.88	0.17	0.00942	0.13449	0.34830	0.39984	0.39979
18 5.56	0.18	0.01075	0.16527	0.37519	0.40712	0.40672
19 5.26	0.19	0.01305	0.20026	0.43158	0.44403	0.44324
20 5.00	0.20	0.01498	0.25502	0.47050	0.45971	0.45904
21 4.76	0.21	0.01740	0.29677	0.52059	0.48448	0.48372
22 4.55	0.22	0.01983	0.34004	0.56631	0.50361	0.50229
23	0.23	0.02087	0.37039	0.57007	0.48427	0.48365

```
4.35
 24      0.24      0.02133      0.38952      0.55841      0.45422      0.45401
4.17
 25      0.25      0.02588      0.40059      0.65033      0.50886      0.50759
4.00
 26      0.26      0.02896      0.37873      0.69976      0.52561      0.52517
3.85
 27      0.27      0.02989      0.42485      0.69562      0.50349      0.50273
3.70
 28      0.28      0.03576      0.52368      0.80246      0.55938      0.55923
3.57
 29      0.29      0.04234      0.59786      0.91738      0.61750      0.61727
3.45
 30      0.30      0.04863      0.66158      1.01848      0.66263      0.66245
3.33
 31      0.31      0.05394      0.70505      1.09323      0.68923      0.68814
3.23
 32      0.32      0.05649      0.77842      1.10927      0.67681      0.67641
3.12
 33      0.33      0.05960      0.81129      1.13486      0.67287      0.67105
3.03
 34      0.34      0.06543      0.87686      1.20923      0.69711      0.69399
2.94
 35      0.35      0.07484      1.01409      1.34348      0.75259      0.74901
2.86
 36      0.36      0.08804      1.19216      1.53651      0.83543      0.83283
2.78
 37      0.37      0.10282      1.37776      1.74605      0.92339      0.92083
2.70
 38      0.38      0.11922      1.57841      1.97124      1.01565      1.01223
2.63
 39      0.39      0.13992      1.84948      2.25427      1.13215      1.12789
2.56
 40      0.40      0.16752      2.20566      2.63134      1.28585      1.28363
2.50
 41      0.41      0.19921      2.62357      3.05282      1.45757      1.45292
2.44
 42      0.42      0.22966      3.09393      3.43573      1.60387      1.59622
2.38
 43      0.43      0.26521      3.48040      3.87527      1.76637      1.75856
2.33
 44      0.44      0.29339      3.88246      4.18959      1.86642      1.85799
2.27
 45      0.45      0.32505      4.19818      4.53860      1.97454      1.96804
2.22
 46      0.46      0.34794      4.39750      4.75261      2.02575      2.01603
2.17
 47      0.47      0.36406      4.50981      4.86693      2.02985      2.02060
2.13
 48      0.48      0.37505      4.55726      4.90945      2.00451      1.99579
2.08
 49      0.49      0.37888      4.52739      4.85835      1.94409      1.93471
2.04
 50      0.50      0.37677      4.40875      4.73463      1.85666      1.84774
2.00
 51      0.51      0.36829      4.21948      4.53728      1.74309      1.73600
1.96
 52      0.52      0.35607      4.00746      4.30243      1.62079      1.61449
1.92
 53      0.53      0.34363      3.80474      4.07379      1.50612      1.49985
1.89
 54      0.54      0.33320      3.62572      3.87699      1.40756      1.40096
1.85
 55      0.55      0.32502      3.47551      3.71303      1.32428      1.31732
1.82
 56      0.56      0.31904      3.34186      3.57957      1.25281      1.24729
1.79
 57      0.57      0.31342      3.22213      3.45482      1.18869      1.18270
1.75
 58      0.58      0.30891      3.11422      3.34641      1.13110      1.12584
```

1.72						
59	0.60	0.31197	3.02894	3.26691	1.06749	1.06245
1.67						
60	0.62	0.34952	3.27212	3.54213	1.12028	1.11480
1.61						
61	0.64	0.41369	3.81385	4.06140	1.24442	1.23828
1.56						
62	0.66	0.47461	4.39861	4.51825	1.34267	1.33583
1.52						
63	0.68	0.50913	4.73663	4.70436	1.35679	1.34994
1.47						
64	0.70	0.52483	4.74911	4.71088	1.31983	1.31319
1.43						
65	0.72	0.61322	5.43768	5.35135	1.45755	1.45029
1.39						
66	0.74	0.63567	5.69655	5.39731	1.43113	1.42321
1.35						
67	0.76	0.62526	5.41289	5.16927	1.33391	1.32721
1.32						
68	0.78	0.58024	4.86206	4.67408	1.17655	1.16930
1.28						
69	0.80	0.52698	4.44028	4.13891	1.01570	1.00953
1.25						
70	0.82	0.48412	4.08188	3.70956	0.88872	0.88274
1.22						
71	0.84	0.45997	3.86643	3.44056	0.80459	0.79923
1.19						
72	0.86	0.44991	3.77158	3.28707	0.75072	0.74582
1.16						
73	0.88	0.45240	3.72811	3.23015	0.71992	0.71625
1.14						
74	0.90	0.45778	3.66750	3.19592	0.69648	0.69291
1.11						
75	0.92	0.45500	3.54267	3.10746	0.66267	0.65909
1.09						
76	0.94	0.44167	3.35170	2.95223	0.61649	0.61284
1.06						
77	0.96	0.42018	3.12598	2.75010	0.56298	0.55899
1.04						
78	0.98	0.39766	2.92211	2.54955	0.51094	0.50765
1.02						
79	1.00	0.38116	2.78438	2.39492	0.47051	0.46732
1.00						
80	1.05	0.39338	2.77997	2.35396	0.44023	0.43746
0.95						
81	1.10	0.44017	2.87540	2.51427	0.44923	0.44601
0.91						
82	1.15	0.46041	2.78423	2.51549	0.42998	0.42682
0.87						
83	1.20	0.47219	2.70639	2.47239	0.40502	0.40203
0.83						
84	1.25	0.53955	2.81093	2.71209	0.42504	0.42337
0.80						
85	1.30	0.63716	3.11265	3.07953	0.46433	0.46224
0.77						
86	1.35	0.67763	3.05128	3.15382	0.45920	0.45585
0.74						
87	1.40	0.73747	2.95129	3.30976	0.46467	0.46131
0.71						
88	1.45	0.78045	3.09832	3.38188	0.45866	0.45511
0.69						
89	1.50	0.82061	3.27944	3.43738	0.45048	0.44716
0.67						
90	1.55	0.86880	3.47908	3.52182	0.44673	0.44336
0.65						
91	1.60	0.92774	3.73640	3.64321	0.44763	0.44431
0.62						
92	1.65	0.99161	4.04463	3.77605	0.44977	0.44656
0.61						
93	1.70	1.05094	4.37554	3.88425	0.44886	0.44584

0.59

94	1.75	1.09837	4.68730	3.94359	0.44227	0.43972	0.57
95	1.80	1.13131	4.93934	3.94902	0.42998	0.42810	0.56
96	1.85	1.16025	5.09965	3.94057	0.41664	0.41563	0.54
97	1.90	1.20668	5.15271	3.99043	0.41112	0.40982	0.53
98	1.95	1.25315	5.09541	4.03783	0.40594	0.40405	0.51
99	2.00	1.28164	4.93277	4.02639	0.39506	0.39283	0.50
100	2.05	1.28715	4.68221	3.94506	0.37786	0.37551	0.49
101	2.10	1.27403	4.36624	3.81190	0.35702	0.35420	0.48
102	2.15	1.25832	4.00904	3.67732	0.33655	0.33375	0.47
103	2.20	1.22572	3.63335	3.50064	0.31331	0.31049	0.45
104	2.25	1.19109	3.50115	3.32616	0.28981	0.28846	0.44
105	2.30	1.20704	3.60252	3.29741	0.28103	0.27975	0.43
106	2.35	1.20047	3.58819	3.20968	0.26808	0.26651	0.43
107	2.40	1.17977	3.43628	3.08864	0.25253	0.25112	0.42
108	2.50	1.08989	3.14489	2.73920	0.21497	0.21380	0.40
109	2.60	0.98539	2.92475	2.38130	0.17978	0.17872	0.38
110	2.70	0.88413	2.67958	2.05745	0.14970	0.14869	0.37
111	2.80	0.84458	2.41502	1.89524	0.13335	0.13208	0.36
112	2.90	0.80246	2.24937	1.73861	0.11823	0.11698	0.34
113	3.00	0.74280	2.19954	1.55572	0.10310	0.10119	0.33
114	3.10	0.78368	2.19345	1.58840	0.10188	0.09998	0.32
115	3.20	0.82792	2.21854	1.62561	0.10101	0.09913	0.31
116	3.30	0.87007	2.26336	1.65661	0.09985	0.09796	0.30
117	3.40	0.90697	2.31858	1.67608	0.09809	0.09619	0.29
118	3.50	0.93695	2.37724	1.68201	0.09569	0.09377	0.29
119	3.60	0.95956	2.43450	1.67475	0.09268	0.09078	0.28
120	3.70	0.97460	2.48725	1.65502	0.08919	0.08728	0.27
121	3.80	0.98256	2.53373	1.62463	0.08533	0.08342	0.26
122	3.90	0.98449	2.57314	1.58608	0.08124	0.07936	0.26
123	4.00	0.98079	2.60545	1.54062	0.07701	0.07516	0.25
124	4.10	0.97226	2.63173	1.48997	0.07277	0.07091	0.24
125	4.20	0.96001	2.65143	1.43617	0.06854	0.06672	0.24
126	4.30	0.94430	2.66517	1.37982	0.06441	0.06261	0.23
127	4.40	0.93752	2.67357	1.33878	0.06042	0.05937	0.23
128	4.50	0.98247	2.67730	1.37179	0.06044	0.05948	

0.22

129	4.60	1.00837	2.67706	1.37734	0.05938	0.05843	0.22
130	4.70	1.01630	2.67412	1.35864	0.05734	0.05641	0.21
131	4.80	1.00822	2.66819	1.31975	0.05454	0.05365	0.21
132	4.90	0.98612	2.65975	1.26448	0.05119	0.05035	0.20
133	5.00	0.95190	2.64923	1.19619	0.04747	0.04668	0.20
134	5.10	0.90759	2.63702	1.11815	0.04354	0.04278	0.20
135	5.20	0.85512	2.62342	1.03325	0.03951	0.03877	0.19
136	5.40	0.73325	2.59322	0.85318	0.03153	0.03083	0.19
137	5.60	0.73894	2.56051	0.82909	0.02927	0.02889	0.18
138	5.80	0.76970	2.52685	0.83382	0.02850	0.02805	0.17
139	6.00	0.78150	2.49339	0.81839	0.02710	0.02662	0.17
140	6.20	0.77813	2.46040	0.78857	0.02531	0.02482	0.16
141	6.40	0.76313	2.42840	0.74920	0.02332	0.02284	0.16
142	6.60	0.73950	2.39771	0.70400	0.02126	0.02081	0.15
143	6.80	0.70980	2.36855	0.65586	0.01924	0.01882	0.15
144	7.00	0.67615	2.34102	0.60691	0.01732	0.01692	0.14
145	7.30	0.63422	2.30287	0.54588	0.01497	0.01459	0.14
146	7.60	0.63957	2.26844	0.52876	0.01399	0.01358	0.13
147	8.00	0.64379	2.22797	0.50563	0.01277	0.01233	0.12
148	8.50	0.64552	2.18523	0.47717	0.01142	0.01095	0.12
149	9.00	0.64480	2.14989	0.45016	0.01024	0.00976	0.11
150	9.50	0.64246	2.12067	0.42491	0.00921	0.00873	0.11
151	10.00	0.63913	2.09643	0.40158	0.00832	0.00784	0.10
152	10.50	0.63540	2.07622	0.38022	0.00755	0.00707	0.10

```
      VALUES IN PERIOD RANGE .1 TO 2.5 SEC.
           AREA OF ACC. RESPONSE SPECTRUM   =      1.481
           AREA OF VEL. RESPONSE SPECTRUM   =      8.150
           MAX. ACCELERATION RESPONSE VALUE =      2.030
           MAX. VELOCITY     RESPONSE VALUE =      5.697

1******   OPTION 10  ***  COMPUTE AMPLIFICATION FUNCTION

    AMPLIFICATION SPECTRUM BETWEEN LAYER   17 AND   1
  OUTPUT LAYER OUTCROPPING
   INPUT LAYER OUTCROPPING
```

FREQUENCY	AMPLITUDE
0.0000	1.0000
0.1250	1.0839
0.2500	1.4075
0.3750	2.2674
0.5000	3.2234
0.6250	2.1992
0.7500	1.6273
0.8750	1.4764

1.0000	1.5474
1.1250	1.7231
1.2500	1.7844
1.3750	1.6345
1.5000	1.4538
1.6250	1.3232
1.7500	1.2057
1.8750	1.0635
2.0000	0.9079
2.1250	0.7613
2.2500	0.6267
2.3750	0.5050
2.5000	0.4043
2.6250	0.3299
2.7500	0.2800
2.8750	0.2489
3.0000	0.2310
3.1250	0.2202
3.2500	0.2102
3.3750	0.1959
3.5000	0.1774
3.6250	0.1591
3.7500	0.1448
3.8750	0.1357
4.0000	0.1317
4.1250	0.1320
4.2500	0.1355
4.3750	0.1404
4.5000	0.1445
4.6250	0.1453
4.7500	0.1412
4.8750	0.1326
5.0000	0.1214
5.1250	0.1099
5.2500	0.0999
5.3750	0.0921
5.5000	0.0864
5.6250	0.0824
5.7500	0.0797
5.8750	0.0775
6.0000	0.0753
6.1250	0.0729
6.2500	0.0700
6.3750	0.0669
6.5000	0.0635
6.6250	0.0600
6.7500	0.0564
6.8750	0.0526
7.0000	0.0488
7.1250	0.0449
7.2500	0.0411
7.3750	0.0376
7.5000	0.0343
7.6250	0.0315
7.7500	0.0289
7.8750	0.0267
8.0000	0.0247
8.1250	0.0228
8.2500	0.0210
8.3750	0.0193
8.5000	0.0176
8.6250	0.0162
8.7500	0.0148
8.8750	0.0136
9.0000	0.0125
9.1250	0.0116
9.2500	0.0107
9.3750	0.0099
9.5000	0.0092
9.6250	0.0085

9.7500	0.0079
9.8750	0.0072
10.0000	0.0066
10.1250	0.0060
10.2500	0.0055
10.3750	0.0050
10.5000	0.0046
10.6250	0.0042
10.7500	0.0038
10.8750	0.0035
11.0000	0.0033
11.1250	0.0031
11.2500	0.0029
11.3750	0.0027
11.5000	0.0026
11.6250	0.0024
11.7500	0.0023
11.8750	0.0022
12.0000	0.0021
12.1250	0.0020
12.2500	0.0019
12.3750	0.0018
12.5000	0.0018
12.6250	0.0017
12.7500	0.0017
12.8750	0.0017
13.0000	0.0016
13.1250	0.0016
13.2500	0.0016
13.3750	0.0015
13.5000	0.0015
13.6250	0.0015
13.7500	0.0014
13.8750	0.0014
14.0000	0.0013
14.1250	0.0013
14.2500	0.0013
14.3750	0.0012
14.5000	0.0012
14.6250	0.0012
14.7500	0.0011
14.8750	0.0011
15.0000	0.0011
15.1250	0.0011
15.2500	0.0010
15.3750	0.0010
15.5000	0.0010
15.6250	0.0009
15.7500	0.0009
15.8750	0.0009
16.0000	0.0009
16.1250	0.0008
16.2500	0.0008
16.3750	0.0008
16.5000	0.0008
16.6250	0.0007
16.7500	0.0007
16.8750	0.0007
17.0000	0.0007
17.1250	0.0007
17.2500	0.0006
17.3750	0.0006
17.5000	0.0006
17.6250	0.0006
17.7500	0.0005
17.8750	0.0005
18.0000	0.0005
18.1250	0.0005
18.2500	0.0004
18.3750	0.0004

18.5000	0.0004
18.6250	0.0004
18.7500	0.0004
18.8750	0.0003
19.0000	0.0003
19.1250	0.0003
19.2500	0.0003
19.3750	0.0003
19.5000	0.0002
19.6250	0.0002
19.7500	0.0002
19.8750	0.0002
20.0000	0.0002
20.1250	0.0002
20.2500	0.0002
20.3750	0.0002
20.5000	0.0001
20.6250	0.0001
20.7500	0.0001
20.8750	0.0001
21.0000	0.0001
21.1250	0.0001
21.2500	0.0001
21.3750	0.0001
21.5000	0.0001
21.6250	0.0001
21.7500	0.0001
21.8750	0.0001
22.0000	0.0001
22.1250	0.0001
22.2500	0.0001
22.3750	0.0001
22.5000	0.0001
22.6250	0.0001
22.7500	0.0001
22.8750	0.0000
23.0000	0.0000
23.1250	0.0000
23.2500	0.0000
23.3750	0.0000
23.5000	0.0000
23.6250	0.0000
23.7500	0.0000
23.8750	0.0000
24.0000	0.0000
24.1250	0.0000
24.2500	0.0000
24.3750	0.0000
24.5000	0.0000
24.6250	0.0000
24.7500	0.0000
24.8750	0.0000

MAXIMUM AMPLIFICATION = 3.22
FOR FREQUENCY = 0.50 C/SEC.
PERIOD = 2.00 SEC.
PLOT OF AMPLIFICATION SPECTRA

*** End of Output File No. 1 ***

Section B-B’

```
SHAKE2000 - Input File Information
Option 1 - Dynamic Soil Properties Set No. 1
    1
    7
   10    Fill        G/Gmax - SAND, Average (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3
         1       .98       .95       .89       .73       .52       .29       .14
       .06       .04
   10    Fill        Damping for SAND, Average (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3
        .5        .8       1.7      3.45       6.5      10.7      16.5      21.9
      25.7        26
   10    YB Mud      G/Gmax - Young Bay Mud (Sun et al, EERC-88/15)
     .0001      .001      .003       .01       .03        .1        .3         1
         3        10
         1         1      .991     .9416     .8398     .6472     .4512     .3036
      .135      .085
   10    YB Mud      Damping for Young Bay Mud
     .0001      .001      .003       .01       .03        .1        .3         1
         3        10
      1.56      1.56      1.56      1.87      2.64      5.44      10.3     17.73
        24        27
   11    Merritt SandG/Gmax - SAND, Upper Bound (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3        10
         1         1       .99       .96       .85      .655       .37       .19
      .085       .05      .035
   11    Merritt SandDamping for SAND, Lower Bound (Seed & Idriss 1970)
     .0001     .0003      .001      .003       .01       .03        .1        .3
         1         3        10
        .3        .4        .7       1.4       2.7         5       9.8      15.5
      20.7        22        23
   20    OB Mud      G/Gmax - Soil with PI=30, OCR=1-15 (Vucetic & Dobry, JGE 1/91)
      .001      .002      .003      .004      .005      .006      .008      .009
       .01       .02       .03       .04       .07        .1        .2        .3
        .4        .6        .8         1
         1      .995      .985       .97       .96       .95      .925       .91
        .9       .82      .745        .7        .6       .53       .42       .35
      .305       .24      .205      .165
   20    OB Mud      Damping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)
      .002      .003      .004      .005      .006      .008       .01       .02
       .03       .04       .05       .06       .08        .1        .2        .3
        .4        .5        .7         1
       1.7       2.1       2.5       2.6       2.9       3.3       3.7      5.05
       5.7       6.4       6.9       7.3       8.1       8.7      10.8      12.3
      13.3      14.1      15.6      16.9
   20    Alameda ClayG/Gmax - Soil with PI=30, OCR=1-15 (Vucetic & Dobry, JGE 1/91)
      .001      .002      .003      .004      .005      .006      .008      .009
       .01       .02       .03       .04       .07        .1        .2        .3
        .4        .6        .8         1
         1      .995      .985       .97       .96       .95      .925       .91
        .9       .82      .745        .7        .6       .53       .42       .35
      .305       .24      .205      .165
   20    Alameda ClayDamping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)
      .002      .003      .004      .005      .006      .008       .01       .02
       .03       .04       .05       .06       .08        .1        .2        .3
        .4        .5        .7         1
       1.7       2.1       2.5       2.6       2.9       3.3       3.7      5.05
       5.7       6.4       6.9       7.3       8.1       8.7      10.8      12.3
      13.3      14.1      15.6      16.9
   10    Alameda Sand'G/Gmax Deep Cohesionless Soils - Depth 251-500 feet (75-150 meters)
(EPRI, 1993
     .0001     .0003     .0011     .0032       .01     .0314     .1002     .3153
         1         3
         1         1     .9988     .9853     .9285     .7929     .5749     .3258
     .1422       .09
   10    Alameda Sand'Damping Deep Cohesionless Soils - Depth 251-500 feet (75-150 meters)
(EPRI, 199
     .0001     .0003      .001     .0031       .01     .0311     .0996     .3212
    1.0091         3
     .7617     .8465      .852    1.1821    1.9317    3.5443    7.0453   12.6693
```

```
   19.1239      22.9
    8    Bedrock     G/Gmax - ROCK (Schnabel 1973)
     .0001     .0003      .001      .003       .01       .03        .1         1
        1         1       .99       .95        .9       .81      .725       .55
    5    Bedrock     Damping for ROCK (Schnabel 1973)
     .0001      .001       .01        .1         1
       .4        .8       1.5         3       4.6
    7    1    2    3    4    5    6    7
Option 2 - Soil Profile Set No. 1
    2
    1   17     Soil Profile No. 1 West
    1    1     10                 .05       .11              492
    2    1     10                 .05       .11              492
    3    1     13                 .05       .11              492
    4    2     12                 .05       .105             492
    5    2     10                 .05       .105             492
    6    2     15                 .05       .105             558
    7    2     13                 .05       .105             558
    8    3     22                 .05       .125             774
    9    4     23                 .05       .11              826
   10    4     20                 .05       .11              902
   11    4     9.5                .05       .11              678
   12    4     19.5               .05       .11              995
   13    4     22                 .05       .11              800
   14    4     41                 .05       .11              895
   15    5     15                 .05       .125             950
   16    6     155                .05       .125            1500
   17    7                        .01       .14             2550
Option 3 - Motion: E.NIS_FN - Scaling Factor: 1
    3
  4096 8192       .01     (8F9.6)  E.NIS_FN
C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk
         1                  25    8    8
Option 4 - Assignment of Object Motion to a Specific Sublayer Set No. 1
    4
   17    0
Option 5 - Number of Iterations & Strain Ratio Set No. 1
    5
        10       .65
Option 6 - Soil Profile No. 1 West - Layers 1 to 15
    6
    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
    0    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    1    1    1    1    1    1    1    0    0    0    0    0    0    0    0
Option 6 - Soil Profile No. 1 West - Layers 16 to 17
    6
   16   17
    1    1
    0    0
Option 7 - Stress & Strain Time Histories for Layer 2
    7
    2    1    1      2048          Stress History Layer No. 2
    2    0    1      2048          Strain History Layer No. 2
Option 7 - Stress & Strain Time Histories for Layer 3
    7
    3    1    1      2048          Stress History Layer No. 3
    3    0    1      2048          Strain History Layer No. 3
Option 7 - Stress & Strain Time Histories for Layer 4
    7
    4    1    1      2048          Stress History Layer No. 4
    4    0    1      2048          Strain History Layer No. 4
Option 7 - Stress & Strain Time Histories for Layer 5
    7
    5    1    1      2048          Stress History Layer No. 5
    5    0    1      2048          Strain History Layer No. 5
Option 9 - Response Spectrum Set No. 1
    9
    1    0
    1    0      32.2
      .05
Option 10 - Amplification Spectrum Set No. 1
   10
   17    0    1    0      .125Amplification Spectrum
```

```
Execution will stop when program encounters 0
    0
```

```
 *******************************************************************
 * SHAKE: PROGRAM FOR EARTHQUAKE RESPONSE ANAL. HORIZONTAL *
 *     LAYERED SITES by Per Schnable & John Lysmer - 1970  *
 * ------------------------------------------------------- *
 * SHAKE85: IBM PC SHAKE VERSION S.S.(Willie) Lai,Jan 1985 *
 * ------------------------------------------------------- *
 * SHAKE88 :New modulus reduction curves for clays added   *
 *      using results from Sun et al (1988) by J. I. Sun   *
 *      & Ramin Golesorkhi February 26, 1988               *
 *  -------------------------------------------------------*
 * SHAKE90/91: Adjust last iteration; Input now is either  *
 *      Gmax or max Vs; up to 13 materials can be specified*
 *      by user; up to 50 Layers can be specified; object  *
 *      motion can be read in from a separate file and can *
 *      user specified format; Different periods for res-  *
 *      ponse spectral calculations;options are renumbered;*
 *      and general cleanup by: J. I. Sun, I. M. Idriss &  *
 *      P. Dirrim June 1990 - February 1991                *
 *  ------------------------------------------------------ *
 * SHAKE91: General cleanup and finalization of input out- *
 *      output format ... etc by: I. M. Idriss Dec. 1991   *
 *  ------------------------------------------------------ *
 * SHAKE2000: Fix the incorrect output of Tot. Stress in   *
 * Option 2. Changed path of ground motion file in         *
 * SHAKE91.  Control file to input file names.  Modified   *
 * by Jerald M. LaVassar & Gustavo A. Ordonez (July 2011)  *
 *          RUN DATE 11/03/2011                            *
 *          RUN TIME  9:59                                 *
 *******************************************************************
 MAX. NUMBER OF TERMS IN FOURIER TRANSFORM =     32768
 NECESSARY LENGTH OF BLANK COMMON X        =    204819

1******   OPTION  1  ***  READ RELATION BETWEEN SOIL PROPERTIES AND STRAIN

 **********************
  MATERIAL TYPE NO.  1
 **********************

 CURVE NO.   1:     Fill        G/Gmax - SAND, Average (Seed & Idriss 1970)
 CURVE NO.   2:     Fill        Damping for SAND, Average (Seed & Idriss 197


      CURVE NO.  1           CURVE NO.  2
  ==================       ==================
    STRAIN    G/GMAX         STRAIN    DAMPING
  --------   -------        --------  --------
    0.0001     1.000         0.0001      0.50
    0.0003     0.980         0.0003      0.80
    0.0010     0.950         0.0010      1.70
    0.0030     0.890         0.0030      3.45
    0.0100     0.730         0.0100      6.50
    0.0300     0.520         0.0300     10.70
    0.1000     0.290         0.1000     16.50
    0.3000     0.140         0.3000     21.90
    1.0000     0.060         1.0000     25.70
    3.0000     0.040         3.0000     26.00

 **********************
  MATERIAL TYPE NO.  2
 **********************

 CURVE NO.   3:     YB Mud      G/Gmax - Young Bay Mud (Sun et al, EERC-88/1
 CURVE NO.   4:     YB Mud      Damping for Young Bay Mud


      CURVE NO.  3           CURVE NO.  4
  ==================       ==================
    STRAIN    G/GMAX         STRAIN    DAMPING
  --------   -------        --------  --------
    0.0001     1.000         0.0001      1.56
```

0.0010	1.000	0.0010	1.56
0.0030	0.991	0.0030	1.56
0.0100	0.942	0.0100	1.87
0.0300	0.840	0.0300	2.64
0.1000	0.647	0.1000	5.44
0.3000	0.451	0.3000	10.30
1.0000	0.304	1.0000	17.73
3.0000	0.135	3.0000	24.00
10.0000	0.085	10.0000	27.00

****
MATERIAL TYPE NO. 3
****

CURVE NO. 5: Merritt SandG/Gmax - SAND, Upper Bound (Seed & Idriss 19
CURVE NO. 6: Merritt SandDamping for SAND, Lower Bound (Seed & Idriss

CURVE NO. 5		CURVE NO. 6	
STRAIN	G/GMAX	STRAIN	DAMPING
0.0001	1.000	0.0001	0.30
0.0003	1.000	0.0003	0.40
0.0010	0.990	0.0010	0.70
0.0030	0.960	0.0030	1.40
0.0100	0.850	0.0100	2.70
0.0300	0.655	0.0300	5.00
0.1000	0.370	0.1000	9.80
0.3000	0.190	0.3000	15.50
1.0000	0.085	1.0000	20.70
3.0000	0.050	3.0000	22.00
10.0000	0.035	10.0000	23.00

****
MATERIAL TYPE NO. 4
****

CURVE NO. 7: OB Mud G/Gmax - Soil with PI=30, OCR=1-15 (Vucetic
CURVE NO. 8: OB Mud Damping - Soil with PI=30, OCR=1-8 (Vucetic

CURVE NO. 7		CURVE NO. 8	
STRAIN	G/GMAX	STRAIN	DAMPING
0.0010	1.000	0.0020	1.70
0.0020	0.995	0.0030	2.10
0.0030	0.985	0.0040	2.50
0.0040	0.970	0.0050	2.60
0.0050	0.960	0.0060	2.90
0.0060	0.950	0.0080	3.30
0.0080	0.925	0.0100	3.70
0.0090	0.910	0.0200	5.05
0.0100	0.900	0.0300	5.70
0.0200	0.820	0.0400	6.40
0.0300	0.745	0.0500	6.90
0.0400	0.700	0.0600	7.30
0.0700	0.600	0.0800	8.10
0.1000	0.530	0.1000	8.70
0.2000	0.420	0.2000	10.80
0.3000	0.350	0.3000	12.30
0.4000	0.305	0.4000	13.30
0.6000	0.240	0.5000	14.10
0.8000	0.205	0.7000	15.60
1.0000	0.165	1.0000	16.90

****
MATERIAL TYPE NO. 5
****

CURVE NO. 9: Alameda ClayG/Gmax - Soil with PI=30, OCR=1-15 (Vucetic
CURVE NO. 10: Alameda ClayDamping - Soil with PI=30, OCR=1-8 (Vucetic

CURVE NO. 9 STRAIN	CURVE NO. 9 G/GMAX	CURVE NO. 10 STRAIN	CURVE NO. 10 DAMPING
0.0010	1.000	0.0020	1.70
0.0020	0.995	0.0030	2.10
0.0030	0.985	0.0040	2.50
0.0040	0.970	0.0050	2.60
0.0050	0.960	0.0060	2.90
0.0060	0.950	0.0080	3.30
0.0080	0.925	0.0100	3.70
0.0090	0.910	0.0200	5.05
0.0100	0.900	0.0300	5.70
0.0200	0.820	0.0400	6.40
0.0300	0.745	0.0500	6.90
0.0400	0.700	0.0600	7.30
0.0700	0.600	0.0800	8.10
0.1000	0.530	0.1000	8.70
0.2000	0.420	0.2000	10.80
0.3000	0.350	0.3000	12.30
0.4000	0.305	0.4000	13.30
0.6000	0.240	0.5000	14.10
0.8000	0.205	0.7000	15.60
1.0000	0.165	1.0000	16.90

****
MATERIAL TYPE NO. 6
****

CURVE NO. 11: Alameda Sand'G/Gmax Deep Cohesionless Soils - Depth 251-
CURVE NO. 12: Alameda Sand'Damping Deep Cohesionless Soils - Depth 251

CURVE NO. 11 STRAIN	CURVE NO. 11 G/GMAX	CURVE NO. 12 STRAIN	CURVE NO. 12 DAMPING
0.0001	1.000	0.0001	0.76
0.0003	1.000	0.0003	0.85
0.0011	0.999	0.0010	0.85
0.0032	0.985	0.0031	1.18
0.0100	0.928	0.0100	1.93
0.0314	0.793	0.0311	3.54
0.1002	0.575	0.0996	7.05
0.3153	0.326	0.3212	12.67
1.0000	0.142	1.0091	19.12
3.0000	0.090	3.0000	22.90

****
MATERIAL TYPE NO. 7
****

CURVE NO. 13: Bedrock G/Gmax - ROCK (Schnabel 1973)
CURVE NO. 14: Bedrock Damping for ROCK (Schnabel 1973)

CURVE NO. 13 STRAIN	CURVE NO. 13 G/GMAX	CURVE NO. 14 STRAIN	CURVE NO. 14 DAMPING
0.0001	1.000	0.0001	0.40
0.0003	1.000	0.0010	0.80
0.0010	0.990	0.0100	1.50
0.0030	0.950	0.1000	3.00
0.0100	0.900	1.0000	4.60

```
    0.0300     0.810         0.0000      0.00
    0.1000     0.725         0.0000      0.00
    1.0000     0.550         0.0000      0.00

1******   OPTION  2  ***  READ SOIL PROFILE
 NEW SOIL PROFILE NO.     1      IDENTIFICATION  Soil Profile No. 1 West
 NUMBER OF LAYERS                  17          DEPTH TO BEDROCK        410.00

  NO. TYPE  THICKNESS   DEPTH  TOTAL PRESS. MODULUS  DAMPING   UNIT WT.  SHEAR VEL
              (FT)      (FT)      (KSF)       (KSF)             (KCF)    (FPS)
   1    1   10.0000    5.0000      0.55        827.   0.050    0.110     492.0
   2    1   10.0000   15.0000      1.65        827.   0.050    0.110     492.0
   3    1   13.0000   26.5000      2.91        827.   0.050    0.110     492.0
   4    2   12.0000   39.0000      4.26        789.   0.050    0.105     492.0
   5    2   10.0000   50.0000      5.41        789.   0.050    0.105     492.0
   6    2   15.0000   62.5000      6.73       1015.   0.050    0.105     558.0
   7    2   13.0000   76.5000      8.20       1015.   0.050    0.105     558.0
   8    3   22.0000   94.0000     10.25       2326.   0.050    0.125     774.0
   9    4   23.0000  116.5000     12.89       2331.   0.050    0.110     826.0
  10    4   20.0000  138.0000     15.26       2779.   0.050    0.110     902.0
  11    4    9.5000  152.7500     16.88       1570.   0.050    0.110     678.0
  12    4   19.5000  167.2500     18.48       3382.   0.050    0.110     995.0
  13    4   22.0000  188.0000     20.76       2186.   0.050    0.110     800.0
  14    4   41.0000  219.5000     24.22       2736.   0.050    0.110     895.0
  15    5   15.0000  247.5000     27.42       3503.   0.050    0.125     950.0
  16    6  155.0000  332.5000     38.04       8734.   0.050    0.125    1500.0
  17   BASE                                  28272.   0.010    0.140    2550.0

  PERIOD =  1.587 FROM AVERAGE SHEAR VEL. =    1033.


  FREQUENCY    AMPLITUDE
 MAXIMUM AMPLIFICATION =  14.98
 FOR FREQUENCY         =   0.70 C/SEC.
     PERIOD            =   1.43 SEC.

1******   OPTION  3  ***  READ INPUT MOTION

  FILE NAME FOR INPUT MOTION = C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

    NO. OF INPUT ACC. POINTS =  4096
   NO. OF POINTS USED IN FFT =  8192
       NO. OF HEADING LINES =     8
      NO. OF POINTS PER LINE =     8
  TIME STEP FOR INPUT MOTION = 0.010000
     FORMAT FOR TIME HISTORY =      (8F9.6)
     EARTHQUAKE IDENTIFICATION =   E.NIS_FN


 *****HEADER*****
Source File: C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.acc
SHAKE2000 Conversion:    4096      .01       8         8         9        (8F9.6
Acceleration Units: (g's) - No. Values: 4096 - Time Step: .01 (secs)
Data Format: (8F9.6) - No. Header Lines: 8
PEER NGA Rotated Accelerogram (November 1, 2007)
H1 for rotation: KOBE 01/16/95 2046, NISHI-AKASHI, 090 (CUE)
rotation angle - clockwise   230.0
4096   0.01000 NPTS, DT
 **  FIRST AND LAST 5 LINES OF INPUT MOTION *****

     1 -0.000001-0.000001-0.000001-0.000001-0.000001 0.000000-0.000001-0.000001
     2 -0.000001 0.000001 0.000005 0.000007 0.000001-0.000001 0.000006 0.000003
     3 -0.000005-0.000009-0.000020-0.000026-0.000011 0.000001 0.000006 0.000010
     4  0.000011-0.000006-0.000030-0.000042-0.000033-0.000018-0.000003-0.000017
     5 -0.000040-0.000044 0.000027 0.000147 0.000171 0.000062-0.000007 0.000043
   ............INPUT MOTION READ NOT ECHOED...........
   508 -0.000178-0.000172-0.000166-0.000159-0.000151-0.000144-0.000140-0.000136
   509 -0.000132-0.000127-0.000123-0.000119-0.000114-0.000110-0.000105-0.000100
   510 -0.000096-0.000091-0.000086-0.000081-0.000076-0.000072-0.000067-0.000063
   511 -0.000059-0.000055-0.000051-0.000047-0.000043-0.000039-0.000035-0.000031
```

512 -0.000027-0.000023-0.000019-0.000015-0.000012-0.000008-0.000005-0.000001

MAXIMUM ACCELERATION = 0.48357
AT TIME = 7.10 SEC
THE VALUES WILL BE MULTIPLIED BY A FACTOR = 1.000
TO GIVE NEW MAXIMUM ACCELERATION = 0.48357
MEAN SQUARE FREQUENCY = 2.69 C/SEC.
MAX ACCELERATION = 0.48322 FOR FREQUENCIES REMOVED ABOVE 25.00 C/SEC.
1****** OPTION 4 *** READ WHERE OBJECT MOTION IS GIVEN
OBJECT MOTION IN LAYER NUMBER 17 OUTCROPPING

1****** OPTION 5 *** OBTAIN STRAIN COMPATIBLE SOIL PROPERTIES
MAXIMUM NUMBER OF ITERATIONS = 10
FACTOR FOR UNIFORM STRAIN IN TIME DOMAIN = 0.65

EARTHQUAKE - C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 1

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH	UNIFRM.	<---- DAMPING	---->		<---- SHEAR MODULUS	----->		G/Go
		(FT)	STRAIN	NEW	USED	ERROR	NEW	USED	ERROR	RATIO
1	1	5.0	0.03698	0.117	0.050	57.3	397.0	826.9	-108.3	1.000
2	1	15.0	0.10799	0.169	0.050	70.4	231.1	826.9	-257.8	1.000
3	1	26.5	0.17901	0.194	0.050	74.2	174.1	826.9	-375.1	1.000
4	2	39.0	0.24640	0.094	0.050	47.0	383.9	789.3	-105.6	1.000
5	2	50.0	0.27448	0.099	0.050	49.5	368.7	789.3	-114.1	1.000
6	2	62.5	0.21836	0.089	0.050	43.8	515.6	1015.3	-96.9	1.000
7	2	76.5	0.21568	0.088	0.050	43.4	517.9	1015.3	-96.1	1.000
8	3	94.0	0.08318	0.091	0.050	44.8	961.9	2325.6	-141.8	1.000
9	4	116.5	0.09471	0.086	0.050	41.5	1260.2	2330.8	-85.0	1.000
10	4	138.0	0.08402	0.082	0.050	39.3	1568.0	2779.4	-77.3	1.000
11	4	152.8	0.15062	0.099	0.050	49.7	730.2	1570.3	-115.1	1.000
12	4	167.2	0.06942	0.077	0.050	35.1	2034.3	3382.1	-66.3	1.000
13	4	188.0	0.12420	0.094	0.050	46.6	1083.6	2186.3	-101.8	1.000
14	4	219.5	0.10115	0.087	0.050	42.8	1445.3	2736.4	-89.3	1.000
15	5	247.5	0.07204	0.078	0.050	36.0	2082.4	3503.5	-68.2	1.000
16	6	332.5	0.02931	0.035	0.050	-44.5	6996.7	8734.5	-24.8	1.000

1
EARTHQUAKE - C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 2

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH	UNIFRM.	<---- DAMPING	---->		<---- SHEAR MODULUS	----->		G/Go
		(FT)	STRAIN	NEW	USED	ERROR	NEW	USED	ERROR	RATIO
1	1	5.0	0.05621	0.137	0.117	14.7	330.8	397.0	-20.0	0.480
2	1	15.0	0.27826	0.215	0.169	21.6	124.3	231.1	-86.0	0.279
3	1	26.5	0.55953	0.239	0.194	18.9	81.5	174.1	-113.5	0.210
4	2	39.0	0.26121	0.097	0.094	2.7	375.6	383.9	-2.2	0.486
5	2	50.0	0.31333	0.106	0.099	6.3	351.9	368.7	-4.8	0.467
6	2	62.5	0.24378	0.094	0.089	5.2	495.7	515.6	-4.0	0.508
7	2	76.5	0.25002	0.095	0.088	6.9	491.1	517.9	-5.4	0.510
8	3	94.0	0.13972	0.115	0.091	21.4	733.0	961.9	-31.2	0.414
9	4	116.5	0.12236	0.093	0.086	8.1	1160.7	1260.2	-8.6	0.541
10	4	138.0	0.10270	0.088	0.082	6.2	1461.3	1568.0	-7.3	0.564
11	4	152.8	0.22454	0.112	0.099	11.5	628.2	730.2	-16.2	0.465
12	4	167.2	0.07774	0.080	0.077	3.9	1959.6	2034.3	-3.8	0.601
13	4	188.0	0.17304	0.104	0.094	9.7	968.5	1083.6	-11.9	0.496
14	4	219.5	0.15076	0.099	0.087	12.2	1272.0	1445.3	-13.6	0.528
15	5	247.5	0.10742	0.089	0.078	12.4	1817.0	2082.4	-14.6	0.594
16	6	332.5	0.04585	0.047	0.035	26.6	6304.3	6996.7	-11.0	0.801

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 3

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH	UNIFRM.	<---- DAMPING ---->			<---- SHEAR MODULUS ----->			G/Go
		(FT)	STRAIN	NEW	USED	ERROR	NEW	USED	ERROR	RATIO
1	1	5.0	0.04543	0.127	0.137	-8.1	364.4	330.8	9.2	0.400
2	1	15.0	0.34662	0.224	0.215	3.7	107.8	124.3	-15.2	0.150
3	1	26.5	0.74403	0.248	0.239	3.6	65.9	81.5	-23.8	0.099
4	2	39.0	0.19591	0.084	0.097	-15.1	416.2	375.6	9.7	0.476
5	2	50.0	0.23310	0.092	0.106	-15.1	391.7	351.9	10.1	0.446
6	2	62.5	0.19441	0.084	0.094	-11.9	536.7	495.7	7.6	0.488
7	2	76.5	0.23252	0.092	0.095	-3.5	504.3	491.1	2.6	0.484
8	3	94.0	0.15626	0.121	0.115	4.8	690.4	733.0	-6.2	0.315
9	4	116.5	0.10366	0.088	0.093	-5.7	1222.0	1160.7	5.0	0.498
10	4	138.0	0.09478	0.086	0.088	-2.6	1502.3	1461.3	2.7	0.526
11	4	152.8	0.24225	0.115	0.112	2.4	607.6	628.2	-3.4	0.400
12	4	167.2	0.08158	0.082	0.080	1.6	1927.6	1959.6	-1.7	0.579
13	4	188.0	0.18096	0.105	0.104	1.3	953.0	968.5	-1.6	0.443
14	4	219.5	0.14449	0.098	0.099	-1.3	1290.5	1272.0	1.4	0.465
15	5	247.5	0.10263	0.088	0.089	-1.6	1842.4	1817.0	1.4	0.519
16	6	332.5	0.04597	0.047	0.047	0.2	6300.2	6304.3	-0.1	0.722

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 4

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH	UNIFRM.	<---- DAMPING ---->			<---- SHEAR MODULUS ----->			G/Go
		(FT)	STRAIN	NEW	USED	ERROR	NEW	USED	ERROR	RATIO
1	1	5.0	0.03752	0.118	0.127	-7.8	394.7	364.4	7.7	0.441
2	1	15.0	0.36313	0.225	0.224	0.7	105.3	107.8	-2.4	0.130
3	1	26.5	0.86921	0.253	0.248	1.9	57.3	65.9	-14.9	0.080
4	2	39.0	0.16390	0.076	0.084	-10.3	441.3	416.2	5.7	0.527
5	2	50.0	0.19496	0.084	0.092	-9.4	416.8	391.7	6.0	0.496
6	2	62.5	0.18678	0.082	0.084	-2.2	543.9	536.7	1.3	0.529
7	2	76.5	0.23406	0.092	0.092	0.3	503.1	504.3	-0.2	0.497
8	3	94.0	0.17265	0.126	0.121	4.1	652.4	690.4	-5.8	0.297
9	4	116.5	0.10195	0.088	0.088	-0.6	1228.2	1222.0	0.5	0.524
10	4	138.0	0.09447	0.085	0.086	-0.1	1504.1	1502.3	0.1	0.541
11	4	152.8	0.25329	0.117	0.115	1.4	595.5	607.6	-2.0	0.387
12	4	167.2	0.08218	0.082	0.082	0.2	1922.8	1927.6	-0.3	0.570
13	4	188.0	0.17927	0.105	0.105	-0.3	956.2	953.0	0.3	0.436
14	4	219.5	0.13918	0.097	0.098	-1.2	1306.7	1290.5	1.2	0.472
15	5	247.5	0.09958	0.087	0.088	-1.0	1859.8	1842.4	0.9	0.526
16	6	332.5	0.04611	0.047	0.047	0.2	6295.1	6300.2	-0.1	0.721

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 5

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH	UNIFRM.	<---- DAMPING ---->			<---- SHEAR MODULUS ----->			G/Go
		(FT)	STRAIN	NEW	USED	ERROR	NEW	USED	ERROR	RATIO
1	1	5.0	0.03285	0.111	0.118	-5.8	415.7	394.7	5.1	0.477
2	1	15.0	0.35373	0.224	0.225	-0.4	106.7	105.3	1.3	0.127

3	1	26.5	0.95572	0.256	0.253	1.2	52.1	57.3	-10.0	0.069
4	2	39.0	0.14602	0.071	0.076	-7.2	457.5	441.3	3.6	0.559
5	2	50.0	0.17472	0.079	0.084	-6.1	432.3	416.8	3.6	0.528
6	2	62.5	0.18536	0.082	0.082	-0.4	545.3	543.9	0.3	0.536
7	2	76.5	0.23563	0.092	0.092	0.3	501.9	503.1	-0.2	0.495
8	3	94.0	0.18701	0.130	0.126	3.2	621.9	652.4	-4.9	0.281
9	4	116.5	0.10337	0.088	0.088	0.5	1223.0	1228.2	-0.4	0.527
10	4	138.0	0.09527	0.086	0.085	0.3	1499.5	1504.1	-0.3	0.541
11	4	152.8	0.25893	0.118	0.117	0.7	589.5	595.5	-1.0	0.379
12	4	167.2	0.08253	0.082	0.082	0.1	1919.9	1922.8	-0.1	0.569
13	4	188.0	0.17660	0.104	0.105	-0.4	961.4	956.2	0.5	0.437
14	4	219.5	0.13523	0.096	0.097	-0.9	1319.2	1306.7	0.9	0.478
15	5	247.5	0.09738	0.086	0.087	-0.7	1875.1	1859.8	0.8	0.531
16	6	332.5	0.04640	0.047	0.047	0.4	6284.9	6295.1	-0.2	0.721

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 6

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING ----> NEW	USED	ERROR	<---- SHEAR MODULUS -----> NEW	USED	ERROR	G/Go RATIO
1	1	5.0	0.03039	0.108	0.111	-3.5	428.0	415.7	2.9	0.503
2	1	15.0	0.33958	0.223	0.224	-0.6	109.0	106.7	2.1	0.129
3	1	26.5	1.01841	0.257	0.256	0.6	49.3	52.1	-5.6	0.063
4	2	39.0	0.13518	0.068	0.071	-5.0	468.4	457.5	2.3	0.580
5	2	50.0	0.16757	0.077	0.079	-2.4	438.2	432.3	1.3	0.548
6	2	62.5	0.18449	0.081	0.082	-0.3	546.2	545.3	0.2	0.537
7	2	76.5	0.23561	0.092	0.092	0.0	501.9	501.9	0.0	0.494
8	3	94.0	0.19838	0.134	0.130	2.3	599.5	621.9	-3.8	0.267
9	4	116.5	0.10496	0.088	0.088	0.5	1217.4	1223.0	-0.5	0.525
10	4	138.0	0.09594	0.086	0.086	0.2	1495.7	1499.5	-0.3	0.540
11	4	152.8	0.26113	0.118	0.118	0.3	587.2	589.5	-0.4	0.375
12	4	167.2	0.08374	0.082	0.082	0.5	1910.3	1919.9	-0.5	0.568
13	4	188.0	0.17696	0.104	0.104	0.1	960.7	961.4	-0.1	0.440
14	4	219.5	0.13239	0.096	0.096	-0.7	1328.4	1319.2	0.7	0.482
15	5	247.5	0.09565	0.086	0.086	-0.6	1887.5	1875.1	0.7	0.535
16	6	332.5	0.04660	0.048	0.047	0.3	6277.8	6284.9	-0.1	0.720

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 7

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	<---- DAMPING ----> NEW	USED	ERROR	<---- SHEAR MODULUS -----> NEW	USED	ERROR	G/Go RATIO
1	1	5.0	0.02901	0.106	0.108	-1.8	435.3	428.0	1.7	0.518
2	1	15.0	0.32680	0.222	0.223	-0.5	111.1	109.0	1.9	0.132
3	1	26.5	1.05535	0.257	0.257	0.0	48.8	49.3	-1.1	0.060
4	2	39.0	0.12887	0.066	0.068	-3.2	475.1	468.4	1.4	0.593
5	2	50.0	0.16423	0.076	0.077	-1.2	441.0	438.2	0.6	0.555
6	2	62.5	0.18329	0.081	0.081	-0.4	547.4	546.2	0.2	0.538
7	2	76.5	0.23441	0.092	0.092	-0.2	502.8	501.9	0.2	0.494
8	3	94.0	0.20616	0.136	0.134	1.5	584.8	599.5	-2.5	0.258
9	4	116.5	0.10601	0.089	0.088	0.3	1213.7	1217.4	-0.3	0.522
10	4	138.0	0.09630	0.086	0.086	0.1	1493.6	1495.7	-0.1	0.538
11	4	152.8	0.26154	0.118	0.118	0.0	586.8	587.2	-0.1	0.374
12	4	167.2	0.08473	0.083	0.082	0.4	1902.5	1910.3	-0.4	0.565
13	4	188.0	0.17765	0.104	0.104	0.1	959.4	960.7	-0.1	0.439
14	4	219.5	0.13053	0.095	0.096	-0.5	1334.6	1328.4	0.5	0.485
15	5	247.5	0.09448	0.085	0.086	-0.4	1895.9	1887.5	0.4	0.539
16	6	332.5	0.04677	0.048	0.048	0.2	6271.7	6277.8	-0.1	0.719

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 8

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	DAMPING NEW	DAMPING USED	DAMPING ERROR	SHEAR MODULUS NEW	SHEAR MODULUS USED	SHEAR MODULUS ERROR	G/Go RATIO
1	1	5.0	0.02843	0.105	0.106	-0.7	438.5	435.3	0.7	0.526
2	1	15.0	0.31955	0.221	0.222	-0.3	112.3	111.1	1.1	0.134
3	1	26.5	1.06437	0.257	0.257	0.0	48.7	48.8	-0.3	0.059
4	2	39.0	0.12667	0.065	0.066	-1.2	477.6	475.1	0.5	0.602
5	2	50.0	0.16221	0.076	0.076	-0.7	442.7	441.0	0.4	0.559
6	2	62.5	0.18204	0.081	0.081	-0.4	548.6	547.4	0.2	0.539
7	2	76.5	0.23310	0.092	0.092	-0.3	503.8	502.8	0.2	0.495
8	3	94.0	0.21057	0.137	0.136	0.8	576.7	584.8	-1.4	0.251
9	4	116.5	0.10647	0.089	0.089	0.1	1212.1	1213.7	-0.1	0.521
10	4	138.0	0.09643	0.086	0.086	0.0	1492.9	1493.6	0.0	0.537
11	4	152.8	0.26140	0.118	0.118	0.0	587.0	586.8	0.0	0.374
12	4	167.2	0.08530	0.083	0.083	0.2	1898.1	1902.5	-0.2	0.563
13	4	188.0	0.17816	0.104	0.104	0.1	958.4	959.4	-0.1	0.439
14	4	219.5	0.12979	0.095	0.095	-0.2	1337.1	1334.6	0.2	0.488
15	5	247.5	0.09404	0.085	0.085	-0.1	1899.1	1895.9	0.2	0.541
16	6	332.5	0.04683	0.048	0.048	0.1	6269.7	6271.7	0.0	0.718

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 9

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	DAMPING NEW	DAMPING USED	DAMPING ERROR	SHEAR MODULUS NEW	SHEAR MODULUS USED	SHEAR MODULUS ERROR	G/Go RATIO
1	1	5.0	0.02819	0.105	0.105	-0.3	439.9	438.5	0.3	0.530
2	1	15.0	0.31576	0.221	0.221	-0.2	113.0	112.3	0.6	0.136
3	1	26.5	1.06681	0.257	0.257	0.0	48.6	48.7	-0.1	0.059
4	2	39.0	0.12598	0.065	0.065	-0.4	478.3	477.6	0.2	0.605
5	2	50.0	0.16101	0.075	0.076	-0.4	443.8	442.7	0.2	0.561
6	2	62.5	0.18112	0.081	0.081	-0.3	549.5	548.6	0.2	0.540
7	2	76.5	0.23215	0.092	0.092	-0.2	504.6	503.8	0.1	0.496
8	3	94.0	0.21301	0.137	0.137	0.4	572.3	576.7	-0.8	0.248
9	4	116.5	0.10665	0.089	0.089	0.1	1211.5	1212.1	-0.1	0.520
10	4	138.0	0.09647	0.086	0.086	0.0	1492.7	1492.9	0.0	0.537
11	4	152.8	0.26117	0.118	0.118	0.0	587.2	587.0	0.0	0.374
12	4	167.2	0.08559	0.083	0.083	0.1	1895.8	1898.1	-0.1	0.561
13	4	188.0	0.17847	0.105	0.104	0.1	957.8	958.4	-0.1	0.438
14	4	219.5	0.12953	0.095	0.095	-0.1	1338.0	1337.1	0.1	0.489
15	5	247.5	0.09390	0.085	0.085	0.0	1900.1	1899.1	0.1	0.542
16	6	332.5	0.04684	0.048	0.048	0.0	6269.2	6269.7	0.0	0.718

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SOIL PROFILE - Soil Profile No. 1 West

ITERATION NUMBER 10

VALUES IN TIME DOMAIN

NO	TYPE	DEPTH (FT)	UNIFRM. STRAIN	DAMPING NEW	DAMPING USED	DAMPING ERROR	SHEAR MODULUS NEW	SHEAR MODULUS USED	SHEAR MODULUS ERROR	G/Go RATIO
1	1	5.0	0.02809	0.104	0.105	-0.1	440.4	439.9	0.1	0.532
2	1	15.0	0.31381	0.220	0.221	-0.1	113.3	113.0	0.3	0.137

3	1	26.5	1.06752	0.257	0.257	0.0	48.6	48.6	0.0	0.059
4	2	39.0	0.12578	0.065	0.065	-0.1	478.6	478.3	0.0	0.606
5	2	50.0	0.16031	0.075	0.075	-0.3	444.4	443.8	0.1	0.562
6	2	62.5	0.18052	0.081	0.081	-0.2	550.1	549.5	0.1	0.541
7	2	76.5	0.23154	0.092	0.092	-0.1	505.0	504.6	0.1	0.497
8	3	94.0	0.21436	0.138	0.137	0.2	569.9	572.3	-0.4	0.246
9	4	116.5	0.10672	0.089	0.089	0.0	1211.2	1211.5	0.0	0.520
10	4	138.0	0.09647	0.086	0.086	0.0	1492.7	1492.7	0.0	0.537
11	4	152.8	0.26098	0.118	0.118	0.0	587.4	587.2	0.0	0.374
12	4	167.2	0.08573	0.083	0.083	0.1	1894.7	1895.8	-0.1	0.561
13	4	188.0	0.17865	0.105	0.105	0.0	957.4	957.8	0.0	0.438
14	4	219.5	0.12944	0.095	0.095	0.0	1338.2	1338.0	0.0	0.489
15	5	247.5	0.09387	0.085	0.085	0.0	1900.3	1900.1	0.0	0.542
16	6	332.5	0.04685	0.048	0.048	0.0	6269.0	6269.2	0.0	0.718

VALUES IN TIME DOMAIN

LAYER	TYPE	THICKNESS FT	DEPTH FT	MAX STRAIN PRCNT	MAX STRESS PSF	TIME SEC
1	1	10.0000	5.0000	0.04321	190.07	11.53
2	1	10.0000	15.0000	0.48279	545.34	11.55
3	1	13.0000	26.5000	1.64234	798.87	11.54
4	2	12.0000	39.0000	0.19351	925.60	11.43
5	2	10.0000	50.0000	0.24663	1094.51	8.77
6	2	15.0000	62.5000	0.27773	1526.16	8.76
7	2	13.0000	76.5000	0.35622	1797.33	8.75
8	3	22.0000	94.0000	0.32979	1887.50	9.24
9	4	23.0000	116.5000	0.16419	1989.12	10.82
10	4	20.0000	138.0000	0.14842	2215.51	10.80
11	4	9.5000	152.7500	0.40150	2357.64	10.79
12	4	19.5000	167.2500	0.13189	2500.35	8.57
13	4	22.0000	188.0000	0.27485	2632.43	8.56
14	4	41.0000	219.5000	0.19914	2664.39	10.68
15	5	15.0000	247.5000	0.14442	2744.14	10.63
16	6	155.0000	332.5000	0.07207	4518.37	8.86

PERIOD = 2.068 FROM AVERAGE SHEAR VEL. = 793.

FREQUENCY AMPLITUDE
MAXIMUM AMPLIFICATION = 8.28
FOR FREQUENCY = 0.49 C/SEC.
PERIOD = 2.05 SEC.

1****** OPTION 6 *** COMPUTE MOTION IN NEW SUBLAYERS

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SOIL DEPOSIT - Soil Profile No. 1 West

LAYER	DEPTH FT	MAX. ACC. G	TIME SEC	MEAN SQ. FR. C/SEC	ACC. RATIO QUIET ZONE	TH SAVED ACC. RECORD
OUTCR.	0.0000	0.34457	11.51	1.39	0.000	1024
WITHIN	10.0000	0.33446	11.51	1.34	0.000	1024
WITHIN	20.0000	0.28933	11.44	1.11	0.000	1024
WITHIN	33.0000	0.50610	9.50	2.02	0.000	1024
WITHIN	45.0000	0.47776	9.49	1.94	0.000	1024
WITHIN	55.0000	0.42117	9.24	1.83	0.000	1024
WITHIN	70.0000	0.33223	9.22	1.84	0.000	1024
WITHIN	83.0000	0.29415	7.53	2.03	0.000	0

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     WITHIN        105.0000        0.42274           8.53           2.16                0.000
                  0
     WITHIN        128.0000        0.41471           8.76           2.15                0.000
                  0
     WITHIN        148.0000        0.37657           9.25           2.17                0.000
                  0
     WITHIN        157.5000        0.38168           9.23           2.35                0.000
                  0
     WITHIN        177.0000        0.36038           9.21           2.37                0.000
                  0
     WITHIN        199.0000        0.37096           7.31           2.43                0.000
                  0
     WITHIN        240.0000        0.48286           8.56           2.39                0.000
                  0

1******   OPTION  6  ***  COMPUTE MOTION IN NEW SUBLAYERS

   EARTHQUAKE -C:\IR2-SH~1\AccelRecords_Final\NGA_1111KOBE.NIS_FN.eqk

  SOIL DEPOSIT - Soil Profile No. 1 West
     LAYER            DEPTH        MAX. ACC.          TIME      MEAN SQ. FR.         ACC.
RATIO      TH SAVED
                        FT            G               SEC          C/SEC             QUIET
ZONE       ACC. RECORD
     WITHIN        255.0000        0.47399           8.54           2.37                0.000
                  0
     WITHIN        410.0000        0.31644           8.13           2.93                0.000
                  0

1******   OPTION  7  ***  COMPUTE STRESS/STRAIN HISTORY

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    2
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Stress History Layer No. 2

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    2
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Strain History Layer No. 2

1******   OPTION  7  ***  COMPUTE STRESS/STRAIN HISTORY

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    3
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Stress History Layer No. 3

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    3
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Strain History Layer No. 3

1******   OPTION  7  ***  COMPUTE STRESS/STRAIN HISTORY

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    4
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Stress History Layer No. 4

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    4
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Strain History Layer No. 4

1******   OPTION  7  ***  COMPUTE STRESS/STRAIN HISTORY

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    5
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Stress History Layer No. 5

  COMPUTE STRESS OR STRAIN HISTORY AT THE TOP OF  LAYER    5
  SCALE FOR PLOTTING     0.0000
 IDENTIFICATION - Strain History Layer No. 5

1******   OPTION  9  ***  COMPUTE RESPONSE SPECTRUM
```

```
 RESPONSE SPECTRUM ANALYSIS FOR LAYER NUMBER        1
CALCULATED FOR DAMPING        0.050

    TIMES AT WHICH MAX. SPECTRAL VALUES OCCUR
         TD = TIME FOR MAX. RELATIVE DISP.
         TV = TIME FOR MAX. RELATIVE VEL.
         TA = TIME FOR MAX. ABSOLUTE ACC.
    DAMPING RATIO = 0.050
    PER = 0.01     TIMES FOR MAXIMA --   TD = 11.5000   TV =  9.1000   TA = 11.5000
    PER = 0.02     TIMES FOR MAXIMA --   TD = 11.5000   TV =  7.9300   TA = 11.5000
    PER = 0.03     TIMES FOR MAXIMA --   TD = 11.5000   TV =  7.9300   TA = 11.5000
    PER = 0.04     TIMES FOR MAXIMA --   TD = 11.5000   TV =  7.9300   TA = 11.5000
    PER = 0.05     TIMES FOR MAXIMA --   TD = 11.5000   TV =  7.9300   TA = 11.5000
    PER = 0.06     TIMES FOR MAXIMA --   TD = 11.5000   TV =  7.9300   TA = 11.5000
    PER = 0.07     TIMES FOR MAXIMA --   TD = 11.5000   TV =  7.9300   TA = 11.5000
    PER = 0.08     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9300   TA = 11.5000
    PER = 0.09     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9300   TA = 11.5000
    PER = 0.10     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9300   TA = 11.5000
    PER = 0.11     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9300   TA = 11.5000
    PER = 0.12     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9300   TA = 11.5000
    PER = 0.13     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9300   TA = 11.5100
    PER = 0.14     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9200   TA = 11.5000
    PER = 0.15     TIMES FOR MAXIMA --   TD = 11.5100   TV =  7.9200   TA = 11.5100
    PER = 0.16     TIMES FOR MAXIMA --   TD = 11.5200   TV =  7.9300   TA = 11.5100
    PER = 0.17     TIMES FOR MAXIMA --   TD = 11.5200   TV =  7.9300   TA = 11.5200
    PER = 0.18     TIMES FOR MAXIMA --   TD =  7.8500   TV =  7.9300   TA =  7.8500
    PER = 0.19     TIMES FOR MAXIMA --   TD =  7.8600   TV =  7.9300   TA =  7.8600
    PER = 0.20     TIMES FOR MAXIMA --   TD =  7.8700   TV =  7.9400   TA =  7.8700
    PER = 0.21     TIMES FOR MAXIMA --   TD = 11.5200   TV =  7.9500   TA = 11.5200
    PER = 0.22     TIMES FOR MAXIMA --   TD = 11.5400   TV =  7.9600   TA = 11.5300
    PER = 0.23     TIMES FOR MAXIMA --   TD = 11.5600   TV =  7.9800   TA = 11.5500
    PER = 0.24     TIMES FOR MAXIMA --   TD =  8.0500   TV =  8.6100   TA =  8.0500
    PER = 0.25     TIMES FOR MAXIMA --   TD =  9.7100   TV =  8.6300   TA =  9.7100
    PER = 0.26     TIMES FOR MAXIMA --   TD =  8.9000   TV =  8.8000   TA =  8.8900
    PER = 0.27     TIMES FOR MAXIMA --   TD =  8.9100   TV =  8.8200   TA =  8.9000
    PER = 0.28     TIMES FOR MAXIMA --   TD =  8.9200   TV =  8.8300   TA =  8.9100
    PER = 0.29     TIMES FOR MAXIMA --   TD =  8.9300   TV =  8.8500   TA =  8.9300
    PER = 0.30     TIMES FOR MAXIMA --   TD =  8.9400   TV =  8.8600   TA =  8.9400
    PER = 0.31     TIMES FOR MAXIMA --   TD =  8.9600   TV =  9.0500   TA =  8.9500
    PER = 0.32     TIMES FOR MAXIMA --   TD =  8.9700   TV =  9.0700   TA =  8.9600
    PER = 0.33     TIMES FOR MAXIMA --   TD =  8.9700   TV =  8.1900   TA =  8.9600
    PER = 0.34     TIMES FOR MAXIMA --   TD =  8.9600   TV =  8.2000   TA =  8.9500
    PER = 0.35     TIMES FOR MAXIMA --   TD =  8.9600   TV =  9.0700   TA =  8.9500
    PER = 0.36     TIMES FOR MAXIMA --   TD =  8.9600   TV =  9.0700   TA =  8.9600
    PER = 0.37     TIMES FOR MAXIMA --   TD =  8.9700   TV =  9.0800   TA =  8.9600
    PER = 0.38     TIMES FOR MAXIMA --   TD =  8.9700   TV =  9.0900   TA =  8.9700
    PER = 0.39     TIMES FOR MAXIMA --   TD =  9.2100   TV =  9.0900   TA =  9.2000
    PER = 0.40     TIMES FOR MAXIMA --   TD =  9.2100   TV =  9.1000   TA =  9.2100
    PER = 0.41     TIMES FOR MAXIMA --   TD =  9.2300   TV =  9.1100   TA =  9.2200
    PER = 0.42     TIMES FOR MAXIMA --   TD =  9.2400   TV =  9.1300   TA =  9.2300
    PER = 0.43     TIMES FOR MAXIMA --   TD =  9.2600   TV =  9.3700   TA =  9.2500
    PER = 0.44     TIMES FOR MAXIMA --   TD =  9.5100   TV =  9.3900   TA =  9.5000
    PER = 0.45     TIMES FOR MAXIMA --   TD =  9.7700   TV =  9.6500   TA =  9.7600
    PER = 0.46     TIMES FOR MAXIMA --   TD =  9.7800   TV =  9.6700   TA =  9.7800
    PER = 0.47     TIMES FOR MAXIMA --   TD =  9.8000   TV =  9.6800   TA =  9.7900
    PER = 0.48     TIMES FOR MAXIMA --   TD =  9.8200   TV =  9.7000   TA =  9.8100
    PER = 0.49     TIMES FOR MAXIMA --   TD =  9.8300   TV =  9.7100   TA =  9.8200
    PER = 0.50     TIMES FOR MAXIMA --   TD =  9.8500   TV =  9.7200   TA =  9.8400
    PER = 0.51     TIMES FOR MAXIMA --   TD =  9.8600   TV =  9.7300   TA =  9.8500
    PER = 0.52     TIMES FOR MAXIMA --   TD =  9.8700   TV =  9.7400   TA =  9.8600
    PER = 0.53     TIMES FOR MAXIMA --   TD =  9.8800   TV =  9.7500   TA =  9.8700
    PER = 0.54     TIMES FOR MAXIMA --   TD =  9.8900   TV =  9.7600   TA =  9.8800
    PER = 0.55     TIMES FOR MAXIMA --   TD =  9.9000   TV =  9.7600   TA =  9.8900
    PER = 0.56     TIMES FOR MAXIMA --   TD =  9.9000   TV =  9.7700   TA =  9.9000
    PER = 0.57     TIMES FOR MAXIMA --   TD =  9.9100   TV =  9.7700   TA =  9.9000
    PER = 0.58     TIMES FOR MAXIMA --   TD =  9.9100   TV =  9.7800   TA =  9.9100
    PER = 0.60     TIMES FOR MAXIMA --   TD =  9.9200   TV =  9.7800   TA =  9.9100
    PER = 0.62     TIMES FOR MAXIMA --   TD =  9.9300   TV =  9.7800   TA =  9.9200
    PER = 0.64     TIMES FOR MAXIMA --   TD =  9.9400   TV =  9.7800   TA =  9.9300
    PER = 0.66     TIMES FOR MAXIMA --   TD =  9.9700   TV =  9.8000   TA =  9.9500
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PER = 0.68     TIMES FOR MAXIMA --   TD = 10.0000   TV =  9.8300   TA =  9.9900
PER = 0.70     TIMES FOR MAXIMA --   TD = 11.5200   TV =  9.5500   TA = 11.5100
PER = 0.72     TIMES FOR MAXIMA --   TD = 11.5700   TV = 12.1200   TA = 11.5600
PER = 0.74     TIMES FOR MAXIMA --   TD = 11.9900   TV = 12.1600   TA = 11.9700
PER = 0.76     TIMES FOR MAXIMA --   TD = 12.0200   TV = 11.8400   TA = 12.0100
PER = 0.78     TIMES FOR MAXIMA --   TD = 12.0400   TV = 11.8600   TA = 12.0300
PER = 0.80     TIMES FOR MAXIMA --   TD = 12.0600   TV = 11.8800   TA = 12.0500
PER = 0.82     TIMES FOR MAXIMA --   TD = 12.0800   TV = 11.8900   TA = 12.0600
PER = 0.84     TIMES FOR MAXIMA --   TD = 11.7000   TV = 11.9000   TA = 11.6900
PER = 0.86     TIMES FOR MAXIMA --   TD = 11.7100   TV = 11.9000   TA = 11.6900
PER = 0.88     TIMES FOR MAXIMA --   TD = 11.7100   TV = 11.9100   TA = 11.7000
PER = 0.90     TIMES FOR MAXIMA --   TD = 11.7300   TV = 11.9200   TA = 11.7100
PER = 0.92     TIMES FOR MAXIMA --   TD = 11.7400   TV = 11.9300   TA = 11.7200
PER = 0.94     TIMES FOR MAXIMA --   TD = 11.7500   TV = 11.9400   TA = 11.7300
PER = 0.96     TIMES FOR MAXIMA --   TD = 11.7500   TV = 11.9500   TA = 11.7400
PER = 0.98     TIMES FOR MAXIMA --   TD = 11.7500   TV = 11.9500   TA = 11.7300
PER = 1.00     TIMES FOR MAXIMA --   TD = 11.7400   TV = 11.9400   TA = 11.7300
PER = 1.05     TIMES FOR MAXIMA --   TD = 11.7300   TV = 11.9400   TA = 11.7100
PER = 1.10     TIMES FOR MAXIMA --   TD = 11.7300   TV = 11.9500   TA = 11.7200
PER = 1.15     TIMES FOR MAXIMA --   TD = 15.9500   TV = 11.9700   TA = 15.9300
PER = 1.20     TIMES FOR MAXIMA --   TD = 16.0200   TV = 15.7300   TA = 16.0000
PER = 1.25     TIMES FOR MAXIMA --   TD = 16.7900   TV = 17.1400   TA = 16.7700
PER = 1.30     TIMES FOR MAXIMA --   TD = 17.5600   TV = 17.2300   TA = 17.5400
PER = 1.35     TIMES FOR MAXIMA --   TD = 17.6700   TV = 18.0200   TA = 17.6500
PER = 1.40     TIMES FOR MAXIMA --   TD = 11.7800   TV = 18.1000   TA = 11.7500
PER = 1.45     TIMES FOR MAXIMA --   TD = 11.7900   TV = 12.0700   TA = 11.7700
PER = 1.50     TIMES FOR MAXIMA --   TD = 11.8100   TV = 12.1300   TA = 11.7900
PER = 1.55     TIMES FOR MAXIMA --   TD = 11.8200   TV = 11.5700   TA = 11.8000
PER = 1.60     TIMES FOR MAXIMA --   TD = 11.8400   TV = 11.5800   TA = 11.8100
PER = 1.65     TIMES FOR MAXIMA --   TD = 11.8600   TV = 11.5800   TA = 11.8300
PER = 1.70     TIMES FOR MAXIMA --   TD = 11.8900   TV = 11.5900   TA = 11.8600
PER = 1.75     TIMES FOR MAXIMA --   TD = 11.9200   TV = 11.6000   TA = 11.8900
PER = 1.80     TIMES FOR MAXIMA --   TD = 11.9600   TV = 11.6200   TA = 11.9300
PER = 1.85     TIMES FOR MAXIMA --   TD = 12.0100   TV = 11.6300   TA = 11.9800
PER = 1.90     TIMES FOR MAXIMA --   TD = 12.0700   TV = 11.6500   TA = 12.0400
PER = 1.95     TIMES FOR MAXIMA --   TD = 12.1300   TV = 11.6600   TA = 12.1000
PER = 2.00     TIMES FOR MAXIMA --   TD = 12.1900   TV = 11.6800   TA = 12.1600
PER = 2.05     TIMES FOR MAXIMA --   TD = 12.2300   TV = 11.6900   TA = 12.2000
PER = 2.10     TIMES FOR MAXIMA --   TD = 12.2800   TV = 11.7000   TA = 12.2400
PER = 2.15     TIMES FOR MAXIMA --   TD = 14.4900   TV = 11.7100   TA = 14.4600
PER = 2.20     TIMES FOR MAXIMA --   TD = 11.4000   TV = 11.7200   TA = 11.3700
PER = 2.25     TIMES FOR MAXIMA --   TD = 18.1100   TV = 11.7300   TA = 18.0700
PER = 2.30     TIMES FOR MAXIMA --   TD = 18.2000   TV = 17.7000   TA = 18.1600
PER = 2.35     TIMES FOR MAXIMA --   TD = 17.2100   TV = 17.7500   TA = 17.1700
PER = 2.40     TIMES FOR MAXIMA --   TD = 17.2600   TV = 17.7900   TA = 17.2200
PER = 2.50     TIMES FOR MAXIMA --   TD = 17.3500   TV = 16.8800   TA = 17.3100
PER = 2.60     TIMES FOR MAXIMA --   TD = 17.4300   TV = 16.9200   TA = 17.3800
PER = 2.70     TIMES FOR MAXIMA --   TD = 17.4900   TV = 16.9400   TA = 17.4500
PER = 2.80     TIMES FOR MAXIMA --   TD = 16.5000   TV = 16.9700   TA = 16.4600
PER = 2.90     TIMES FOR MAXIMA --   TD = 16.5500   TV = 16.9900   TA = 16.5000
PER = 3.00     TIMES FOR MAXIMA --   TD = 11.4700   TV = 11.7100   TA = 11.4200
PER = 3.10     TIMES FOR MAXIMA --   TD = 11.4600   TV = 11.7100   TA = 11.4200
PER = 3.20     TIMES FOR MAXIMA --   TD = 11.4700   TV = 11.7100   TA = 11.4200
PER = 3.30     TIMES FOR MAXIMA --   TD = 11.4700   TV = 11.1800   TA = 11.4200
PER = 3.40     TIMES FOR MAXIMA --   TD = 11.4700   TV = 11.1800   TA = 11.4200
PER = 3.50     TIMES FOR MAXIMA --   TD = 11.4800   TV = 11.1800   TA = 11.4300
PER = 3.60     TIMES FOR MAXIMA --   TD = 11.4900   TV = 11.1900   TA = 11.4300
PER = 3.70     TIMES FOR MAXIMA --   TD = 11.4900   TV = 11.1900   TA = 11.4400
PER = 3.80     TIMES FOR MAXIMA --   TD = 11.5000   TV = 11.1900   TA = 11.4400
PER = 3.90     TIMES FOR MAXIMA --   TD = 11.5100   TV = 11.1900   TA = 11.4500
PER = 4.00     TIMES FOR MAXIMA --   TD = 11.5100   TV = 11.1900   TA = 11.4500
PER = 4.10     TIMES FOR MAXIMA --   TD = 11.5200   TV = 11.2000   TA = 11.4600
PER = 4.20     TIMES FOR MAXIMA --   TD = 11.5200   TV = 11.2000   TA = 11.4600
PER = 4.30     TIMES FOR MAXIMA --   TD = 11.5300   TV = 11.2000   TA = 11.4600
PER = 4.40     TIMES FOR MAXIMA --   TD = 11.5300   TV = 11.2000   TA = 11.4700
PER = 4.50     TIMES FOR MAXIMA --   TD = 11.5400   TV = 11.2000   TA = 11.4700
PER = 4.60     TIMES FOR MAXIMA --   TD = 16.5900   TV = 11.2100   TA = 16.5200
PER = 4.70     TIMES FOR MAXIMA --   TD = 16.6100   TV = 11.2100   TA = 16.5400
PER = 4.80     TIMES FOR MAXIMA --   TD = 16.6400   TV = 11.2100   TA = 16.5600
PER = 4.90     TIMES FOR MAXIMA --   TD = 16.6600   TV = 11.2100   TA = 16.5800
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PER = 5.00     TIMES FOR MAXIMA --   TD = 16.6800   TV = 11.2100   TA = 16.6000
PER = 5.10     TIMES FOR MAXIMA --   TD = 16.7000   TV = 11.2100   TA = 16.6200
PER = 5.20     TIMES FOR MAXIMA --   TD = 16.7200   TV = 11.2100   TA = 16.6400
PER = 5.40     TIMES FOR MAXIMA --   TD = 11.5600   TV = 11.2200   TA = 11.4700
PER = 5.60     TIMES FOR MAXIMA --   TD = 11.5600   TV = 11.2200   TA = 11.4700
PER = 5.80     TIMES FOR MAXIMA --   TD = 15.5300   TV = 11.2200   TA = 11.4700
PER = 6.00     TIMES FOR MAXIMA --   TD = 15.5600   TV = 11.2200   TA = 15.4700
PER = 6.20     TIMES FOR MAXIMA --   TD = 15.5900   TV = 11.2200   TA = 15.5000
PER = 6.40     TIMES FOR MAXIMA --   TD = 15.6200   TV = 11.2200   TA = 15.5200
PER = 6.60     TIMES FOR MAXIMA --   TD = 15.6400   TV = 11.2200   TA = 15.5400
PER = 6.80     TIMES FOR MAXIMA --   TD = 15.6600   TV = 11.2200   TA = 15.5500
PER = 7.00     TIMES FOR MAXIMA --   TD = 15.6700   TV = 11.2200   TA = 15.5700
PER = 7.30     TIMES FOR MAXIMA --   TD = 10.5400   TV = 11.2200   TA = 10.4000
PER = 7.60     TIMES FOR MAXIMA --   TD = 10.5500   TV = 11.2200   TA = 10.4000
PER = 8.00     TIMES FOR MAXIMA --   TD = 10.5600   TV = 11.2200   TA = 10.4000
PER = 8.50     TIMES FOR MAXIMA --   TD = 10.5700   TV = 11.2200   TA = 10.3900
PER = 9.00     TIMES FOR MAXIMA --   TD = 10.5900   TV = 11.2200   TA = 10.3900
PER = 9.50     TIMES FOR MAXIMA --   TD = 10.6000   TV = 11.2200   TA = 10.3800
PER =10.00     TIMES FOR MAXIMA --   TD = 10.7400   TV = 11.2200   TA = 10.3700
PER =10.50     TIMES FOR MAXIMA --   TD = 10.7600   TV = 11.2200   TA = 10.3600
 SPECTRAL VALUES--
 (Acceleration of gravity used =   32.20)
                       Soil Profile No. 1 West          DAMPING RATIO = 0.050
```

NO.	PERIOD	REL. DISP.	REL. VEL.	PSU.REL.VEL.	ABS. ACC.	PSU.ABS.ACC.	FREQ.
1	0.01	0.00003	0.00029	0.01765	0.34456	0.34445	100.00
2	0.02	0.00011	0.00128	0.03531	0.34457	0.34454	50.00
3	0.03	0.00025	0.00290	0.05303	0.34497	0.34491	33.33
4	0.04	0.00045	0.00517	0.07081	0.34549	0.34542	25.00
5	0.05	0.00071	0.00814	0.08868	0.34617	0.34607	20.00
6	0.06	0.00102	0.01182	0.10666	0.34701	0.34688	16.67
7	0.07	0.00139	0.01627	0.12478	0.34800	0.34783	14.29
8	0.08	0.00182	0.02149	0.14314	0.34920	0.34912	12.50
9	0.09	0.00232	0.02766	0.16166	0.35051	0.35049	11.11
10	0.10	0.00287	0.03455	0.18061	0.35241	0.35242	10.00
11	0.11	0.00349	0.04243	0.19959	0.35420	0.35405	9.09
12	0.12	0.00421	0.05085	0.22021	0.35798	0.35808	8.33
13	0.13	0.00496	0.05964	0.23963	0.35956	0.35969	7.69
14	0.14	0.00583	0.07277	0.26187	0.36475	0.36498	7.14
15	0.15	0.00682	0.09047	0.28550	0.37124	0.37139	6.67
16	0.16	0.00794	0.11188	0.31189	0.38085	0.38037	6.25
17	0.17	0.00905	0.13572	0.33446	0.38429	0.38390	5.88
18	0.18	0.00996	0.15817	0.34778	0.37790	0.37701	5.56
19	0.19	0.01209	0.21765	0.39975	0.41132	0.41055	5.26
20	0.20	0.01342	0.27015	0.42148	0.41236	0.41122	5.00
21	0.21	0.01578	0.31182	0.47200	0.43825	0.43858	4.76
22	0.22	0.01869	0.35397	0.53388	0.47502	0.47352	4.55
23	0.23	0.02065	0.37741	0.56413	0.47919	0.47860	

4.35

24	0.24	0.02170	0.39674	0.56801	0.46452	0.46181	4.17
25	0.25	0.02428	0.45059	0.61028	0.47839	0.47633	4.00
26	0.26	0.02728	0.46949	0.65920	0.49627	0.49473	3.85
27	0.27	0.03395	0.54502	0.79003	0.57216	0.57096	3.70
28	0.28	0.04138	0.63256	0.92861	0.64685	0.64714	3.57
29	0.29	0.04738	0.68147	1.02652	0.69242	0.69071	3.45
30	0.30	0.05278	0.72539	1.10552	0.72225	0.71907	3.33
31	0.31	0.05633	0.78970	1.14166	0.72150	0.71862	3.23
32	0.32	0.05566	0.79809	1.09298	0.66943	0.66648	3.12
33	0.33	0.05488	0.83621	1.04499	0.62098	0.61790	3.03
34	0.34	0.06057	0.83912	1.11930	0.64374	0.64238	2.94
35	0.35	0.07139	0.93919	1.28167	0.71661	0.71455	2.86
36	0.36	0.08311	1.11842	1.45053	0.78860	0.78623	2.78
37	0.37	0.09413	1.29159	1.59845	0.84514	0.84299	2.70
38	0.38	0.10589	1.46662	1.75079	0.90302	0.89903	2.63
39	0.39	0.12384	1.70277	1.99516	1.00288	0.99824	2.56
40	0.40	0.14862	2.02866	2.33457	1.14477	1.13886	2.50
41	0.41	0.17796	2.39573	2.72723	1.30504	1.29796	2.44
42	0.42	0.20645	2.73369	3.08849	1.43857	1.43490	2.38
43	0.43	0.22849	3.06168	3.33871	1.52266	1.51508	2.33
44	0.44	0.24735	3.28047	3.53214	1.57304	1.56642	2.27
45	0.45	0.27324	3.51974	3.81516	1.66327	1.65434	2.22
46	0.46	0.29362	3.69773	4.01055	1.70999	1.70126	2.17
47	0.47	0.30839	3.81512	4.12276	1.71784	1.71165	2.13
48	0.48	0.31720	3.85768	4.15214	1.69690	1.68793	2.08
49	0.49	0.32081	3.84313	4.11372	1.64397	1.63818	2.04
50	0.50	0.31828	3.74937	3.99963	1.56923	1.56090	2.00
51	0.51	0.31114	3.59334	3.83329	1.47310	1.46665	1.96
52	0.52	0.30079	3.40656	3.63446	1.36935	1.36383	1.92
53	0.53	0.29027	3.22169	3.44113	1.27217	1.26692	1.89
54	0.54	0.28150	3.05782	3.27537	1.18887	1.18356	1.85
55	0.55	0.27472	2.92000	3.13844	1.11892	1.11346	1.82
56	0.56	0.26929	2.80759	3.02139	1.05740	1.05279	1.79
57	0.57	0.26497	2.70133	2.92075	1.00440	0.99987	1.75
58	0.58	0.26104	2.60429	2.82789	0.95609	0.95139	

1.72						
59	0.60	0.26523	2.53843	2.77744	0.90740	0.90327
1.67						
60	0.62	0.29594	2.77246	2.99914	0.94833	0.94391
1.61						
61	0.64	0.34692	3.22998	3.40583	1.04329	1.03841
1.56						
62	0.66	0.39298	3.65036	3.74119	1.11123	1.10609
1.52						
63	0.68	0.41752	3.83566	3.85788	1.11210	1.10704
1.47						
64	0.70	0.45538	3.83012	4.08751	1.14332	1.13942
1.43						
65	0.72	0.52494	4.52103	4.58097	1.24595	1.24151
1.39						
66	0.74	0.56226	4.71508	4.77401	1.26522	1.25885
1.35						
67	0.76	0.55779	4.69791	4.61143	1.18986	1.18398
1.32						
68	0.78	0.52389	4.42274	4.22013	1.06209	1.05573
1.28						
69	0.80	0.48431	4.07744	3.80375	0.93328	0.92778
1.25						
70	0.82	0.45501	3.80409	3.48650	0.83454	0.82966
1.22						
71	0.84	0.44274	3.65631	3.31171	0.77312	0.76930
1.19						
72	0.86	0.44662	3.60670	3.26303	0.74430	0.74037
1.16						
73	0.88	0.45481	3.57640	3.24736	0.72435	0.72006
1.14						
74	0.90	0.45750	3.49592	3.19396	0.69680	0.69249
1.11						
75	0.92	0.44873	3.33410	3.06461	0.65401	0.65000
1.09						
76	0.94	0.42753	3.10408	2.85769	0.59718	0.59321
1.06						
77	0.96	0.39941	2.85271	2.61411	0.53431	0.53134
1.04						
78	0.98	0.37309	2.65117	2.39206	0.47907	0.47629
1.02						
79	1.00	0.35934	2.55513	2.25781	0.44345	0.44057
1.00						
80	1.05	0.40314	2.75574	2.41237	0.45102	0.44831
0.95						
81	1.10	0.47561	2.98019	2.71666	0.48497	0.48191
0.91						
82	1.15	0.56637	2.89572	3.09446	0.52763	0.52506
0.87						
83	1.20	0.65828	3.36157	3.44674	0.56316	0.56047
0.83						
84	1.25	0.76715	3.61991	3.85612	0.60430	0.60196
0.80						
85	1.30	0.90344	4.22870	4.36653	0.65835	0.65542
0.77						
86	1.35	0.93138	4.20612	4.33483	0.62925	0.62656
0.74						
87	1.40	0.87526	3.77996	3.92814	0.55098	0.54750
0.71						
88	1.45	0.93662	3.55152	4.05859	0.54993	0.54617
0.69						
89	1.50	0.99306	3.51547	4.15973	0.54467	0.54113
0.67						
90	1.55	1.05996	3.75852	4.29672	0.54466	0.54092
0.65						
91	1.60	1.14359	4.07635	4.49087	0.55122	0.54769
0.62						
92	1.65	1.23775	4.47032	4.71335	0.56095	0.55740
0.61						
93	1.70	1.33135	4.90636	4.92065	0.56835	0.56480

							0.59
94	1.75	1.41388	5.33319	5.07640	0.56928	0.56603	0.57
95	1.80	1.47829	5.70093	5.16020	0.56225	0.55939	0.56
96	1.85	1.52372	5.97394	5.17505	0.54825	0.54584	0.54
97	1.90	1.55429	6.12363	5.13994	0.52995	0.52787	0.53
98	1.95	1.57275	6.14637	5.06762	0.50923	0.50710	0.51
99	2.00	1.57517	6.04209	4.94854	0.48517	0.48280	0.50
100	2.05	1.55630	5.83036	4.77002	0.45659	0.45404	0.49
101	2.10	1.51539	5.52945	4.53404	0.42382	0.42130	0.48
102	2.15	1.47127	5.16678	4.29966	0.39275	0.39023	0.47
103	2.20	1.44022	4.76923	4.11326	0.36787	0.36483	0.45
104	2.25	1.42090	4.36106	3.96789	0.34602	0.34411	0.44
105	2.30	1.42382	4.25644	3.88962	0.33159	0.32999	0.43
106	2.35	1.40937	4.24258	3.76823	0.31489	0.31289	0.43
107	2.40	1.39628	4.07616	3.65546	0.29910	0.29720	0.42
108	2.50	1.29607	3.62315	3.25738	0.25587	0.25425	0.40
109	2.60	1.16701	3.44527	2.82020	0.21304	0.21166	0.38
110	2.70	1.04048	3.21425	2.42130	0.17617	0.17499	0.37
111	2.80	0.94219	2.95142	2.11427	0.14865	0.14734	0.36
112	2.90	0.90349	2.63160	1.95751	0.13297	0.13171	0.34
113	3.00	0.86673	2.35125	1.81527	0.12015	0.11807	0.33
114	3.10	0.90611	2.35351	1.83654	0.11765	0.11560	0.32
115	3.20	0.95174	2.33222	1.86873	0.11599	0.11395	0.31
116	3.30	0.99752	2.35645	1.89927	0.11434	0.11230	0.30
117	3.40	1.03905	2.41004	1.92017	0.11225	0.11020	0.29
118	3.50	1.07458	2.47015	1.92908	0.10961	0.10755	0.29
119	3.60	1.10253	2.53187	1.92428	0.10638	0.10430	0.28
120	3.70	1.12288	2.59080	1.90683	0.10266	0.10056	0.27
121	3.80	1.13604	2.64442	1.87840	0.09854	0.09646	0.26
122	3.90	1.14227	2.69143	1.84028	0.09418	0.09208	0.26
123	4.00	1.14253	2.73126	1.79469	0.08964	0.08755	0.25
124	4.10	1.13761	2.76510	1.74337	0.08505	0.08297	0.24
125	4.20	1.12802	2.79216	1.68751	0.08048	0.07840	0.24
126	4.30	1.11492	2.81283	1.62913	0.07598	0.07393	0.23
127	4.40	1.09851	2.82765	1.56866	0.07161	0.06957	0.23
128	4.50	1.07976	2.83729	1.50764	0.06740	0.06537	

```
    0.22
    129      4.60        1.07904        2.84309        1.47387        0.06343        0.06252
    0.22
    130      4.70        1.09385        2.84514        1.46231        0.06163        0.06071
    0.21
    131      4.80        1.09160        2.84370        1.42890        0.05901        0.05809
    0.21
    132      4.90        1.07420        2.83928        1.37742        0.05577        0.05485
    0.20
    133      5.00        1.04359        2.83233        1.31142        0.05208        0.05118
    0.20
    134      5.10        1.00196        2.82327        1.23442        0.04811        0.04723
    0.20
    135      5.20        0.95127        2.81245        1.14943        0.04399        0.04313
    0.19
    136      5.40        0.86524        2.78702        1.00676        0.03826        0.03638
    0.19
    137      5.60        0.81764        2.75868        0.91739        0.03382        0.03197
    0.18
    138      5.80        0.77621        2.72812        0.84087        0.02999        0.02829
    0.17
    139      6.00        0.80252        2.69654        0.84040        0.02787        0.02733
    0.17
    140      6.20        0.81131        2.66483        0.82220        0.02643        0.02588
    0.16
    141      6.40        0.80611        2.63361        0.79139        0.02468        0.02413
    0.16
    142      6.60        0.79010        2.60334        0.75217        0.02279        0.02224
    0.15
    143      6.80        0.76608        2.57429        0.70785        0.02086        0.02031
    0.15
    144      7.00        0.73661        2.54665        0.66118        0.01898        0.01843
    0.14
    145      7.30        0.69541        2.50804        0.59855        0.01672        0.01600
    0.14
    146      7.60        0.69442        2.47290        0.57411        0.01545        0.01474
    0.13
    147      8.00        0.69145        2.43128        0.54306        0.01394        0.01325
    0.12
    148      8.50        0.68606        2.38697        0.50713        0.01233        0.01164
    0.12
    149      9.00        0.67972        2.35007        0.47454        0.01096        0.01029
    0.11
    150      9.50        0.67305        2.31938        0.44515        0.00981        0.00914
    0.11
    151     10.00        0.66724        2.29379        0.41924        0.00884        0.00818
    0.10
    152     10.50        0.66264        2.27237        0.39653        0.00801        0.00737
    0.10
         VALUES IN PERIOD RANGE .1 TO 2.5 SEC.
              AREA OF ACC. RESPONSE SPECTRUM   =      1.524
              AREA OF VEL. RESPONSE SPECTRUM   =      8.878
              MAX. ACCELERATION RESPONSE VALUE =      1.718
              MAX. VELOCITY     RESPONSE VALUE =      6.146

1******   OPTION 10  ***  COMPUTE AMPLIFICATION FUNCTION

   AMPLIFICATION SPECTRUM BETWEEN LAYER   17 AND   1
  OUTPUT LAYER OUTCROPPING
   INPUT LAYER OUTCROPPING

  FREQUENCY    AMPLITUDE
    0.0000       1.0000
    0.1250       1.0955
    0.2500       1.4691
    0.3750       2.5210
    0.5000       3.9128
    0.6250       2.8566
    0.7500       2.3638
    0.8750       2.3518
```

1.0000	2.2482
1.1250	1.8320
1.2500	1.4898
1.3750	1.3142
1.5000	1.2164
1.6250	1.1052
1.7500	0.9662
1.8750	0.8401
2.0000	0.7384
2.1250	0.6448
2.2500	0.5526
2.3750	0.4744
2.5000	0.4213
2.6250	0.3937
2.7500	0.3853
2.8750	0.3835
3.0000	0.3723
3.1250	0.3454
3.2500	0.3122
3.3750	0.2834
3.5000	0.2617
3.6250	0.2452
3.7500	0.2312
3.8750	0.2180
4.0000	0.2048
4.1250	0.1911
4.2500	0.1769
4.3750	0.1629
4.5000	0.1502
4.6250	0.1393
4.7500	0.1297
4.8750	0.1205
5.0000	0.1113
5.1250	0.1022
5.2500	0.0940
5.3750	0.0871
5.5000	0.0816
5.6250	0.0769
5.7500	0.0727
5.8750	0.0683
6.0000	0.0634
6.1250	0.0580
6.2500	0.0523
6.3750	0.0466
6.5000	0.0411
6.6250	0.0360
6.7500	0.0316
6.8750	0.0279
7.0000	0.0250
7.1250	0.0226
7.2500	0.0208
7.3750	0.0194
7.5000	0.0183
7.6250	0.0173
7.7500	0.0163
7.8750	0.0154
8.0000	0.0145
8.1250	0.0135
8.2500	0.0126
8.3750	0.0117
8.5000	0.0108
8.6250	0.0100
8.7500	0.0092
8.8750	0.0085
9.0000	0.0080
9.1250	0.0075
9.2500	0.0071
9.3750	0.0067
9.5000	0.0064
9.6250	0.0061

9.7500	0.0057
9.8750	0.0054
10.0000	0.0051
10.1250	0.0048
10.2500	0.0044
10.3750	0.0041
10.5000	0.0038
10.6250	0.0036
10.7500	0.0034
10.8750	0.0032
11.0000	0.0030
11.1250	0.0028
11.2500	0.0027
11.3750	0.0025
11.5000	0.0024
11.6250	0.0023
11.7500	0.0022
11.8750	0.0020
12.0000	0.0019
12.1250	0.0018
12.2500	0.0017
12.3750	0.0016
12.5000	0.0015
12.6250	0.0014
12.7500	0.0013
12.8750	0.0013
13.0000	0.0012
13.1250	0.0011
13.2500	0.0011
13.3750	0.0010
13.5000	0.0010
13.6250	0.0009
13.7500	0.0009
13.8750	0.0008
14.0000	0.0008
14.1250	0.0007
14.2500	0.0007
14.3750	0.0007
14.5000	0.0006
14.6250	0.0006
14.7500	0.0005
14.8750	0.0005
15.0000	0.0005
15.1250	0.0004
15.2500	0.0004
15.3750	0.0004
15.5000	0.0003
15.6250	0.0003
15.7500	0.0003
15.8750	0.0003
16.0000	0.0003
16.1250	0.0002
16.2500	0.0002
16.3750	0.0002
16.5000	0.0002
16.6250	0.0002
16.7500	0.0002
16.8750	0.0002
17.0000	0.0002
17.1250	0.0001
17.2500	0.0001
17.3750	0.0001
17.5000	0.0001
17.6250	0.0001
17.7500	0.0001
17.8750	0.0001
18.0000	0.0001
18.1250	0.0001
18.2500	0.0001
18.3750	0.0001

18.5000	0.0001
18.6250	0.0001
18.7500	0.0001
18.8750	0.0001
19.0000	0.0001
19.1250	0.0000
19.2500	0.0000
19.3750	0.0000
19.5000	0.0000
19.6250	0.0000
19.7500	0.0000
19.8750	0.0000
20.0000	0.0000
20.1250	0.0000
20.2500	0.0000
20.3750	0.0000
20.5000	0.0000
20.6250	0.0000
20.7500	0.0000
20.8750	0.0000
21.0000	0.0000
21.1250	0.0000
21.2500	0.0000
21.3750	0.0000
21.5000	0.0000
21.6250	0.0000
21.7500	0.0000
21.8750	0.0000
22.0000	0.0000
22.1250	0.0000
22.2500	0.0000
22.3750	0.0000
22.5000	0.0000
22.6250	0.0000
22.7500	0.0000
22.8750	0.0000
23.0000	0.0000
23.1250	0.0000
23.2500	0.0000
23.3750	0.0000
23.5000	0.0000
23.6250	0.0000
23.7500	0.0000
23.8750	0.0000
24.0000	0.0000
24.1250	0.0000
24.2500	0.0000
24.3750	0.0000
24.5000	0.0000
24.6250	0.0000
24.7500	0.0000
24.8750	0.0000

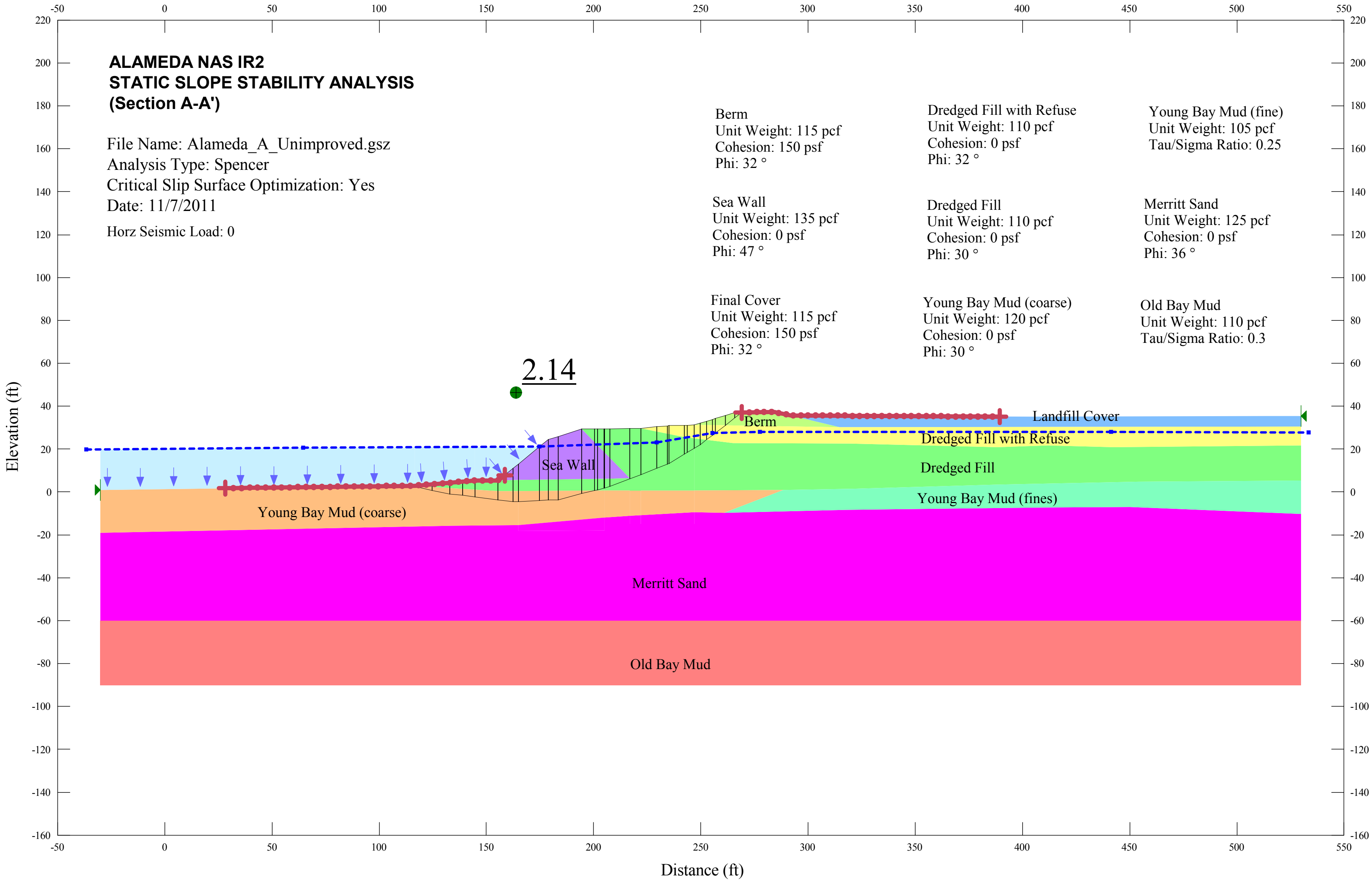
MAXIMUM AMPLIFICATION = 3.91
FOR FREQUENCY = 0.50 C/SEC.
PERIOD = 2.00 SEC.
PLOT OF AMPLIFICATION SPECTRA

*** End of Output File No. 1 ***

Appendix D
(on CD only)

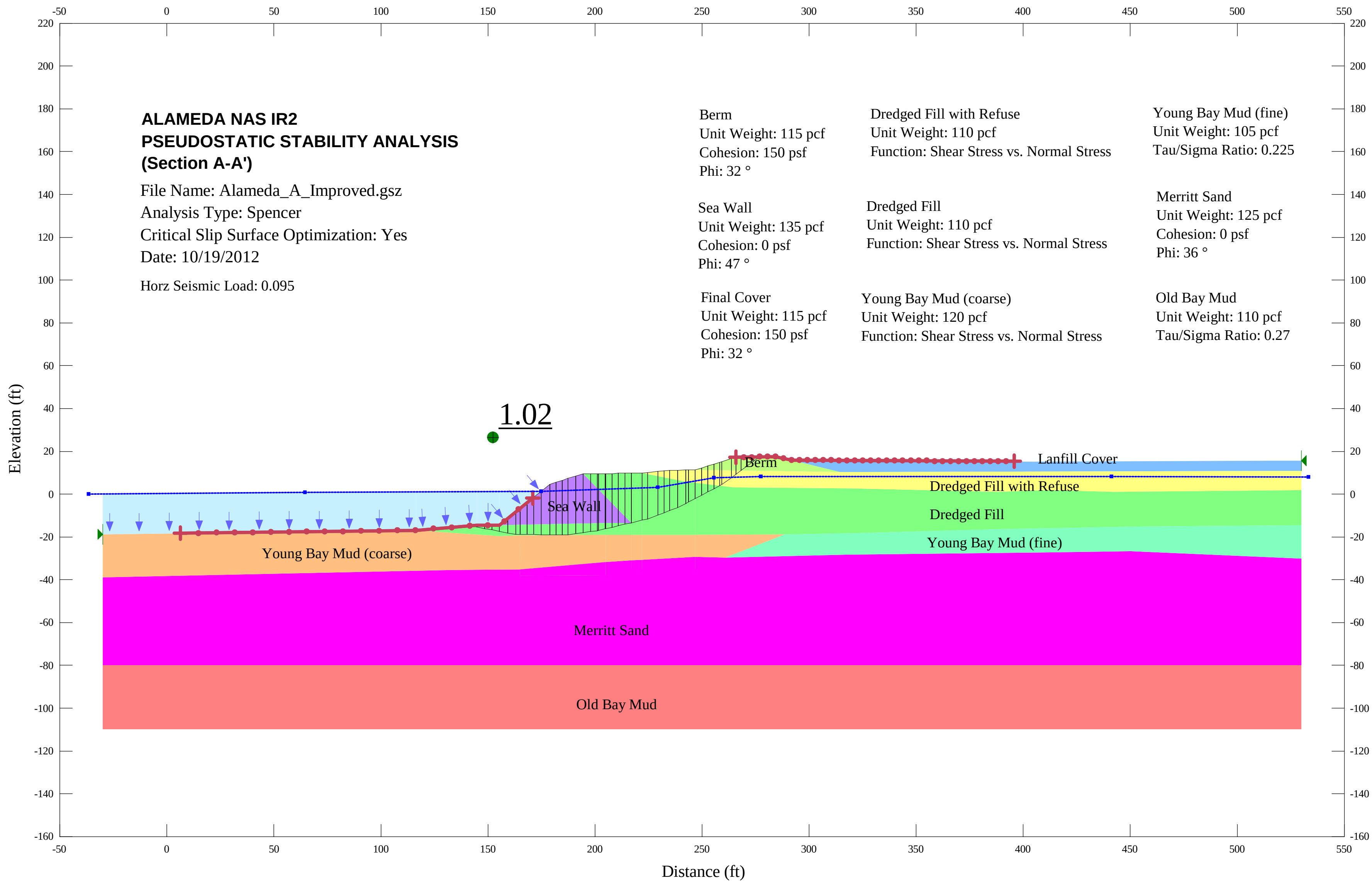
Slope Stability Analyses

Section A-A’



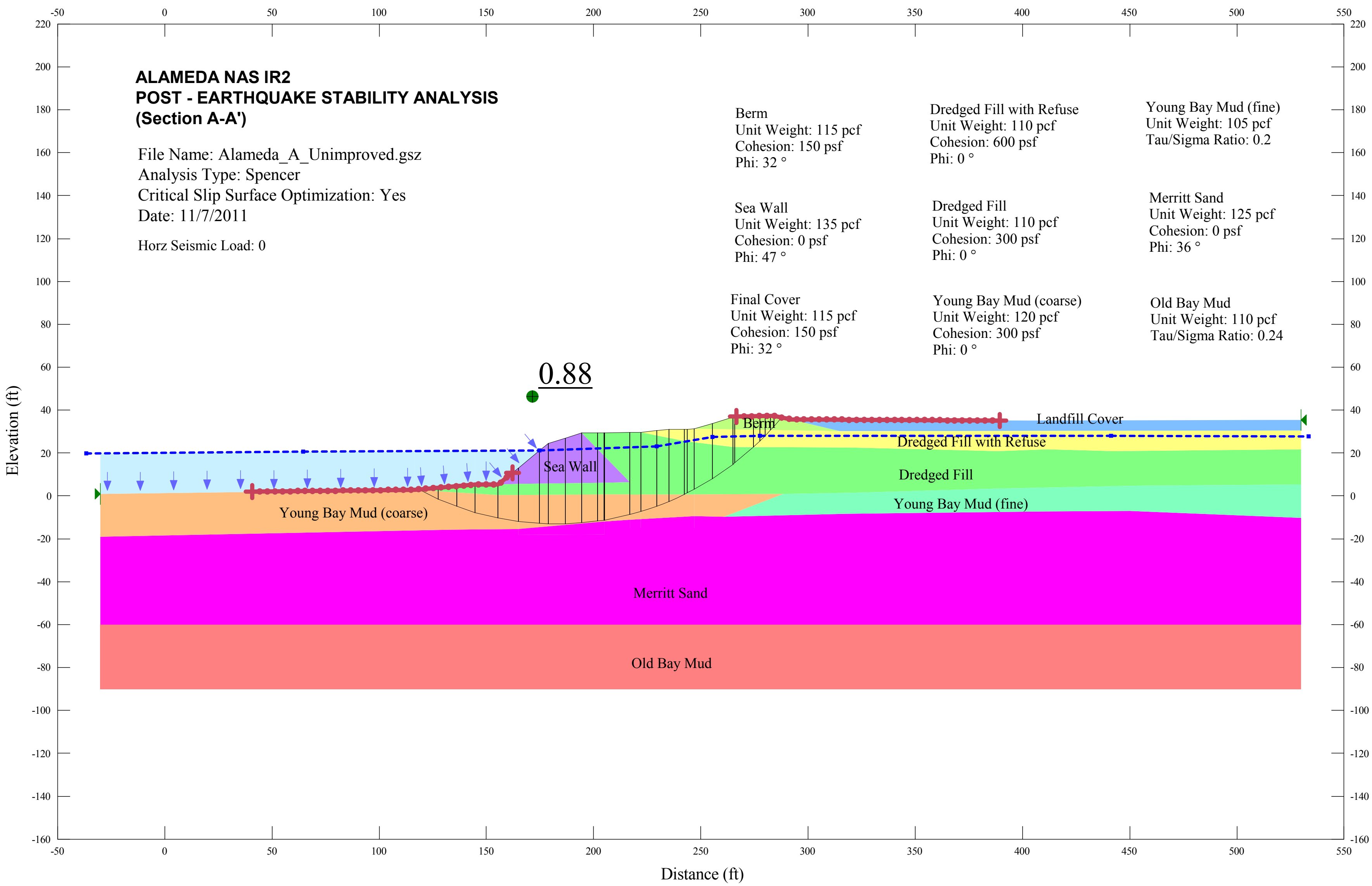
TETRA TECH

Figure D-1



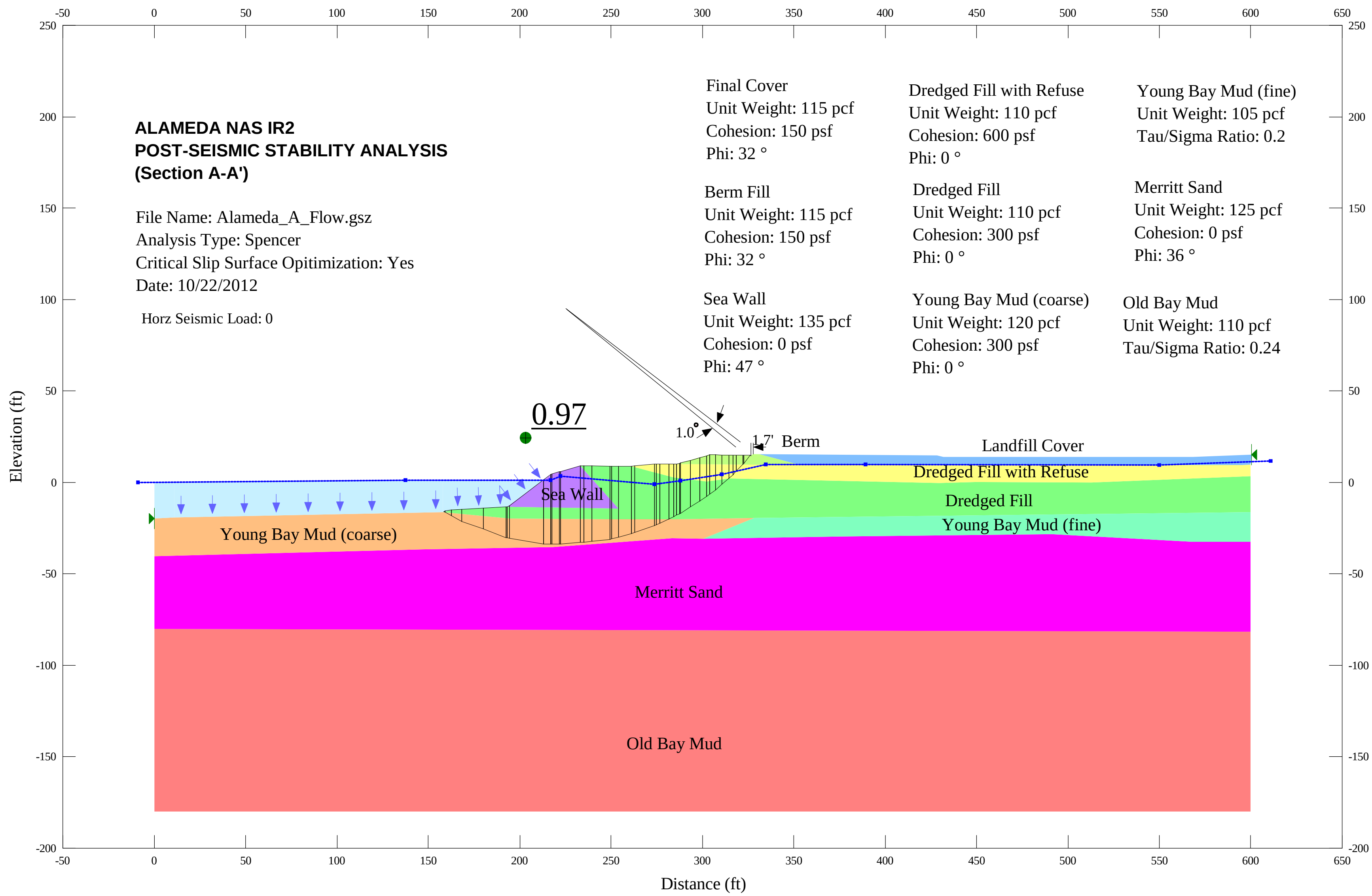
TETRA TECH

Figure D-2



TETRA TECH

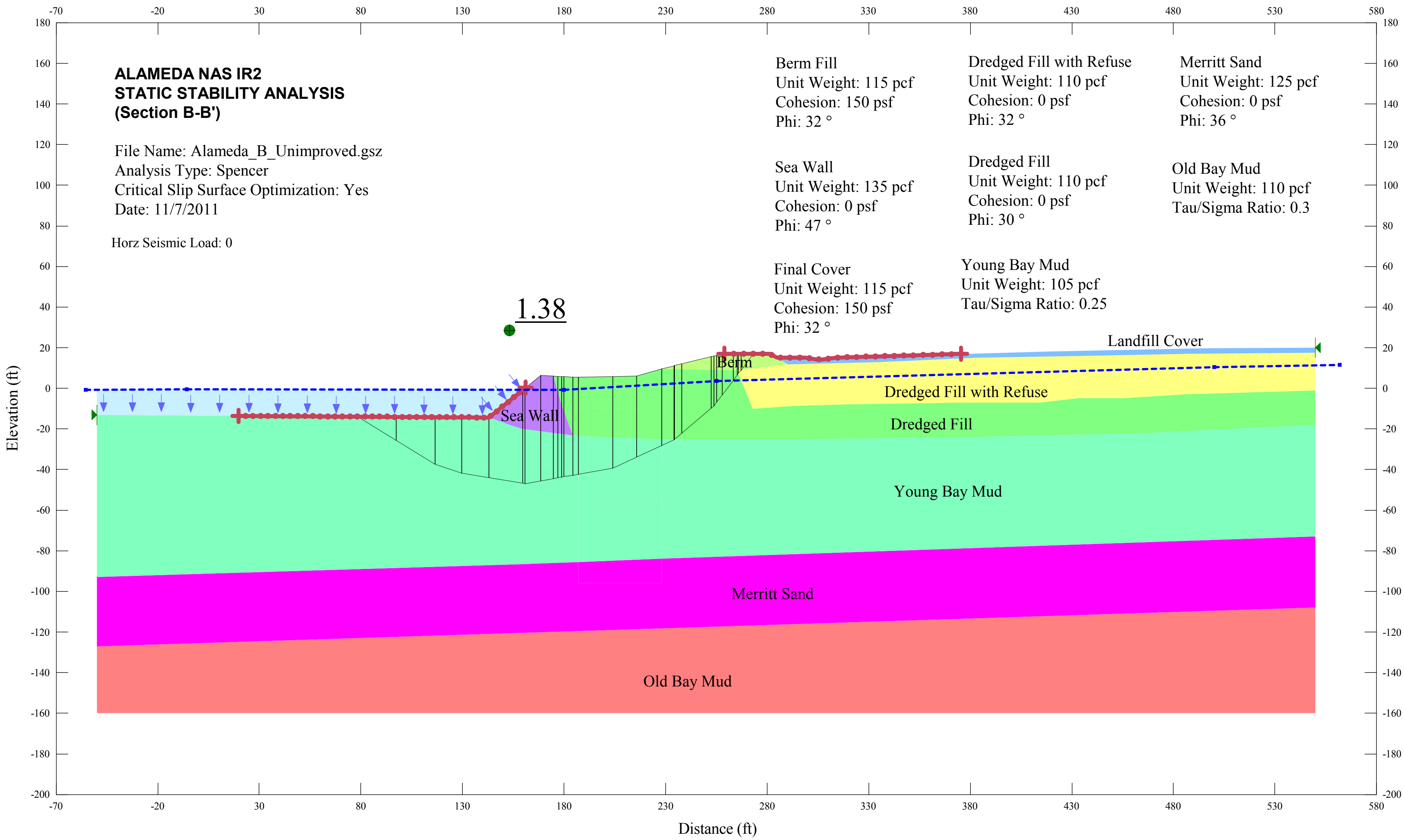
Figure D-3



TETRA TECH

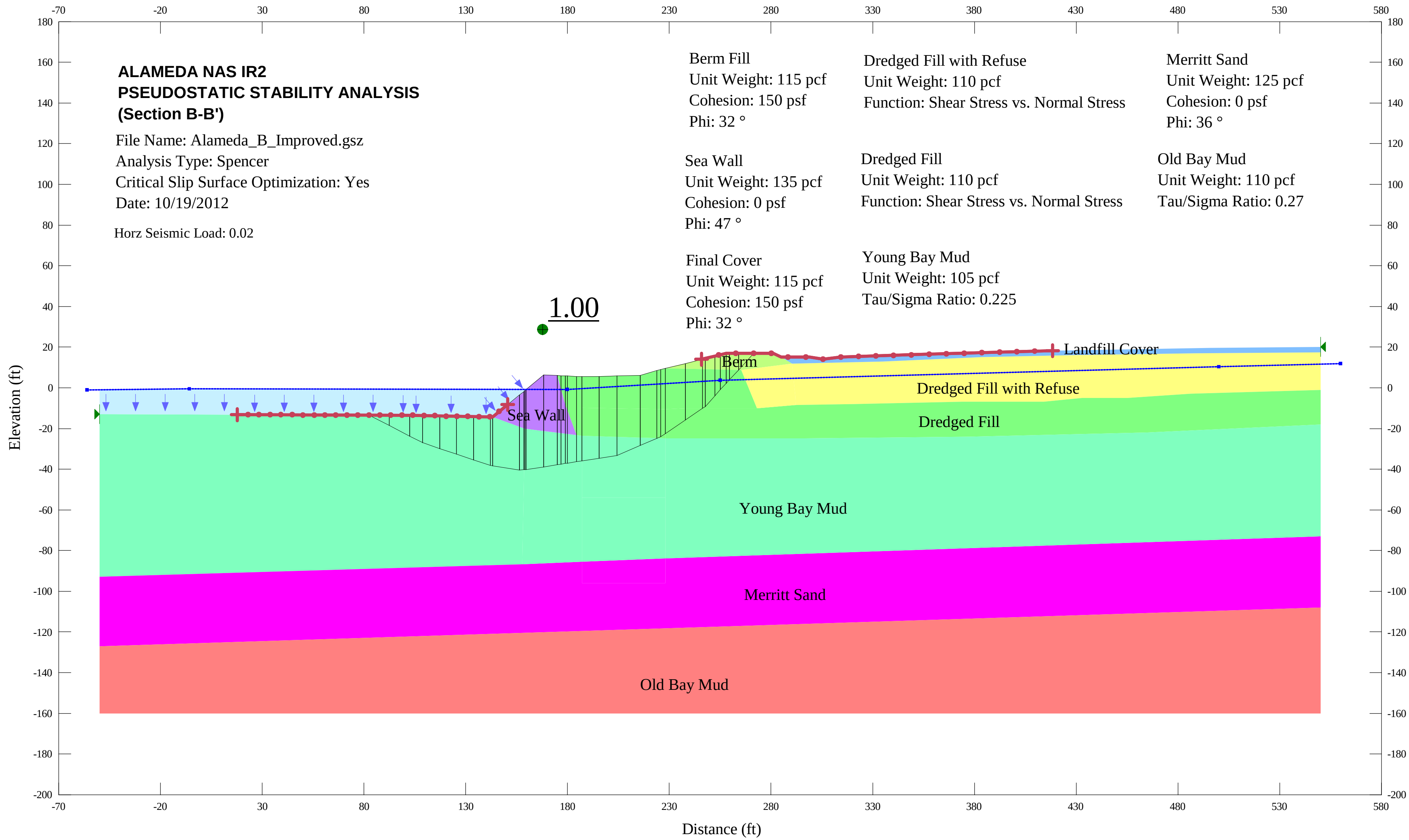
Figure D-4

Section B-B’



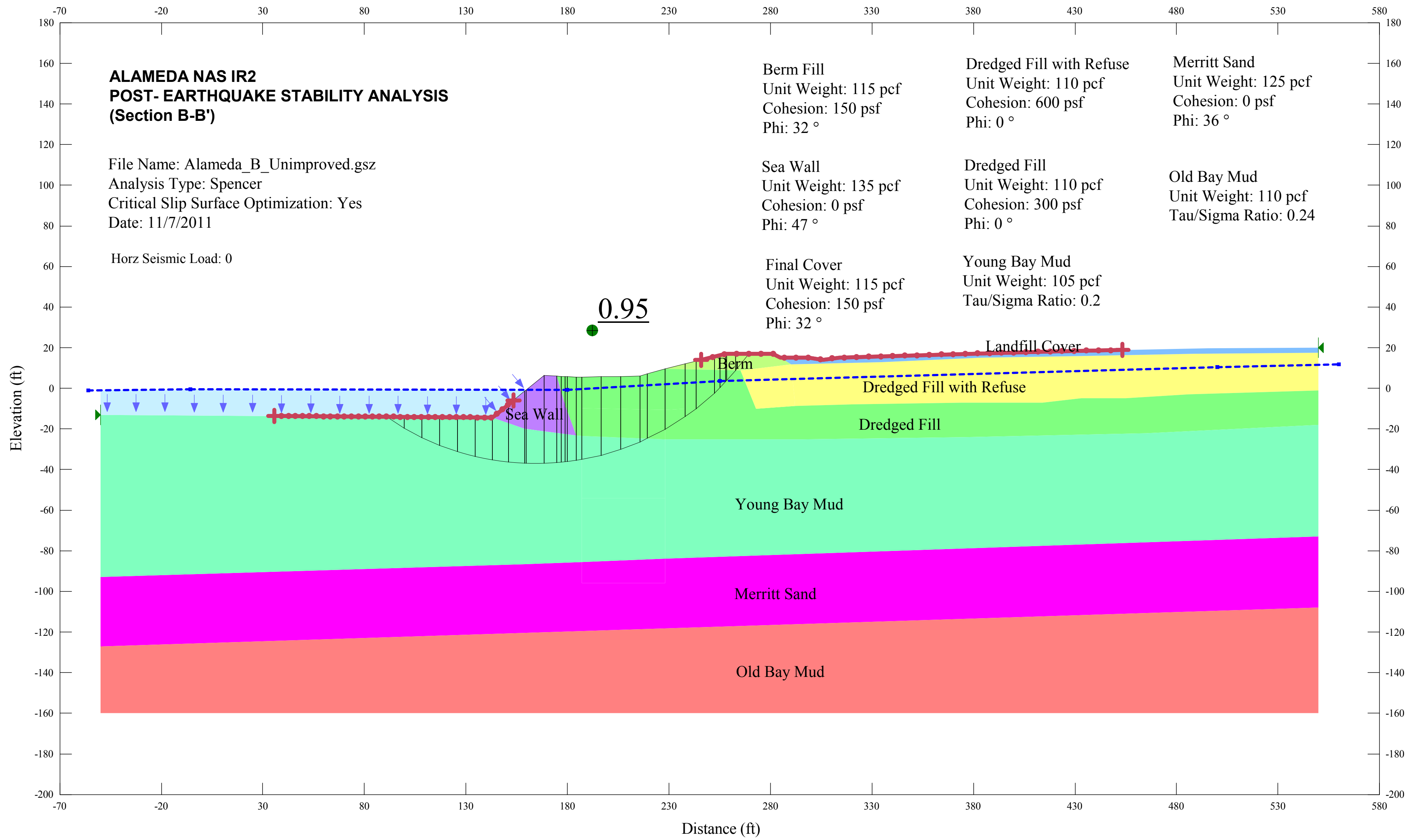
TETRA TECH

Figure D-5



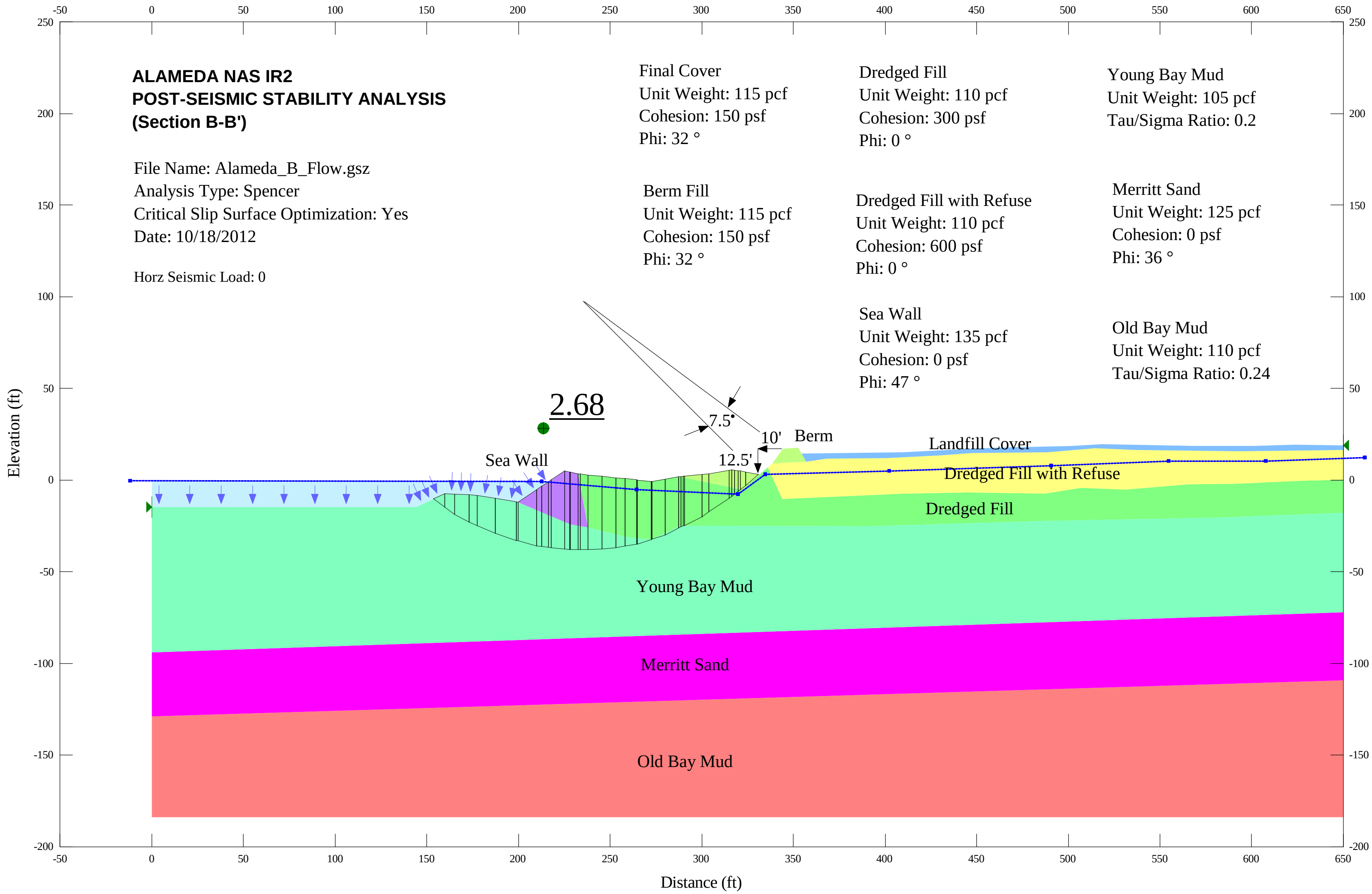
TETRA TECH

Figure D-6



TETRA TECH

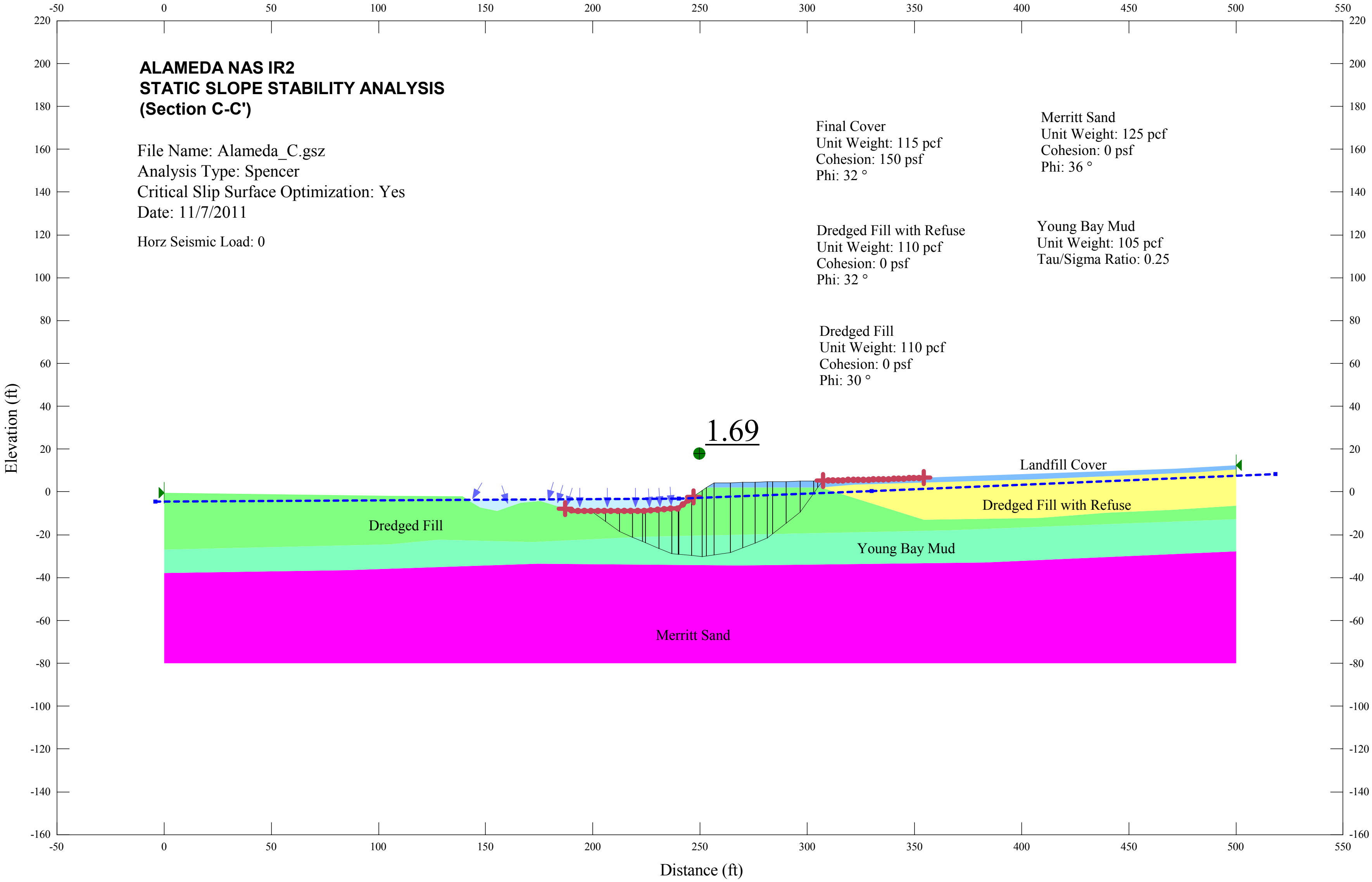
Figure D-7



TETRA TECH

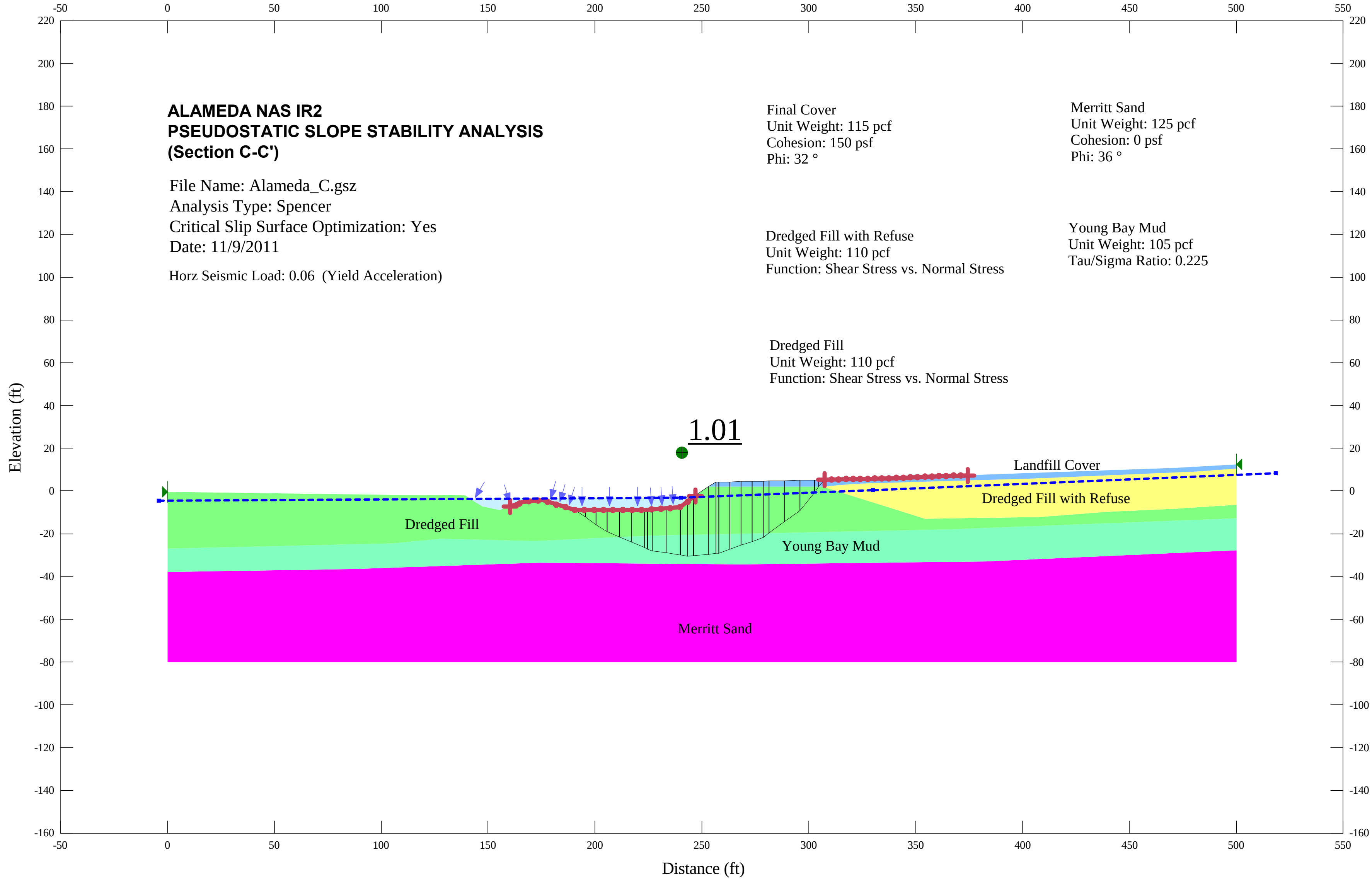
Figure D-8

Section C-C'



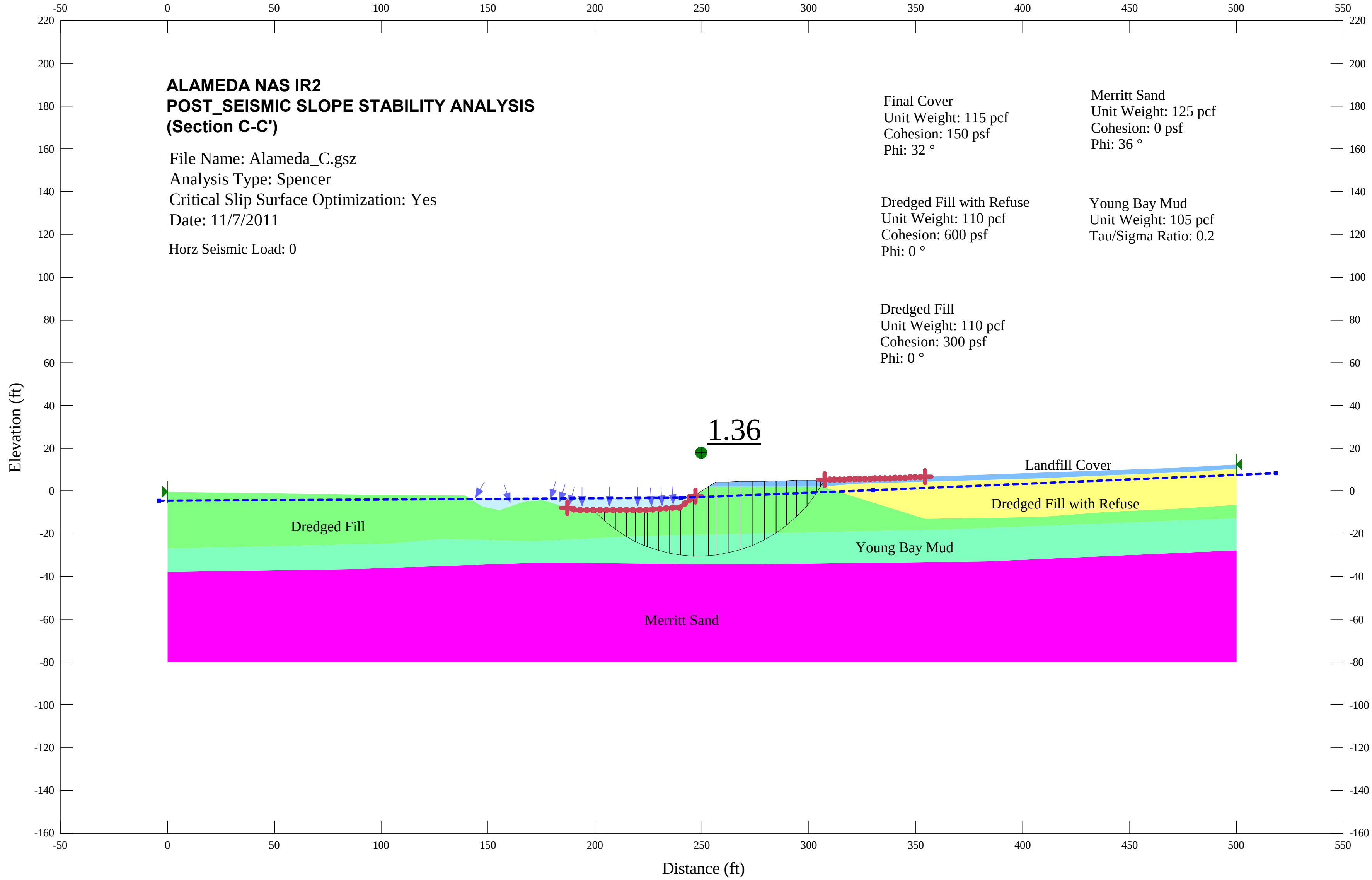
TETRA TECH

Figure D-9



ALAMEDA NAS IR2
PSEUDOSTATIC SLOPE STABILITY ANALYSIS
(Section C-C')
File Name: Alameda_C.gsz
Analysis Type: Spencer
Critical Slip Surface Optimization: Yes
Date: 11/9/2011
Horz Seismic Load: 0.06 (Yield Acceleration)
Final Cover
Unit Weight: 115 pcf
Cohesion: 150 psf
Phi: 32 °
Merritt Sand
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 36 °
Dredged Fill with Refuse
Unit Weight: 110 pcf
Function: Shear Stress vs. Normal Stress
Young Bay Mud
Unit Weight: 105 pcf
Tau/Sigma Ratio: 0.225
Dredged Fill
Unit Weight: 110 pcf
Function: Shear Stress vs. Normal Stress
1.01
Landfill Cover
Dredged Fill with Refuse
Dredged Fill
Young Bay Mud
Merritt Sand
Elevation (ft)
Distance (ft)

Figure D-10



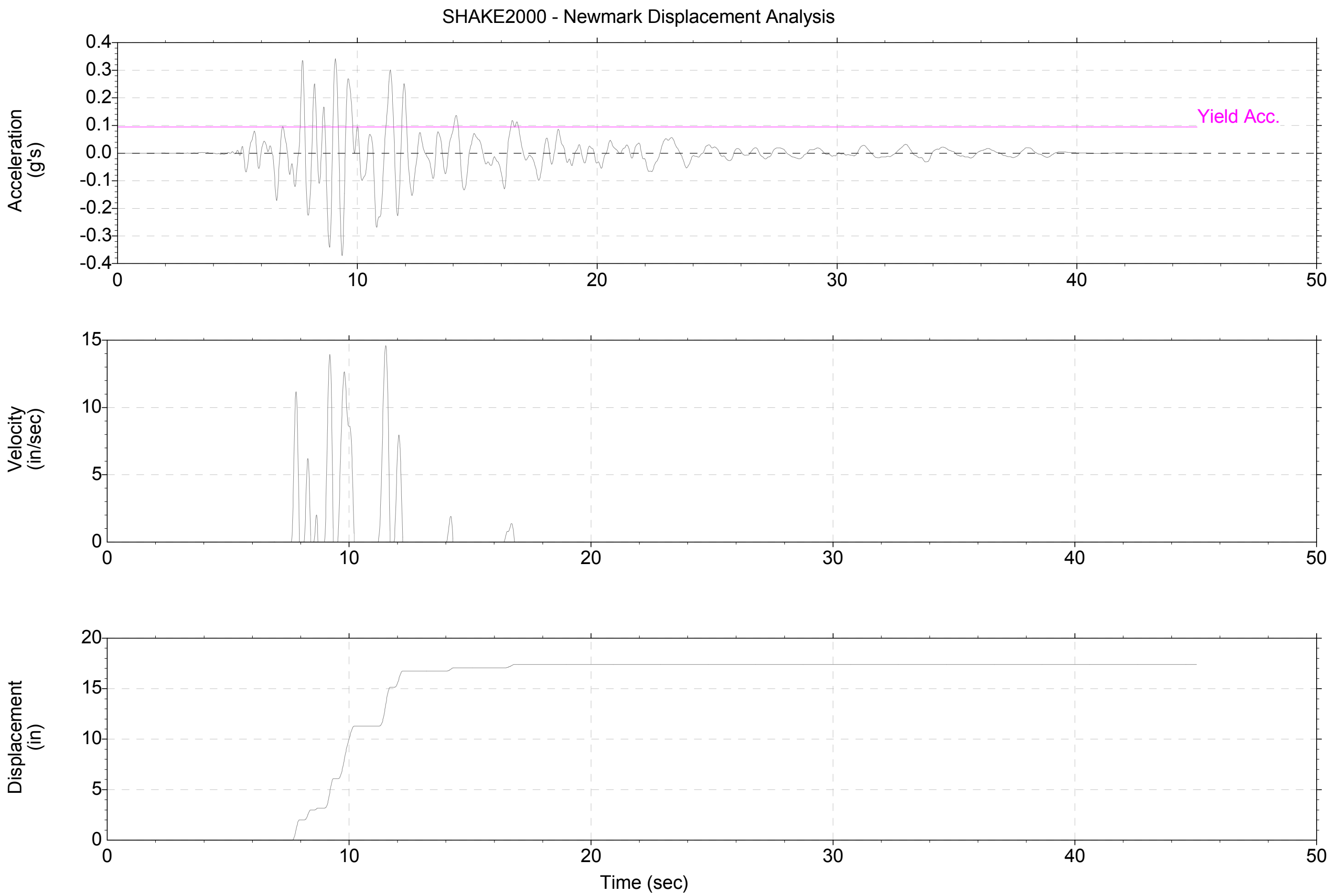
TETRA TECH

Figure D-11

Appendix E
(on CD only)

Deformation Analyses

Section A-A'
Rigorous Newmark-Type Seismic Deformations



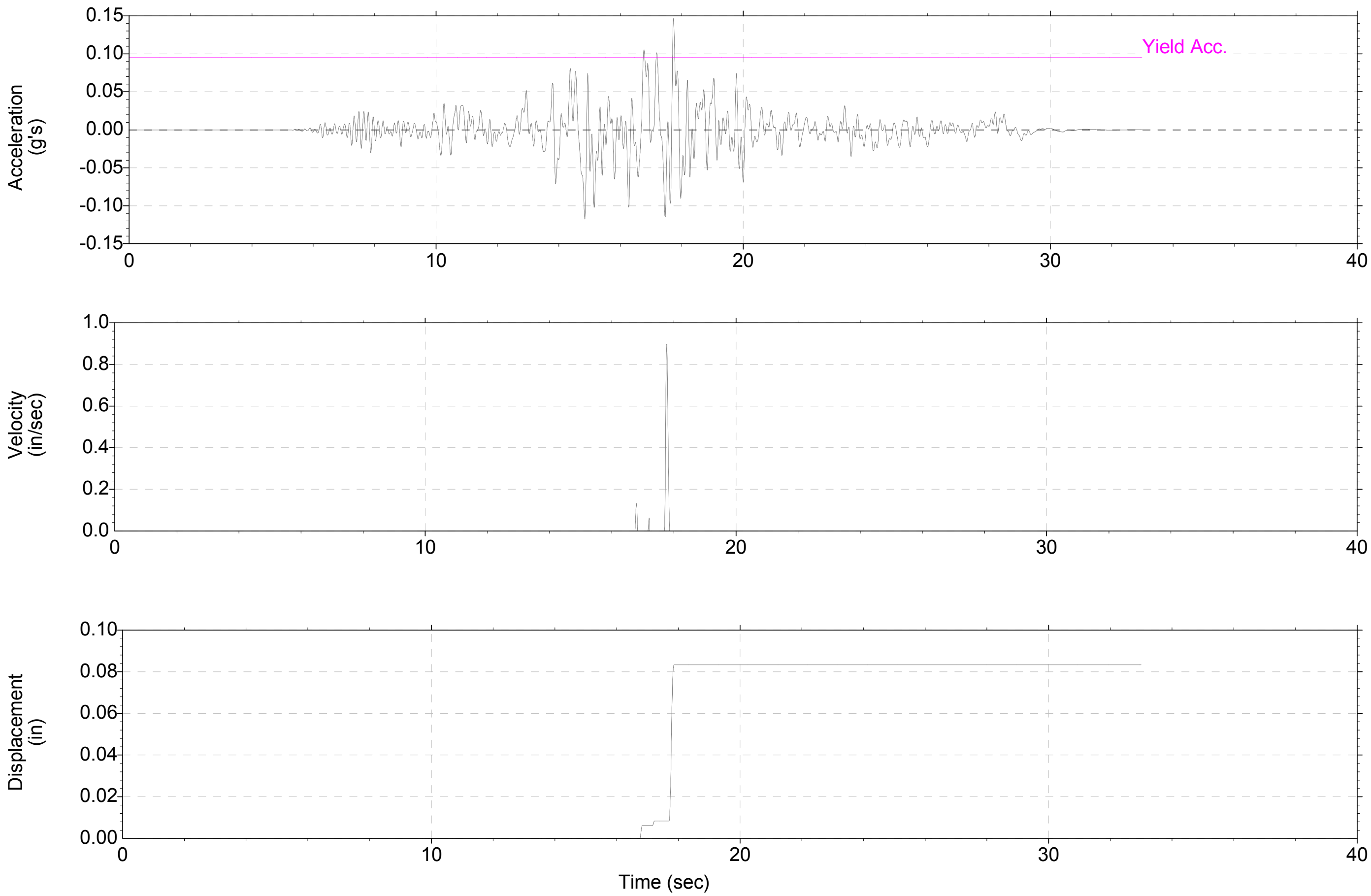
Notes:

Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .095 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 1 - Soil Deposit: 2
Acceleration Time History File: c:\IR2 rerun\South\South-L2A1D2-8-Soil Pro-E.NIS_FN.hea
Peak Acceleration Value: .3708882 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

Displacement computed: 17.38686 in

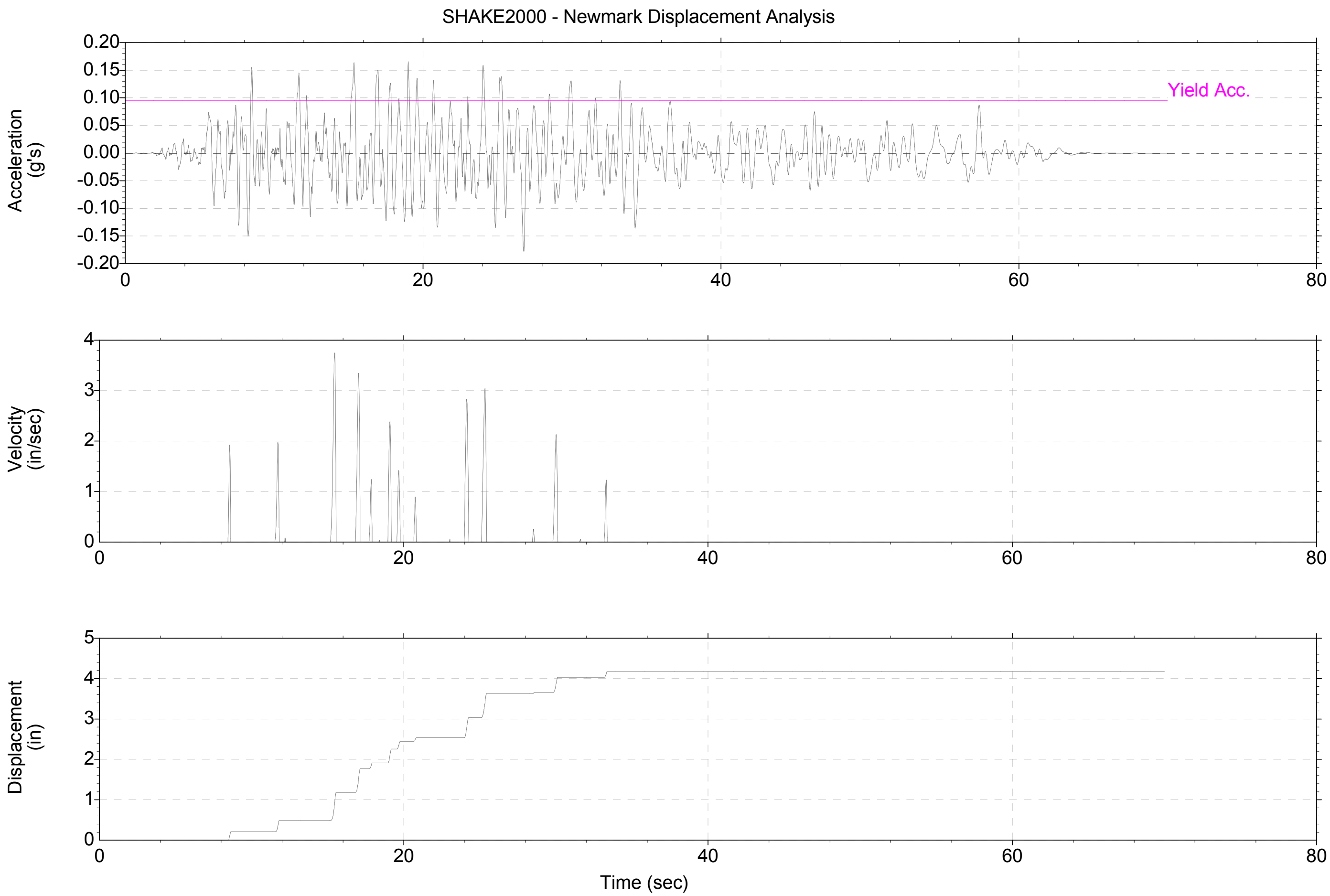
SHAKE2000 - Newmark Displacement Analysis




```
Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Franklin & Chang (1977)
     Constant Yield Acceleration:     .095 (g)
     Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                               - Analysis: 2 - Soil Deposit: 2
     Acceleration Time History File: c:\IR2 rerun\South\South-L2A2D2-23-Soil Pro-I.ARC_FN.hea
     Peak Acceleration Value:  .1463382 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

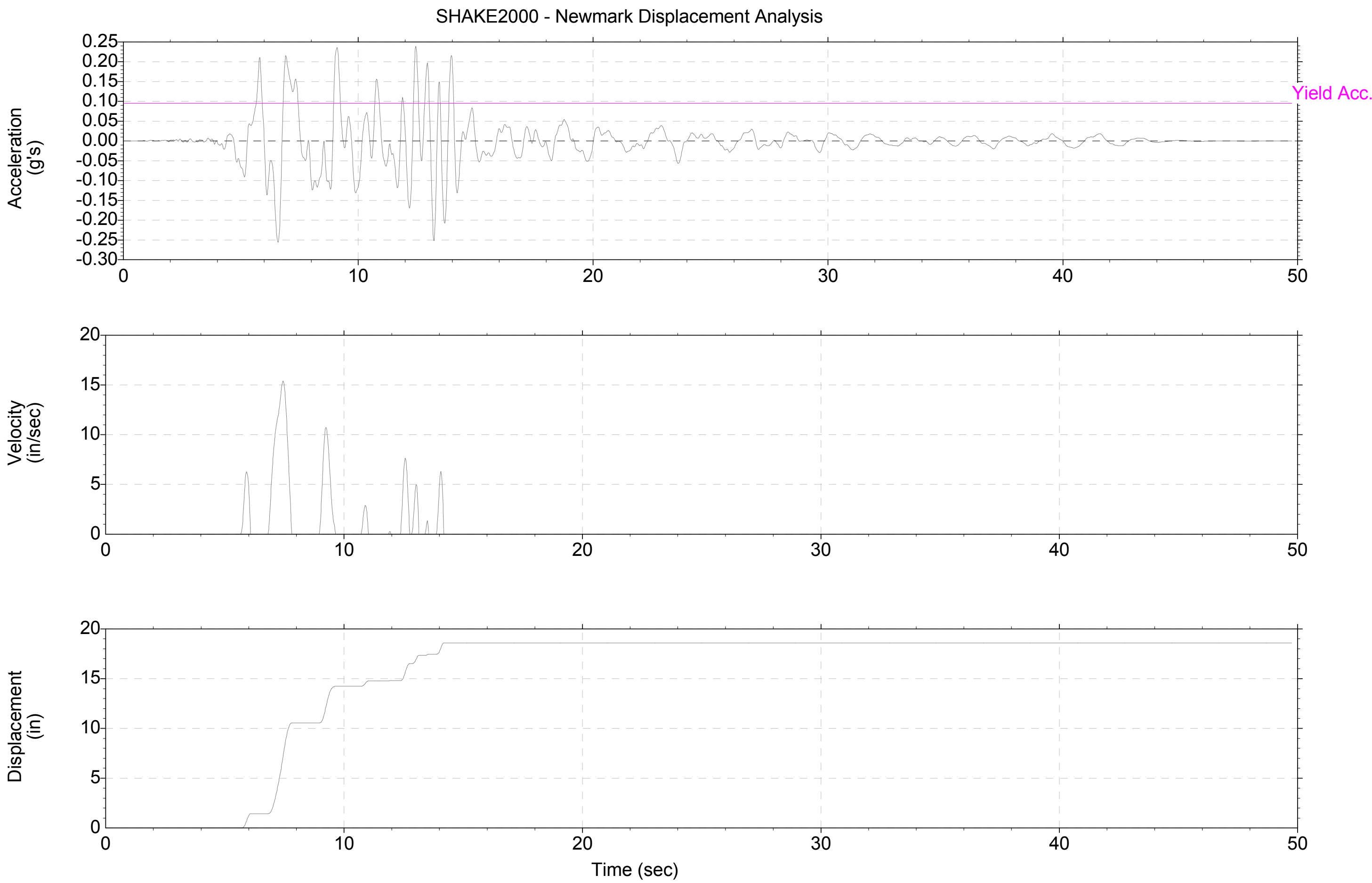
     Displacement computed: 8.336245E-02 in
```




```
Notes:
      Displacement Analysis - Newmark Method
      Project: SHAKE2000 - Newmark Displacement Analysis

      Newmark Method by Franklin & Chang (1977)
      Constant Yield Acceleration:     .095 (g)
      Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                                 - Analysis: 3 - Soil Deposit: 2
      Acceleration Time History File: c:\IR2 rerun\South\South-L2A3D2-38-Soil Pro-H-CPE_FN.hea
      Peak Acceleration Value:  .1781955 (g)
      Upslope Movement not Included in Analysis
      Acceleration due to gravity:   386.4 (in/sec^2)

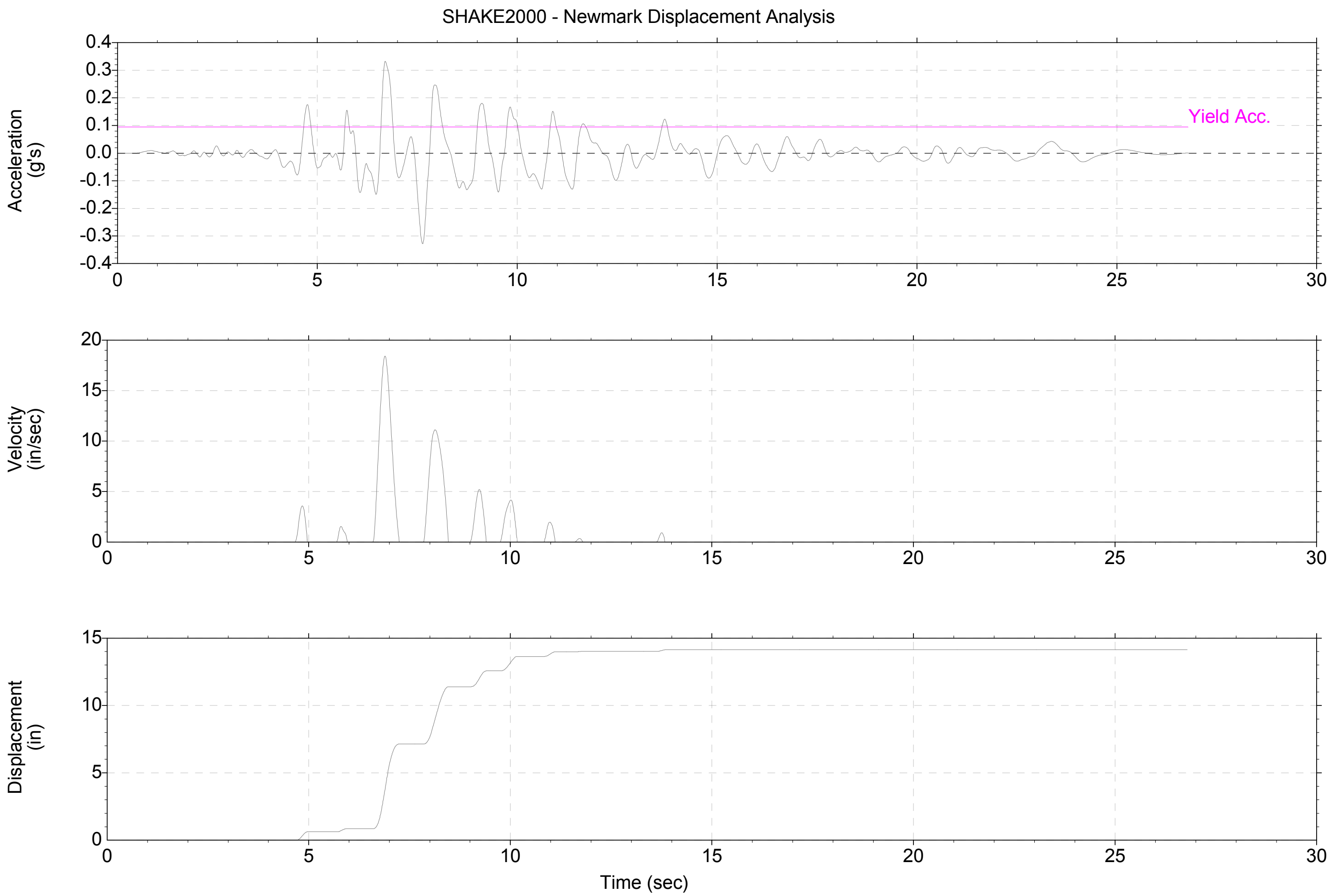
      Displacement computed:    4.175778 in
```



Notes:
Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .095 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 4 - Soil Deposit: 2
Acceleration Time History File: c:\IR2 rerun\South\South-L2A4D2-53-Soil Pro-R.HEC_FN.hea
Peak Acceleration Value: .2556627 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

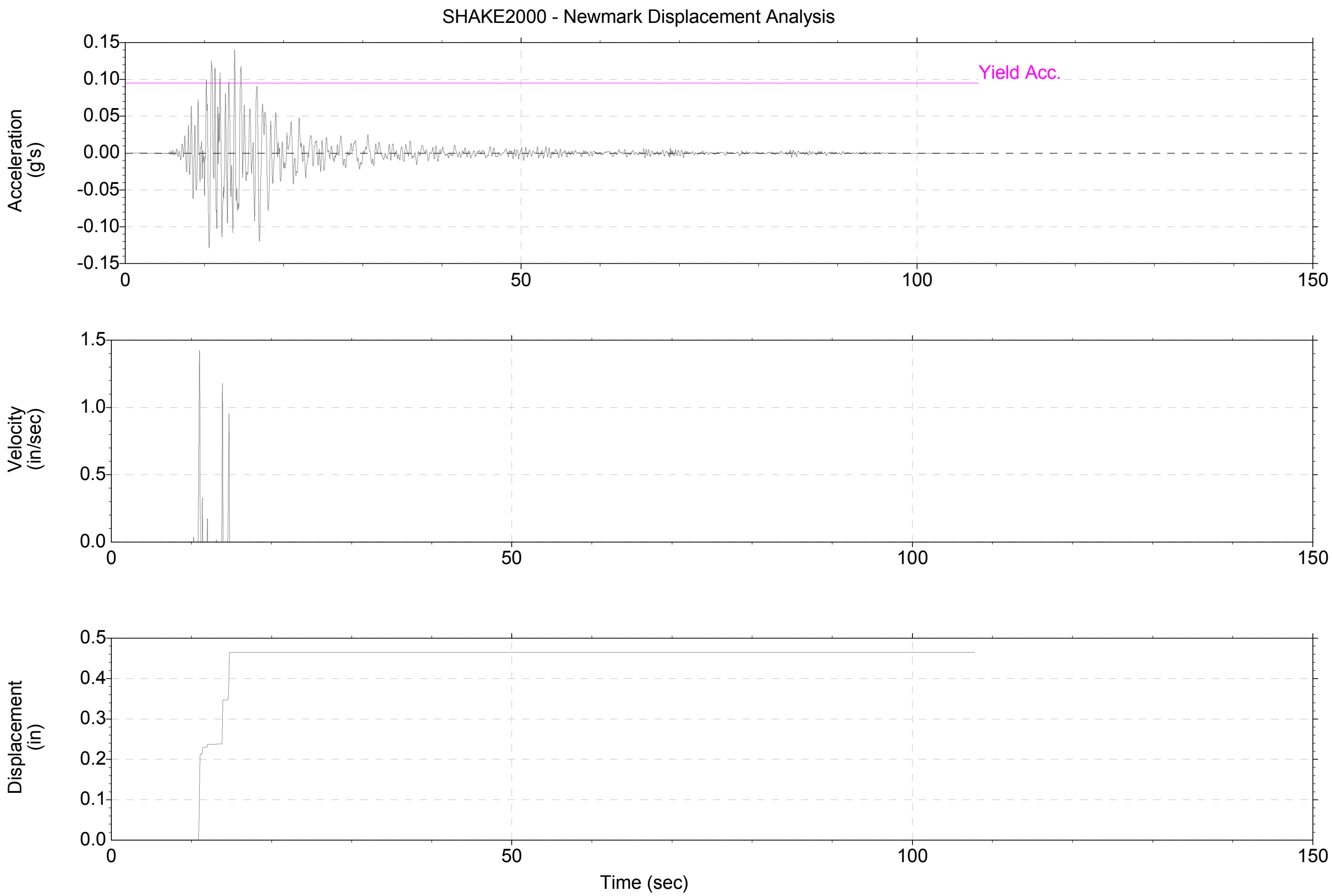
Displacement computed: 18.59414 in




```
Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Franklin & Chang (1977)
     Constant Yield Acceleration:     .095 (g)
     Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                           - Analysis: 5 - Soil Deposit: 2
     Acceleration Time History File: c:\IR2 rerun\South\South-L2A5D2-68-Soil Pro-T.CPE_FN.hea
     Peak Acceleration Value:  .3325845 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

     Displacement computed:    14.12731 in
```

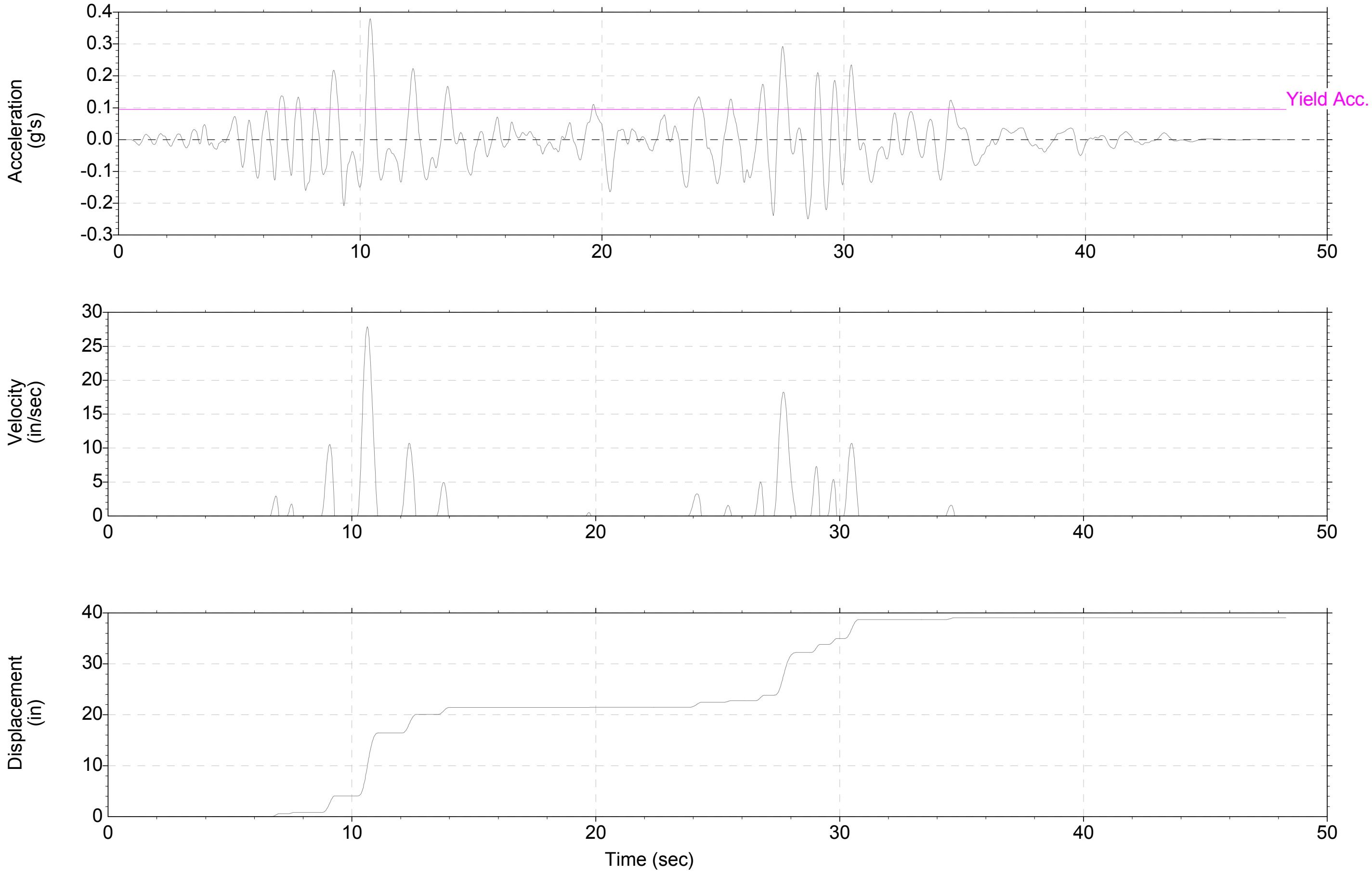



```
Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Franklin & Chang (1977)
     Constant Yield Acceleration:     .095 (g)
     Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                           - Analysis: 6 - Soil Deposit: 2
     Acceleration Time History File: c:\IR2 rerun\South\South-L2A6D2-83-Soil Pro-HY080_FN.hea
     Peak Acceleration Value:  .1403282 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

     Displacement computed:    .4649767 in
```

SHAKE2000 - Newmark Displacement Analysis



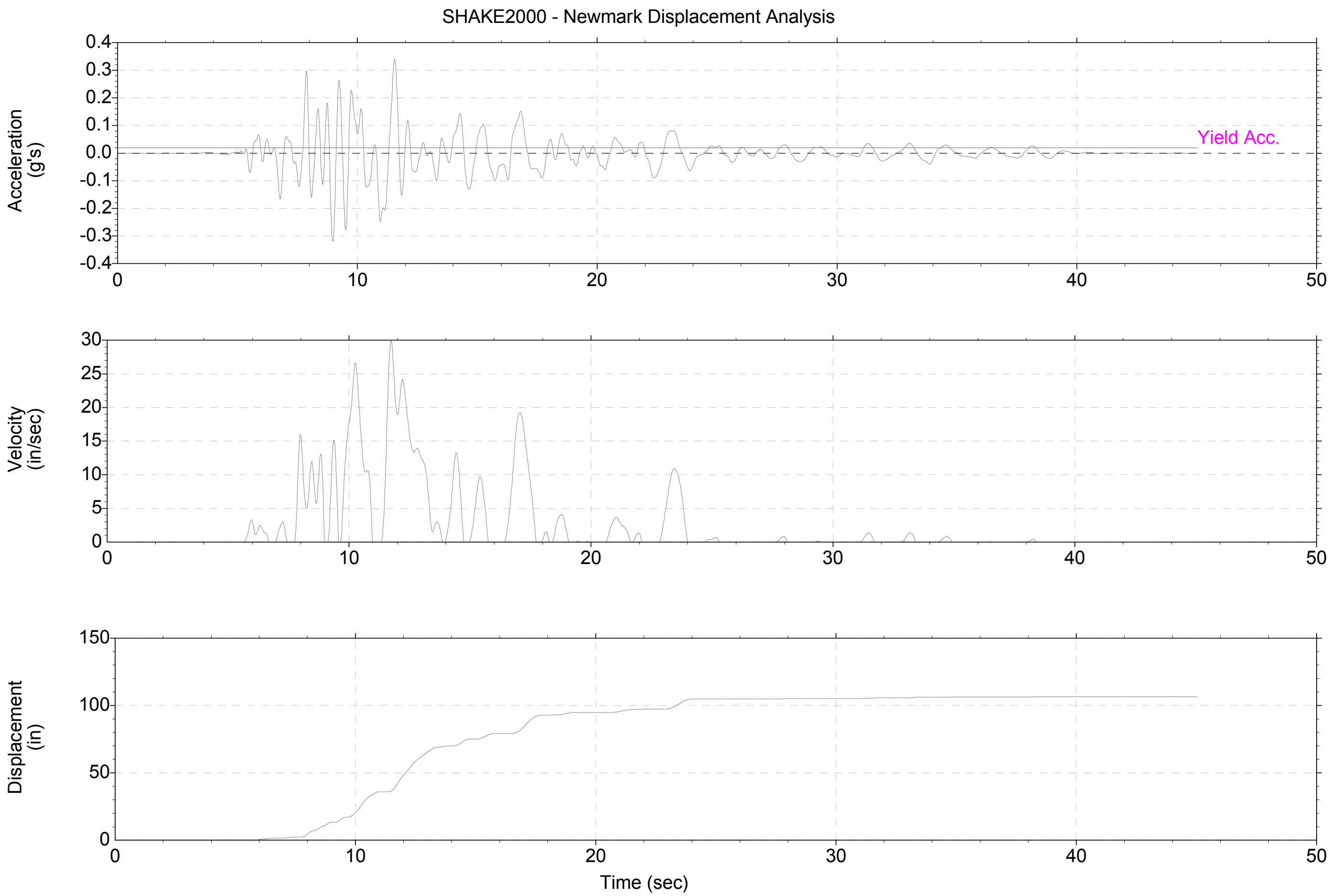
Notes:

Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .095 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 7 - Soil Deposit: 2
Acceleration Time History File: c:\IR2 rerun\South\South-L2A7D2-98-Soil Pro-S.JOS_FN.hea
Peak Acceleration Value: .3793318 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

Displacement computed: 39.05452 in

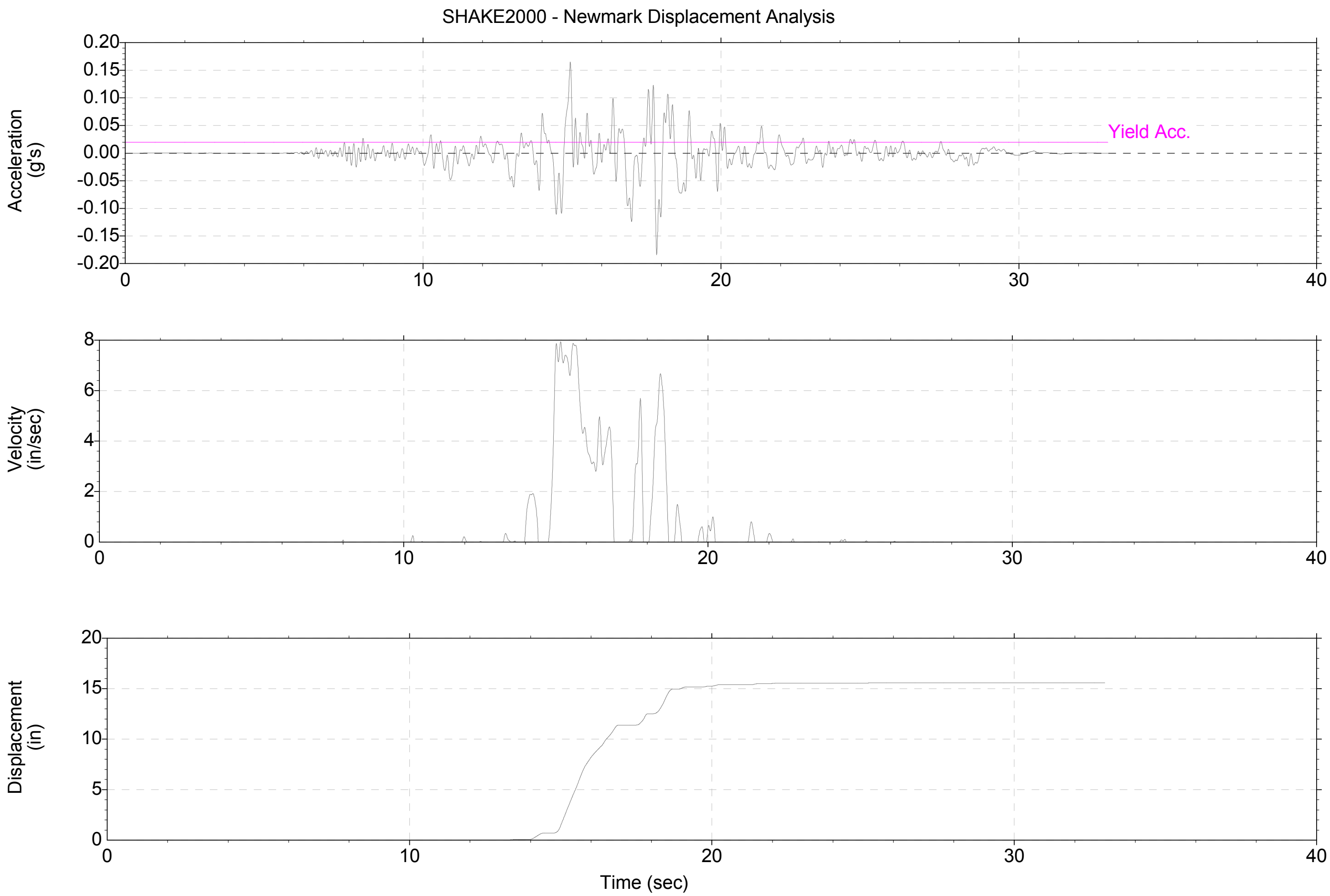
Section B-B'
Rigorous Newmark-Type Seismic Deformations



Notes:
Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .02 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 1 - Soil Deposit: 1
Acceleration Time History File: c:\IR2 rerun\West\West-L2A1D1-8-Soil Pro-E.NIS_FN.hea
Peak Acceleration Value: .3399736 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

Displacement computed: 106.4428 in

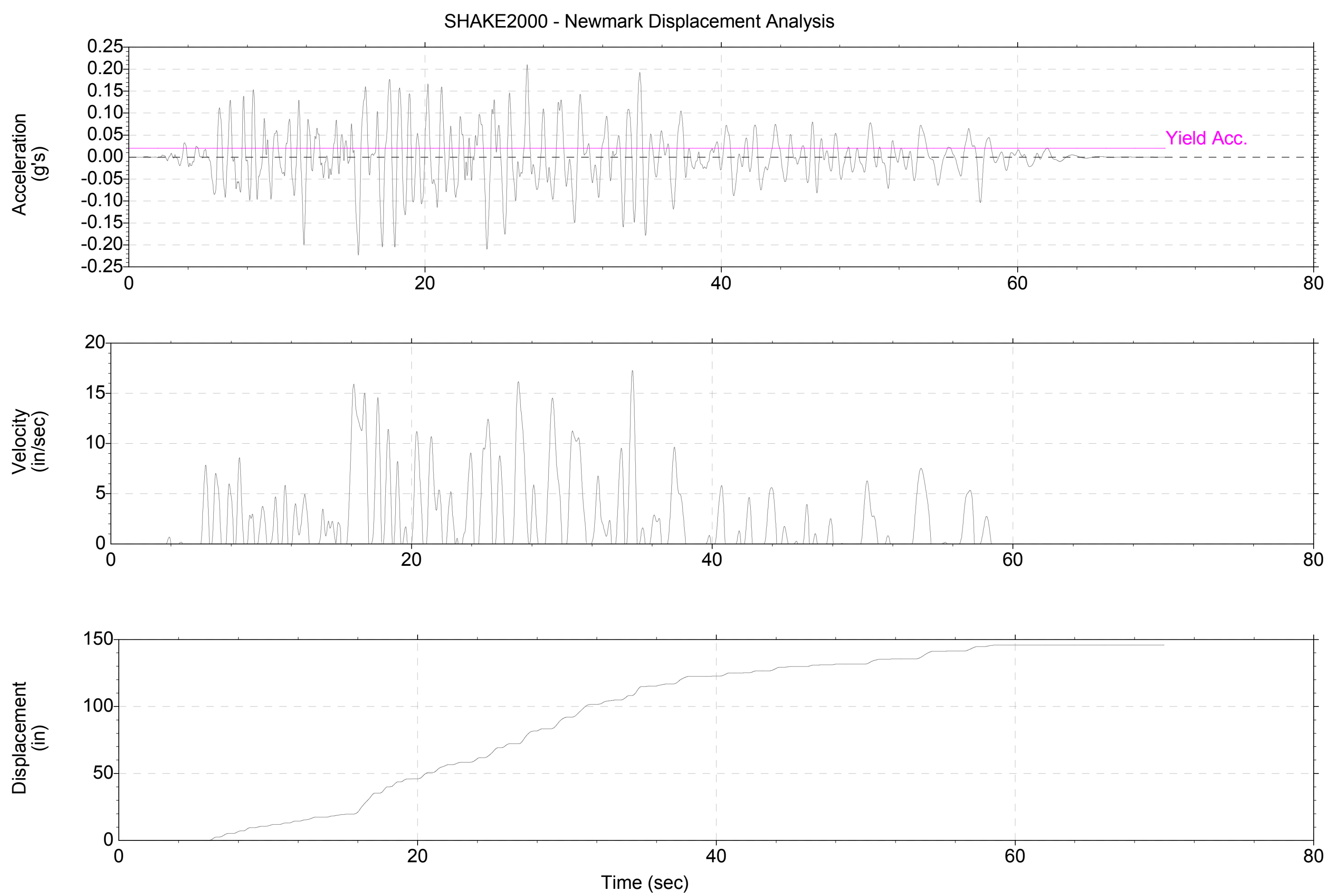


Notes:

Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .02 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 2 - Soil Deposit: 1
Acceleration Time History File: c:\IR2 rerun\West\West-L2A2D1-27-Soil Pro-I.ARC_FN.hea
Peak Acceleration Value: .1842754 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

Displacement computed: 15.56422 in



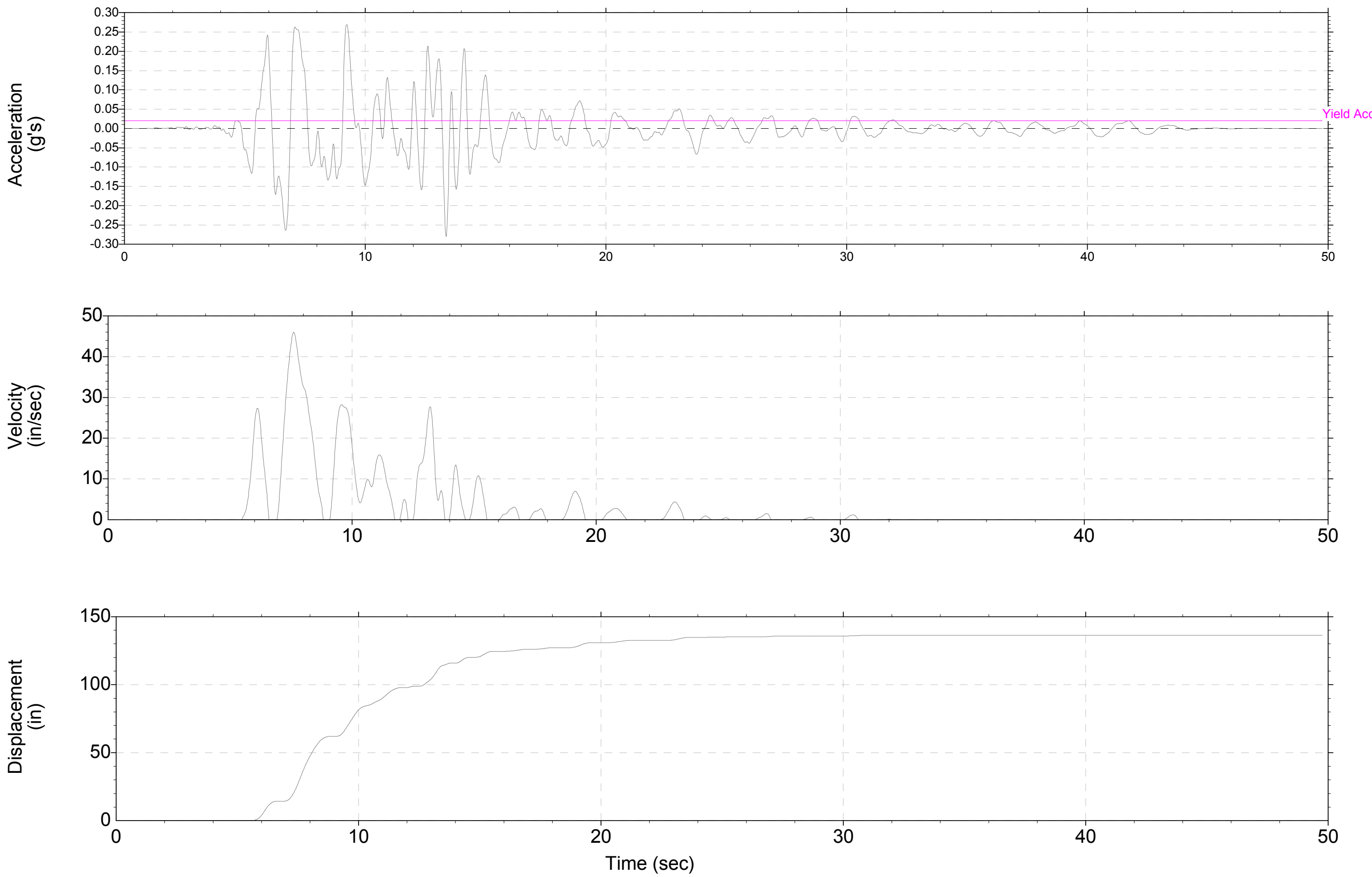
Notes:

Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .02 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 3 - Soil Deposit: 1
Acceleration Time History File: c:\IR2 rerun\West\West-L2A3D1-46-Soil Pro-H-CPE_FN.hea
Peak Acceleration Value: .2227764 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

Displacement computed: 145.7453 in

SHAKE2000 - Newmark Displacement Analysis

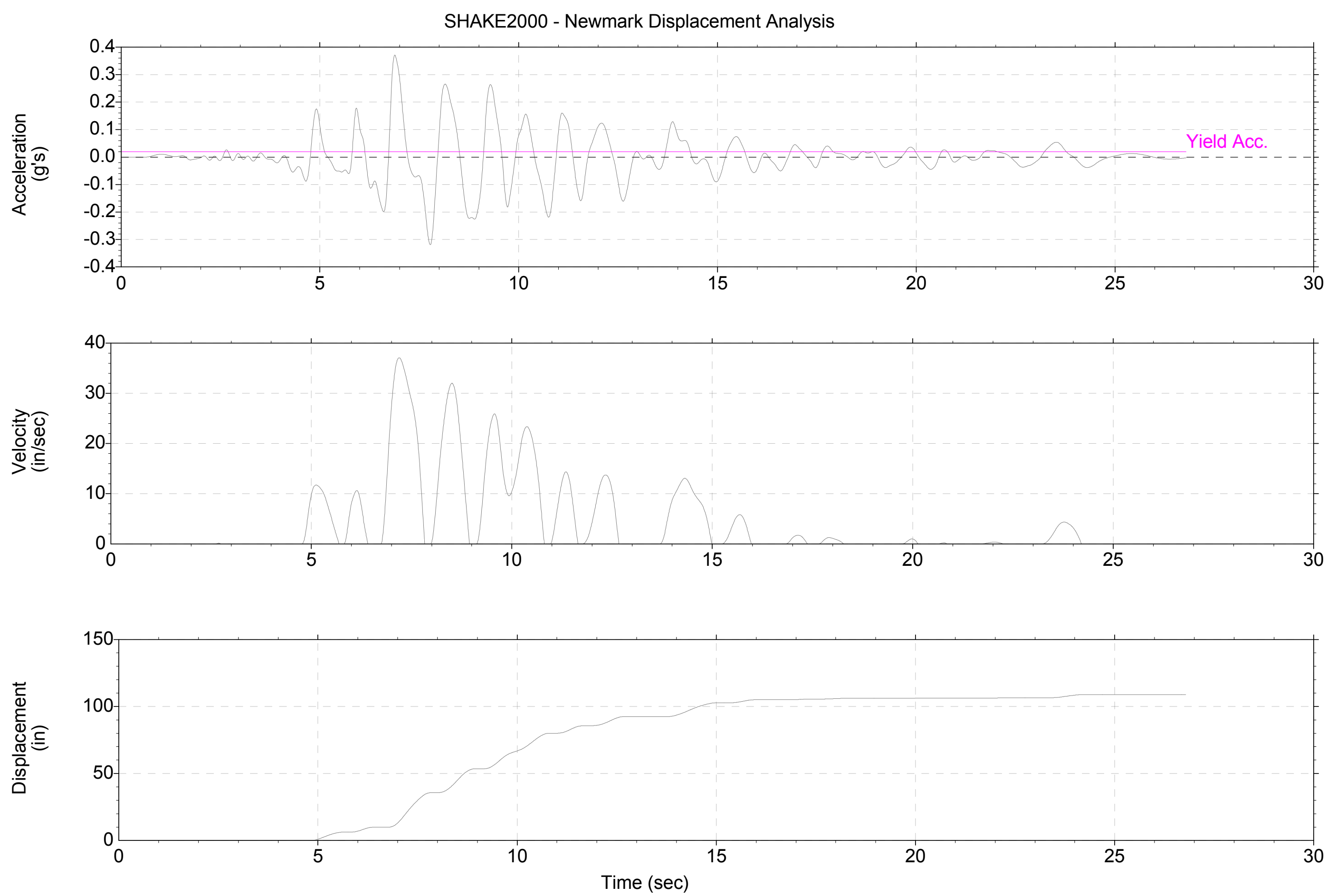


Notes:

Displacement Analysis - Newmark Method
Project: SHAKE2000 - Newmark Displacement Analysis

Newmark Method by Franklin & Chang (1977)
Constant Yield Acceleration: .02 (g)
Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
- Analysis: 4 - Soil Deposit: 1
Acceleration Time History File: c:\IR2 rerun\West\West-L2A4D1-65-Soil Pro-R.HEC_FN.hea
Peak Acceleration Value: .27951 (g)
Upslope Movement not Included in Analysis
Acceleration due to gravity: 386.4 (in/sec^2)

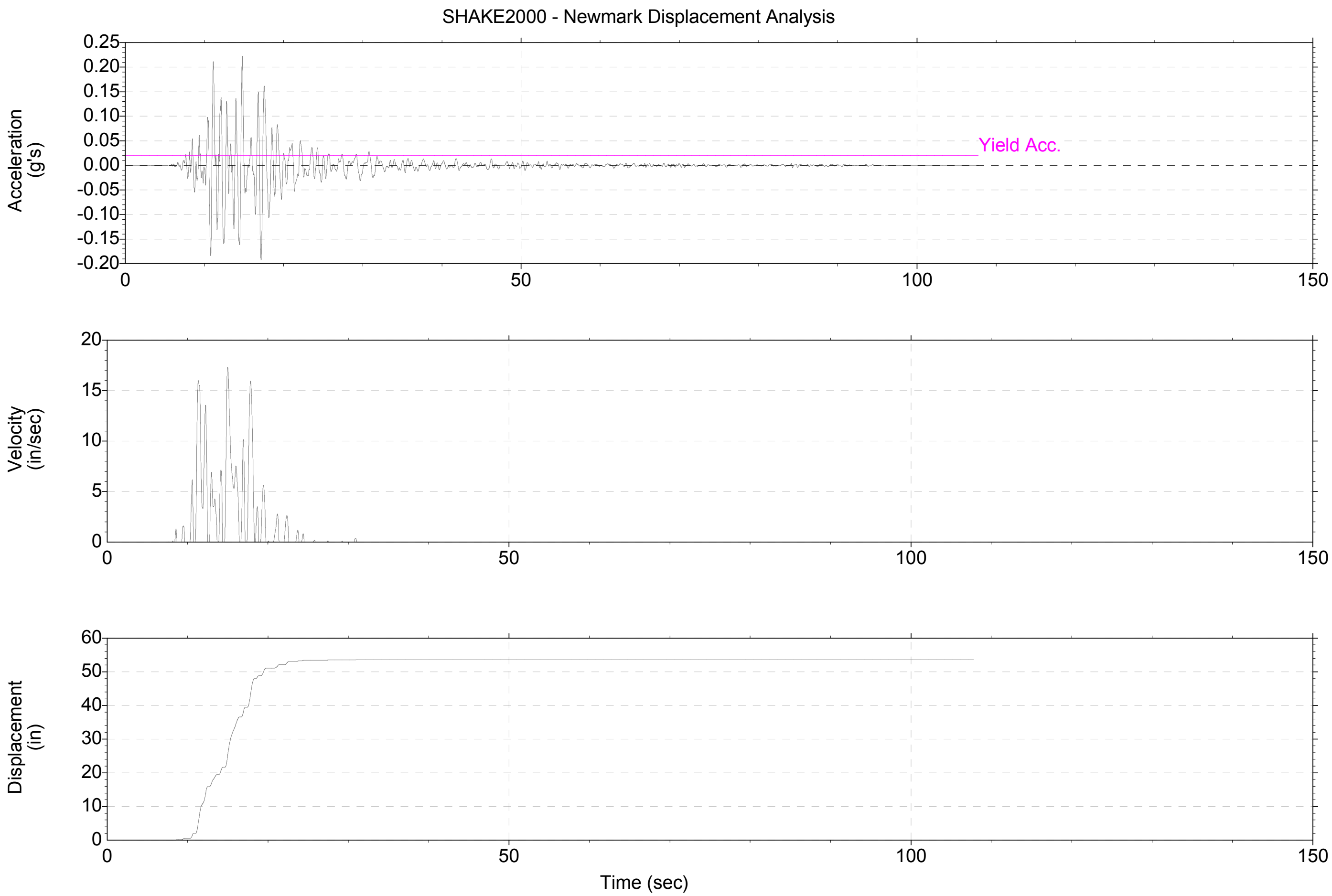
Displacement computed: 136.2228 in




```
Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Franklin & Chang (1977)
     Constant Yield Acceleration:      .02 (g)
     Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                           - Analysis: 5 - Soil Deposit: 1
     Acceleration Time History File: c:\IR2 rerun\West\West-L2A5D1-84-Soil Pro-T.CPE_FN.hea
     Peak Acceleration Value:  .3710382 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

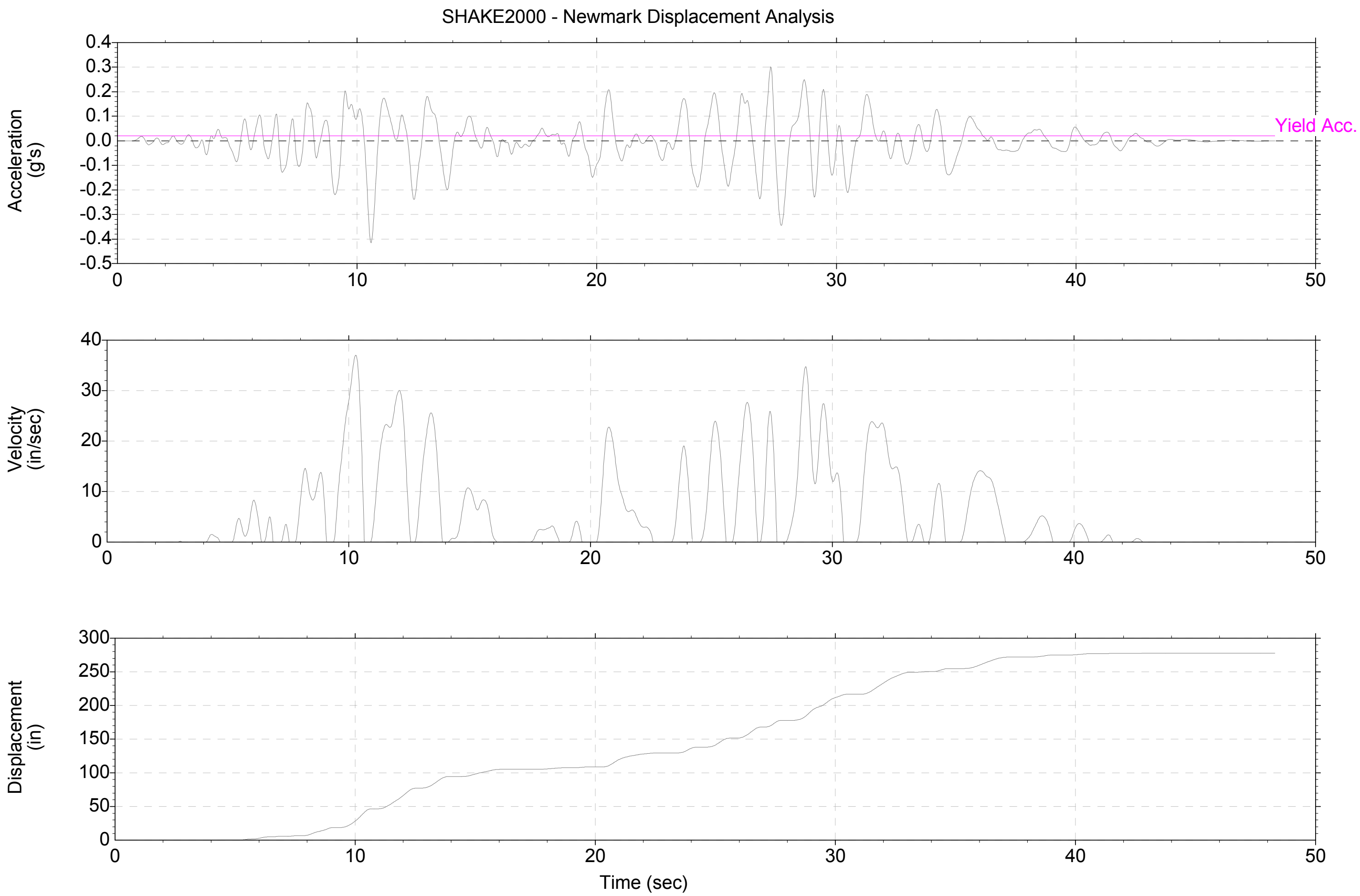
     Displacement computed:    108.8382 in
```




```
Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Franklin & Chang (1977)
     Constant Yield Acceleration:      .02 (g)
     Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                           - Analysis: 6 - Soil Deposit: 1
     Acceleration Time History File: c:\IR2 rerun\West\West-L2A6D1-103-Soil Pro-HY080_FN.hea
     Peak Acceleration Value:  .2226236 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

     Displacement computed:    53.56282 in
```




```
Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Franklin & Chang (1977)
     Constant Yield Acceleration:      .02 (g)
     Acceleration Time History: Stress History Layer No. 2 - HEA - Layer: 2
                          - Analysis: 7 - Soil Deposit: 1
     Acceleration Time History File: c:\IR2 rerun\West\West-L2A7D1-122-Soil Pro-S.JOS_FN.hea
     Peak Acceleration Value:  .4149373 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

     Displacement computed:    277.4712 in
```

Section C-C'
Simplified Newmark-Type Seismic Deformations

Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements
by Jonathan D. Bray and Thaleia Travasarou
Journal of Geotechnical and Geonvironmental Engineering, ASCE, V. 133(4), pp. 381-392, April 2007

SEE NOTES BELOW FOR GUIDANCE IN THE USE OF SPREADSHEET

Input Parameters			
Yield Coefficient (ky)	0.06		Based on pseudostatic analysis
Initial Fundamental Period (Ts)	0.20	seconds	1D: Ts=4H/Vs 2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.30	seconds	
Moment Magnitude (M_w)	7.3		
Spectral Acceleration (Sa(1.5Ts))	0.47	g	

Additional Input Parameters		
Probability of Exceedance #1 (P1)	50	%
Probability of Exceedance #2 (P2)	84	%
Probability of Exceedance #3 (P3)	16	%
Displacement Threshold (d_threshold)	15	cm

Intermediate Calculated Parameters			
Non-Zero Seismic Displacement Est (D)	29.44	cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66		

Results			
Probability of Negligible Displ. (P(D=0))	0.000		eq. (3)
D1	29.44	cm	calc. using eq. (7)
D2	15.27	cm	calc. using eq. (7)
D3	56.75	cm	calc. using eq. (7)
P(D>d_threshold)	0.847		eq. (7)

Notes

1. Values highlighted in blue are input parameters
2. Probability of Exceedance is the desired probability of exceeding a particular displacement value.
3. Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
   (e.g., the probability of exceeding displacement D1 is P1)
4. Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
5. ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
6. Rigid slope is assumed for Ts < 0.05 s
7. When a value for D is not calculated, D is < 1cm
8. ky may be estimated using the simplified equations shown below.
9. Examples of how Ts is estimated are shown below.
10. Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements
by Jonathan D. Bray and Thaleia Travasarou
Journal of Geotechnical and Geonvironmental Engineering, Vol 133, No. 4, pp. 381-392, April 2007

Flow Run-Out Analyses

FLOW RUN-OUT ANALYSIS OF PLASTIC FLUID

Cardano's Cubic Formula Reduction

SECTION A-A' (B-B')

PROBLEM DEFINITION

95	Initial length, ft (x_0)
25	Initial height, ft (H_0)
115	Unit weight, pcf (γ)
300	Cohesion, psf (c)

CARDANO'S PARAMETERS

75	a
0	b
-4090937.5	c
364877929.7	d
-18181.9	Q
-2432519.531	R
-93492357303	D<0
2451661	SQRT (-Q3)
-0.99	R/SQRT (-Q3)
172.84	theta
57.61	theta divided by 3, degrees
1.01	converted to radian
5.19	theta+4Pi/3
0.46	cos (theta+4Pi/3)

CUBIC ROOTS

144.5	X1 - Final length (x_f)
125.0	X2, X3
24.7	Final height (H_f)

APPROXIMATE ENERGY METHOD (SIMULTANEOUS EQUATIONS)

$$\frac{c}{4}x_f^3 - \left(\frac{c}{4}x_0^2 + \gamma H_0^2 \frac{x_0}{2}\right)x_f + \frac{9}{16}\gamma H_0^2 x_0^2 = 0$$

$$H_0 x_0 = \frac{2}{3}H_f x_f$$

Final Parobolic Flow Profile

X	Y
0	24.66163555
10	23.79271926
20	22.8908434
30	21.95194601
40	20.97105518
50	19.94197526
60	18.85681838
70	17.70527665
80	16.47343446
90	15.14170614
95	14.42982591
100	13.68095343
110	12.04432268
120	10.14706512
130	7.80129172
140	4.330978456
144.5	0

Intial Geometry

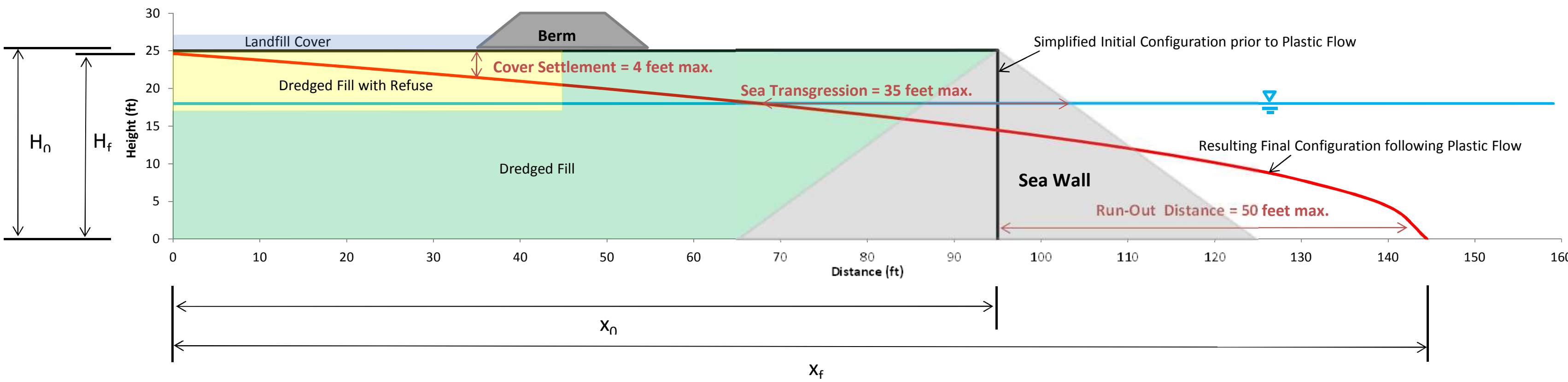
Face	
X	Y
95	0
95	25
Top Surface	
X	Y
0	25
95	25

Water Surface

X	Y
0	18
159	18

Parabolic Formula

$$y^2 = \frac{H_f^2}{x_f}(x_f - x)$$



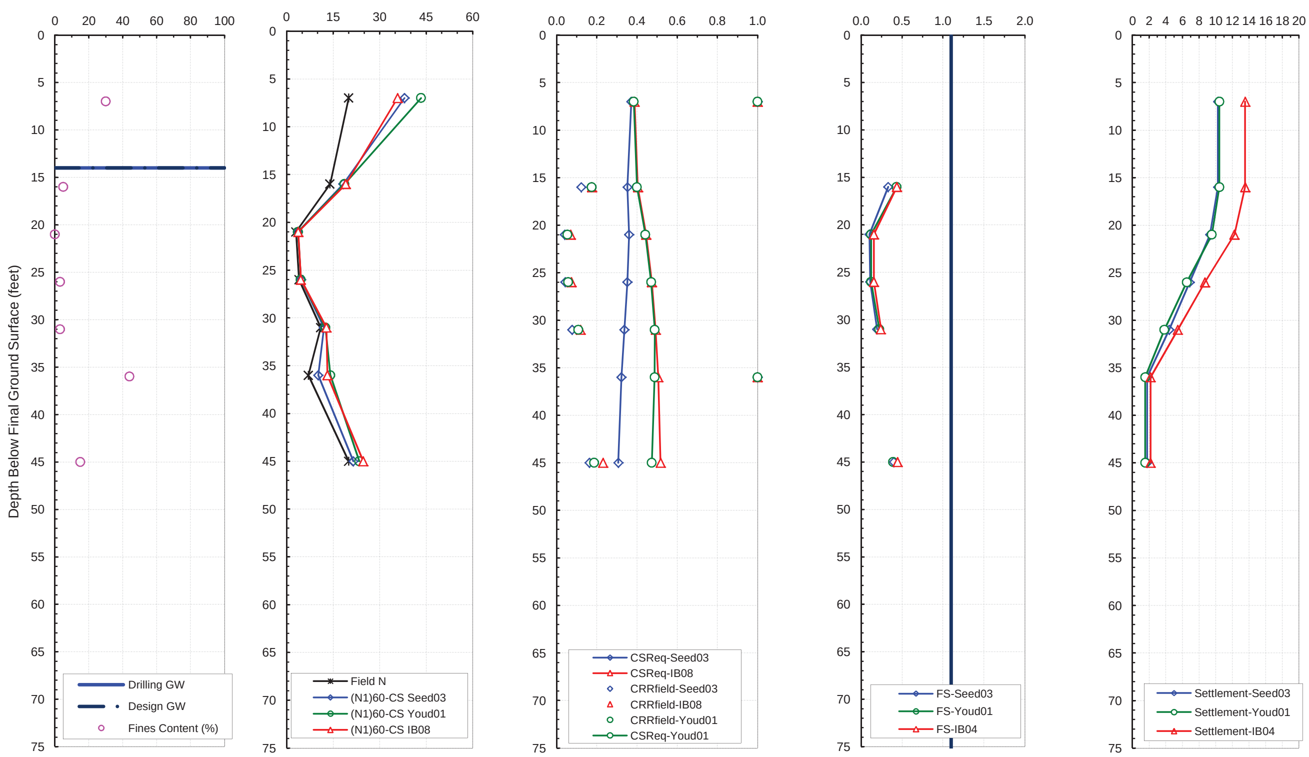
Appendix F
(on CD only)

Settlement Evaluation from Previous Investigation

CH2M Hill Kleinfelder, a Joint Venture
Document Control No. KCH-2622-0006-0029

Liquefaction Induced Settlements

Boring ID:	**KCHSB-1**	M_w= **7.9**	Groundwater Depth During Drilling (ft) = **14.0 ft**	Existing Ground Elevation = **19.5 ft**	Ana. by:	Morley John
		PGA= **0.60g**	Design Groundwater Depth (ft) = **14.0 ft**	Final Ground Elevation = **19.5 ft**	Checked by:	John Liao



1. $(N_1)_{60\text{-}CS}$ capped at 60; 2. CRRfield = 1 for non-liquefiable soils; 3. FS is capped at 2.0 for liquefiable soils and not plotted for non-liquefiable soils including soils above G.W.T.

KLEINFELDER
Bright People. Right Solutions.

1330 Broadway, #1200
Oakland, California 94612
t: 510628 9000 f: 510 628 9009

Project Name: **Alameda Installation Restoration Site 2**
Project No.: **106454**
Project Location: **Alameda, CA**

LIQUEFACTION ANALYSIS

Date 6/13/2011 **FIGURE A-1**

KCH-2622-0006-0029

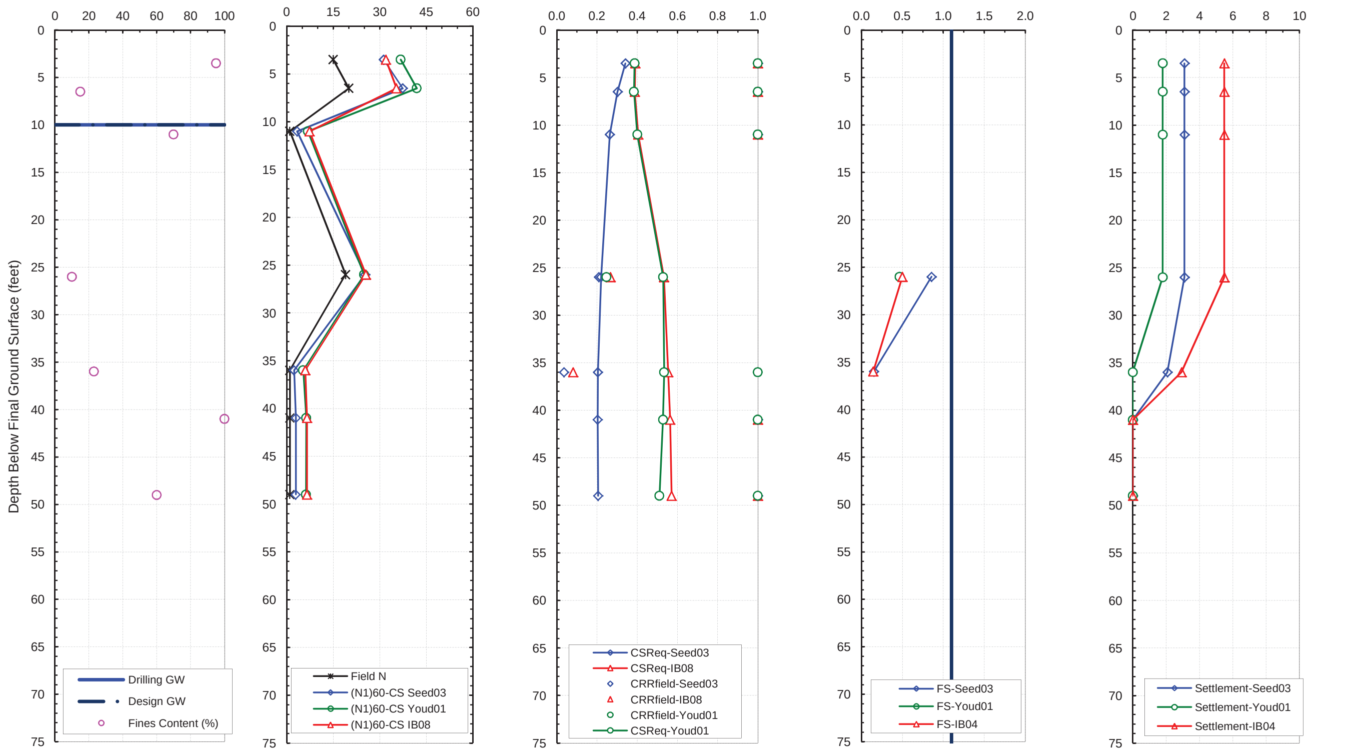
Boring ID: **KCHSB-3**

M_w= **7.9**
PGA= **0.60g**

Groundwater Depth During Drilling (ft) = **10.0 ft**
Design Groundwater Depth (ft) = **10.0 ft**

Existing Ground Elevation = **16.2 ft**
Final Ground Elevation = **16.2 ft**

Ana. by: Morley John
Checked by: John Liao



1. $(N_1)_{60\text{-}CS}$ capped at 60; 2. CRRfield = 1 for non-liquefiable soils; 3. FS is capped at 2.0 for liquefiable soils and not plotted for non-liquefiable soils including soils above G.W.T.

KLEINFELDER
Bright People. Right Solutions.

1330 Broadway, #1200
Oakland, California 94612
t: 510628 9000 f: 510 628 9009

Project Name: Alameda Installation Restoration Site 2
Project No.: 106454
Project Location: Alameda, CA

LIQUEFACTION ANALYSIS

Date 6/13/2011 **FIGURE A-1**

KCH-2622-0006-0029

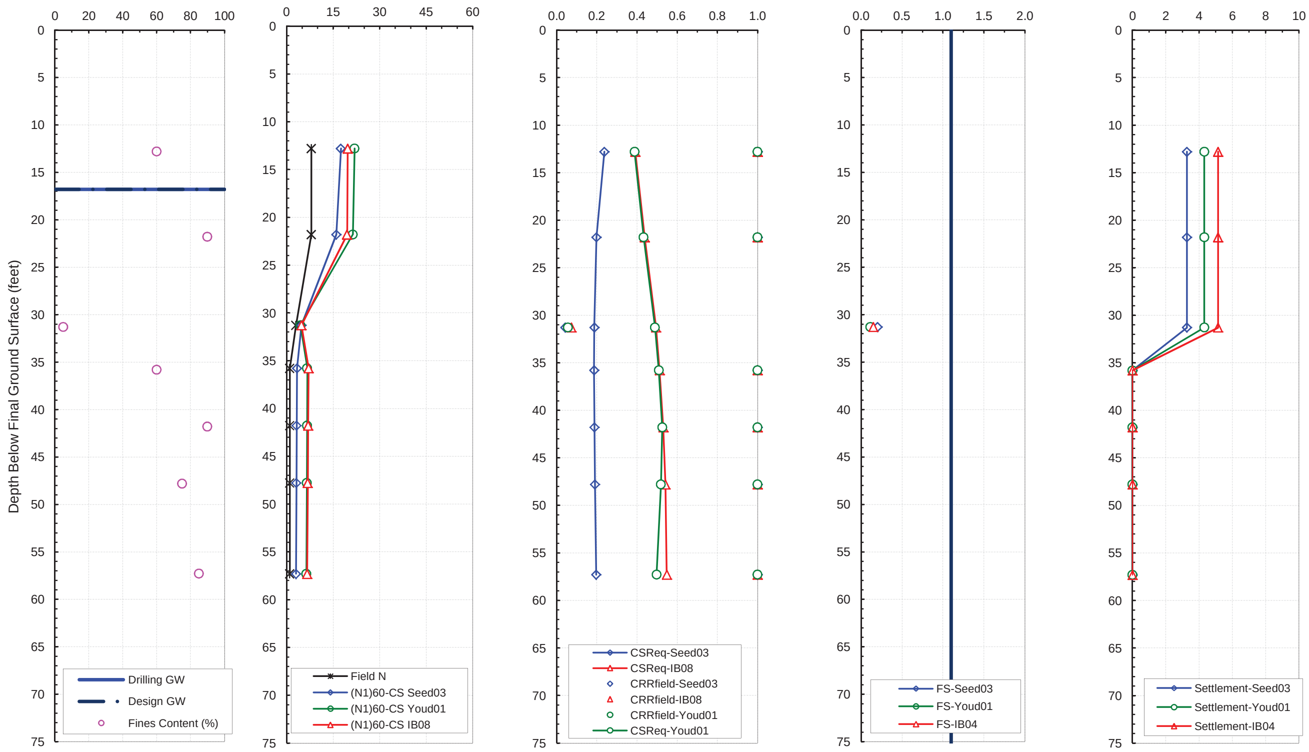
Boring ID: **KCHSB-4**

M_w= **7.9**
PGA= **0.60g**

Groundwater Depth During Drilling (ft) = **6.0 ft**
Design Groundwater Depth (ft) = **6.0 ft**

Existing Ground Elevation = **16.2 ft**
Final Ground Elevation = **27.0 ft**

Ana. by: Morley John
Checked by: John Liao



1. $(N_1)_{60\text{-}CS}$ capped at 60; 2. CRRfield = 1 for non-liquefiable soils; 3. FS is capped at 2.0 for liquefiable soils and not plotted for non-liquefiable soils including soils above G.W.T.

KLEINFELDER
Bright People. Right Solutions.

1330 Broadway, #1200
Oakland, California 94612
t: 510628 9000 f: 510 628 9009

Project Name: **Alameda Installation Restoration Site 2**
Project No.: **106454**
Project Location: **Alameda, CA**

LIQUEFACTION ANALYSIS

Date 6/13/2011 **FIGURE A-1**

KCH-2622-0006-0029

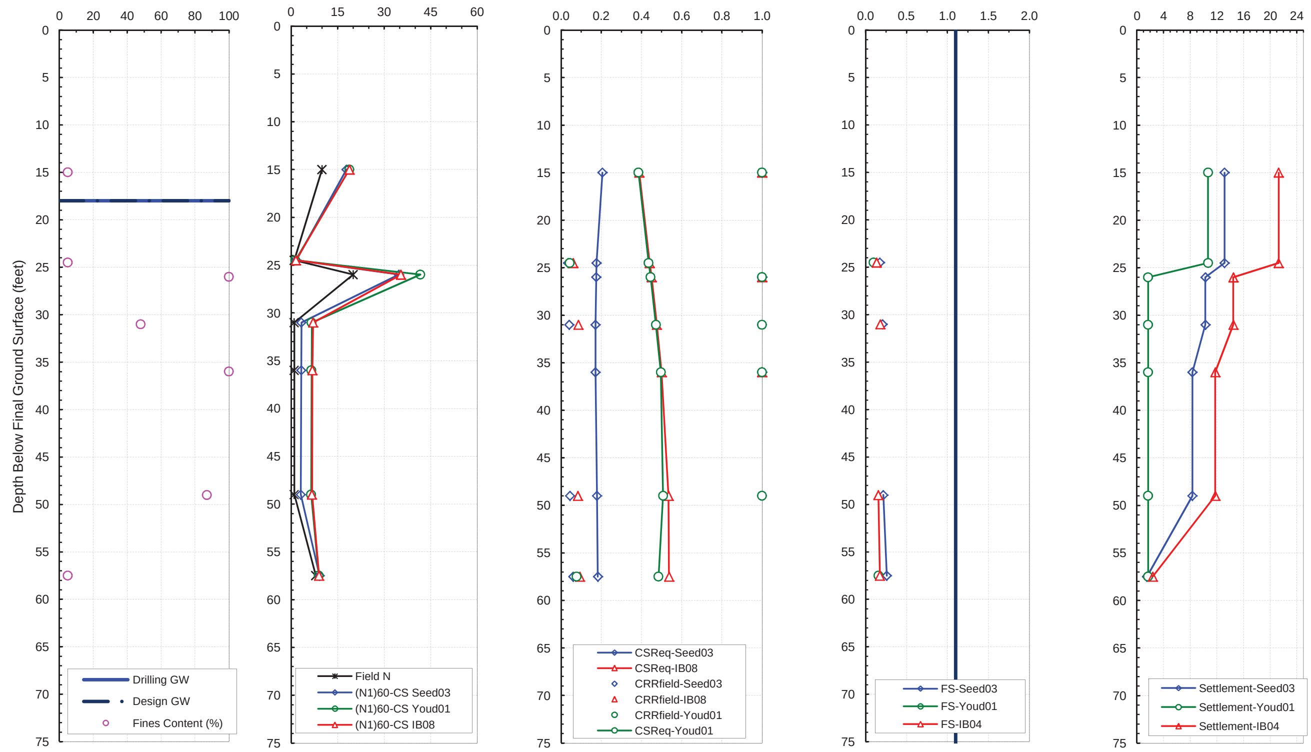
Boring ID: **KCHSB-5**

M_w= **7.9**
PGA= **0.60g**

Groundwater Depth During Drilling (ft) = **8.0 ft**
Design Groundwater Depth (ft) = **8.0 ft**

Existing Ground Elevation = **10.9 ft**
Final Ground Elevation = **20.9 ft**

Ana. by: Morley John
Checked by: John Liao



1. $(N_1)_{60\text{-}CS}$ capped at 60; 2. CRRfield = 1 for non-liquefiable soils; 3. FS is capped at 2.0 for liquefiable soils and not plotted for non-liquefiable soils including soils above G.W.T.

KLEINFELDER
Bright People. Right Solutions.

1330 Broadway, #1200
Oakland, California 94612
t: 510628 9000 f: 510 628 9009

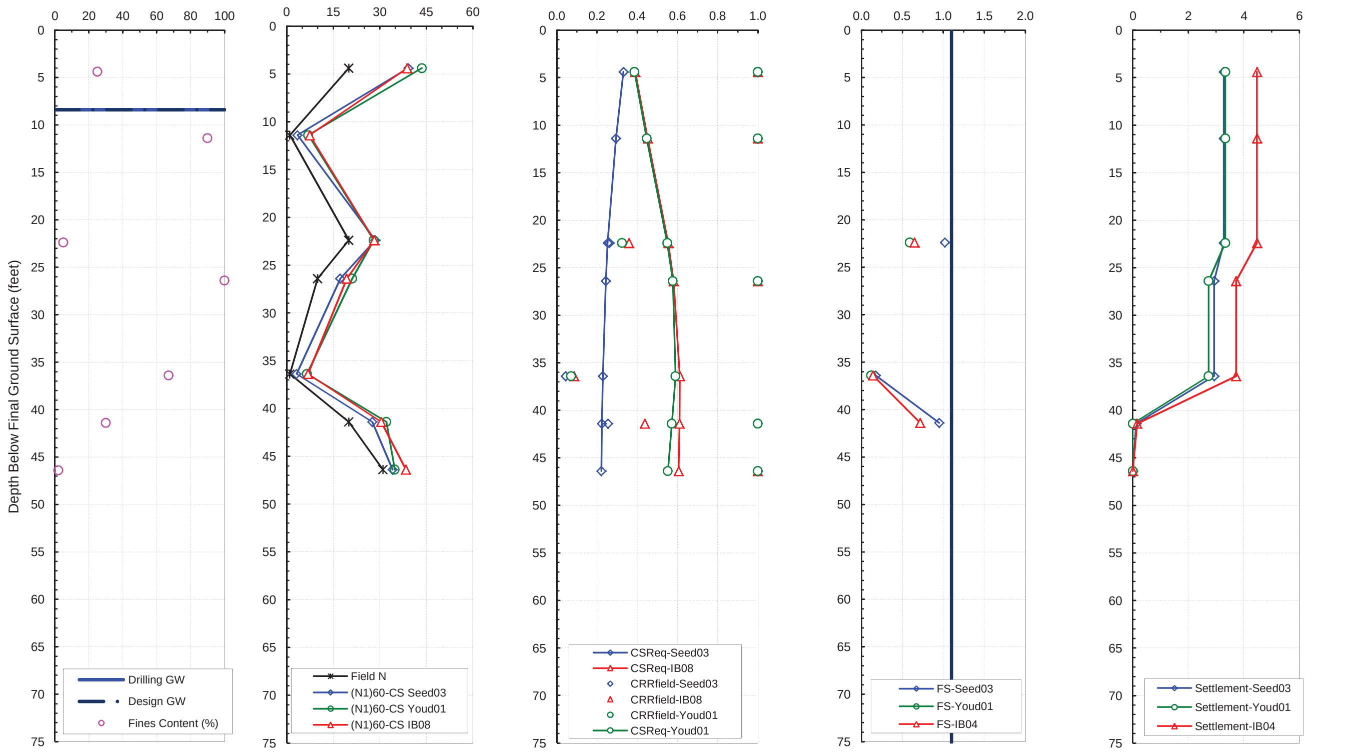
Project Name: Alameda Installation Restoration Site 2
Project No.: 106454
Project Location: Alameda, CA

LIQUEFACTION ANALYSIS

Date 6/13/2011

FIGURE A-1

Boring ID: **KCHSB-6**	M_w= **7.9**	Groundwater Depth During Drilling (ft) = **8.0 ft**	Existing Ground Elevation = **13.4 ft**	Ana. by:	Morley John
	PGA= **0.60g**	Design Groundwater Depth (ft) = **8.0 ft**	Final Ground Elevation = **13.8 ft**	Checked by:	John Liao



1. $(N_1)_{60\text{-}CS}$ capped at 60; 2. CRRfield = 1 for non-liquefiable soils; 3. FS is capped at 2.0 for liquefiable soils and not plotted for non-liquefiable soils including soils above G.W.T.

KLEINFELDER
Bright People. Right Solutions.

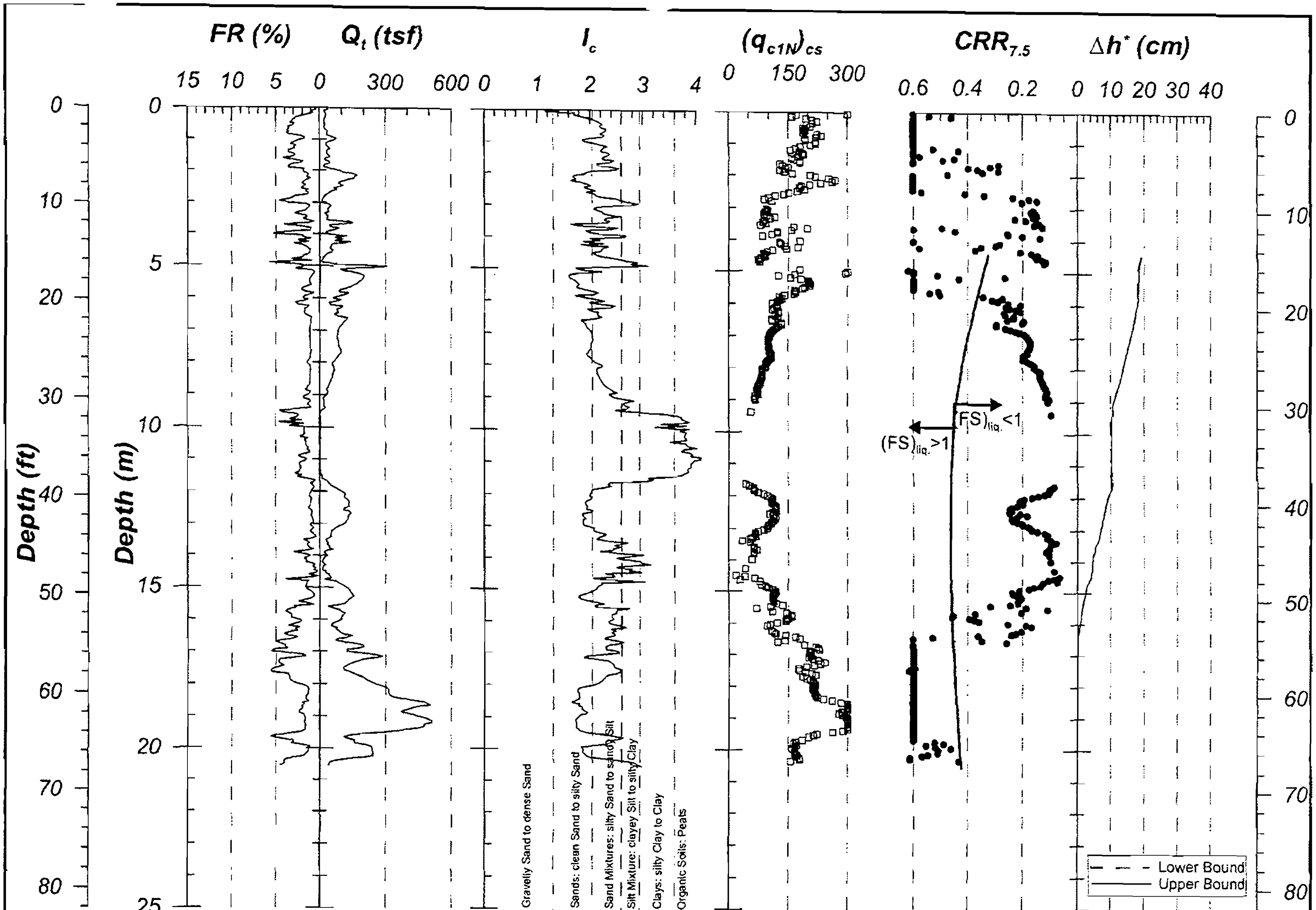
1330 Broadway, #1200
Oakland, California 94612
t: 510628 9000 f: 510 628 9009

Project Name: **Alameda Installation Restoration Site 2**
Project No.: **106454**
Project Location: **Alameda, CA**

LIQUEFACTION ANALYSIS

Date 6/13/2011 **FIGURE A-1**

KCH-2622-0006-0029



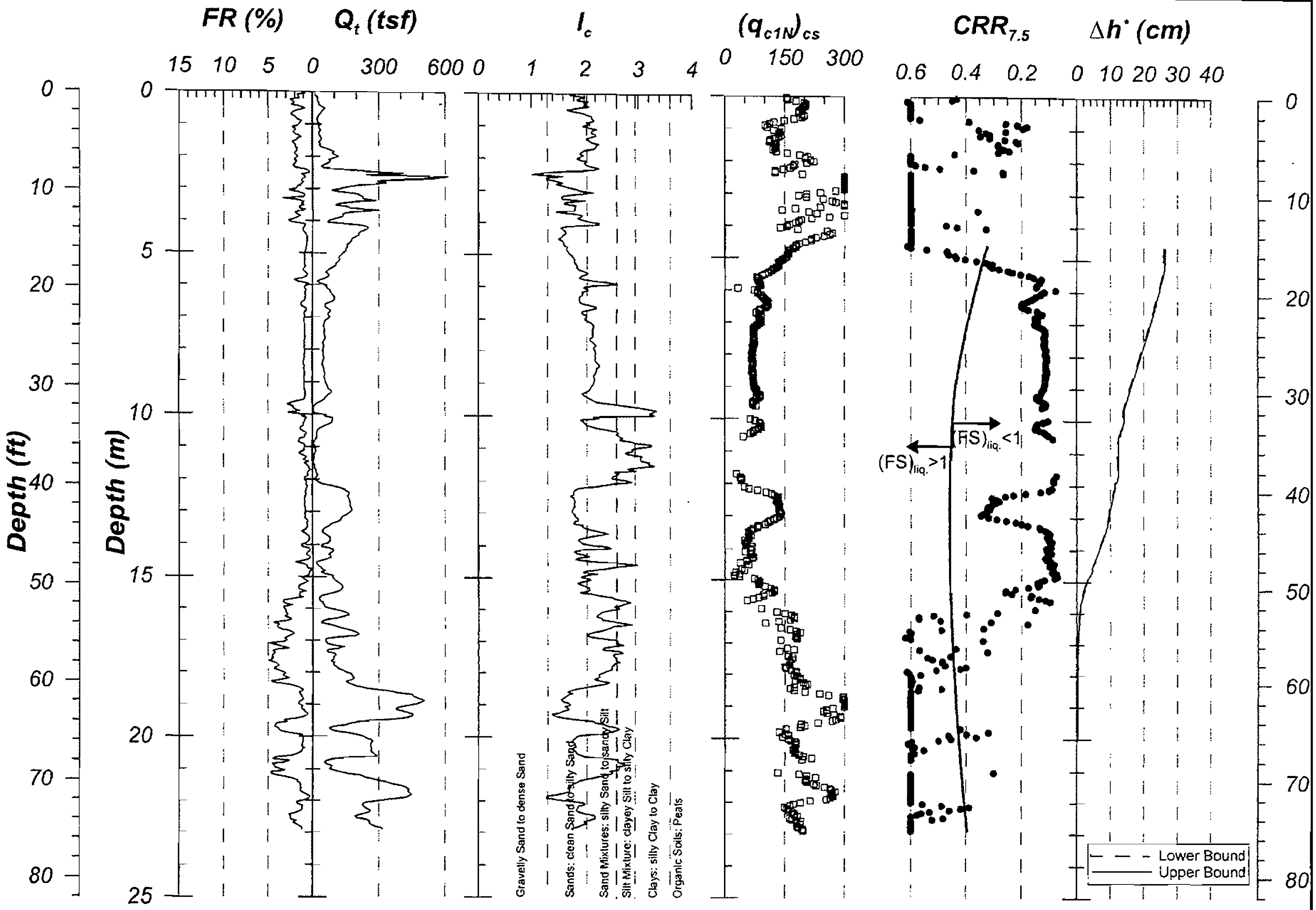
NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

ALAMEDA NAS - Alameda Point, Alameda, CA
Project No. 01-0810
HUSHMAND ASSOCIATES INC.

Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-1

Figure L4

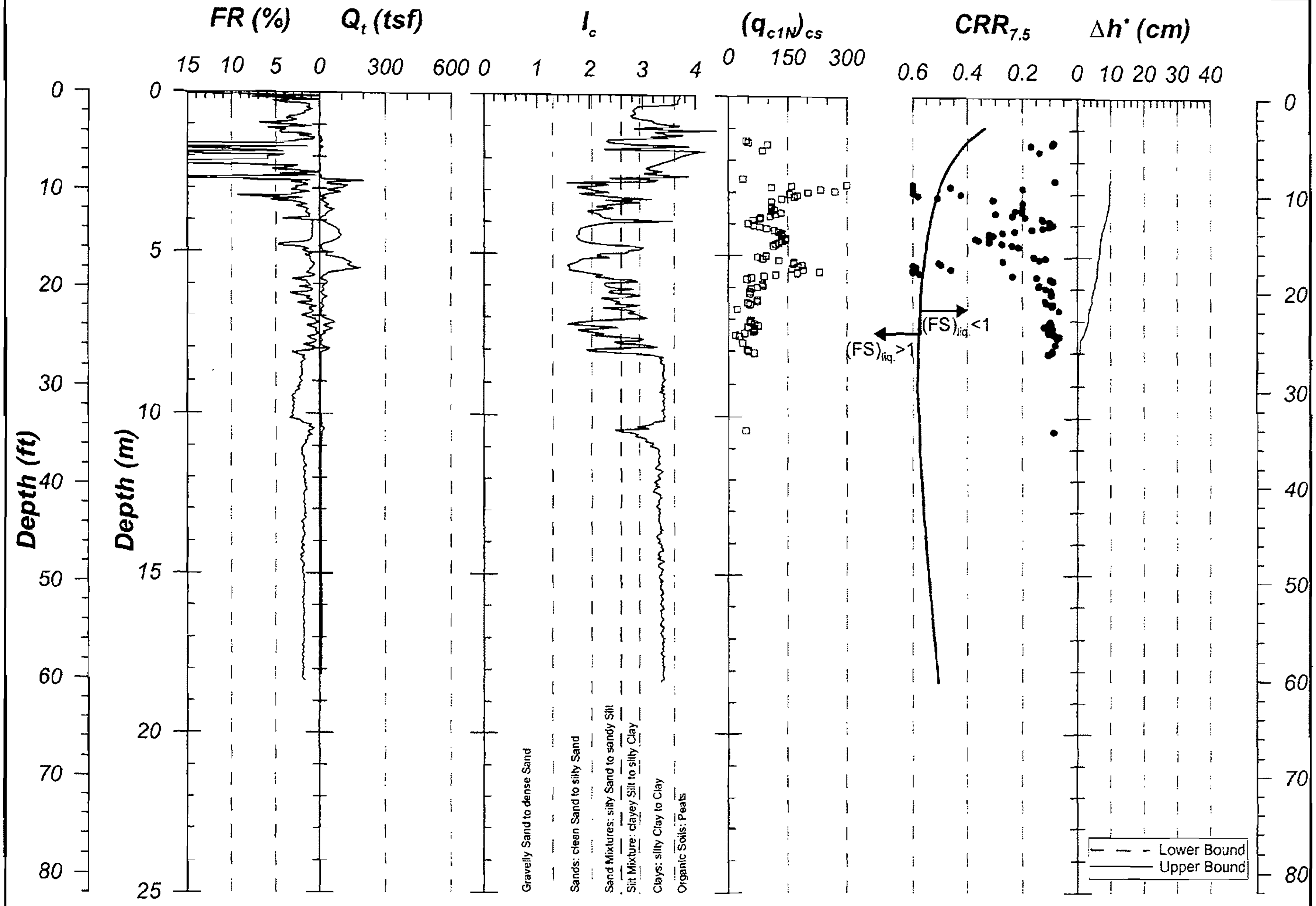
Date: July 2002



NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

ALAMEDA NAS - Alameda Point, Alameda, CA	Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-2
Project No. 01-0810	
HUSHMAND ASSOCIATES INC.	Figure L5

Date: July 2002



NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

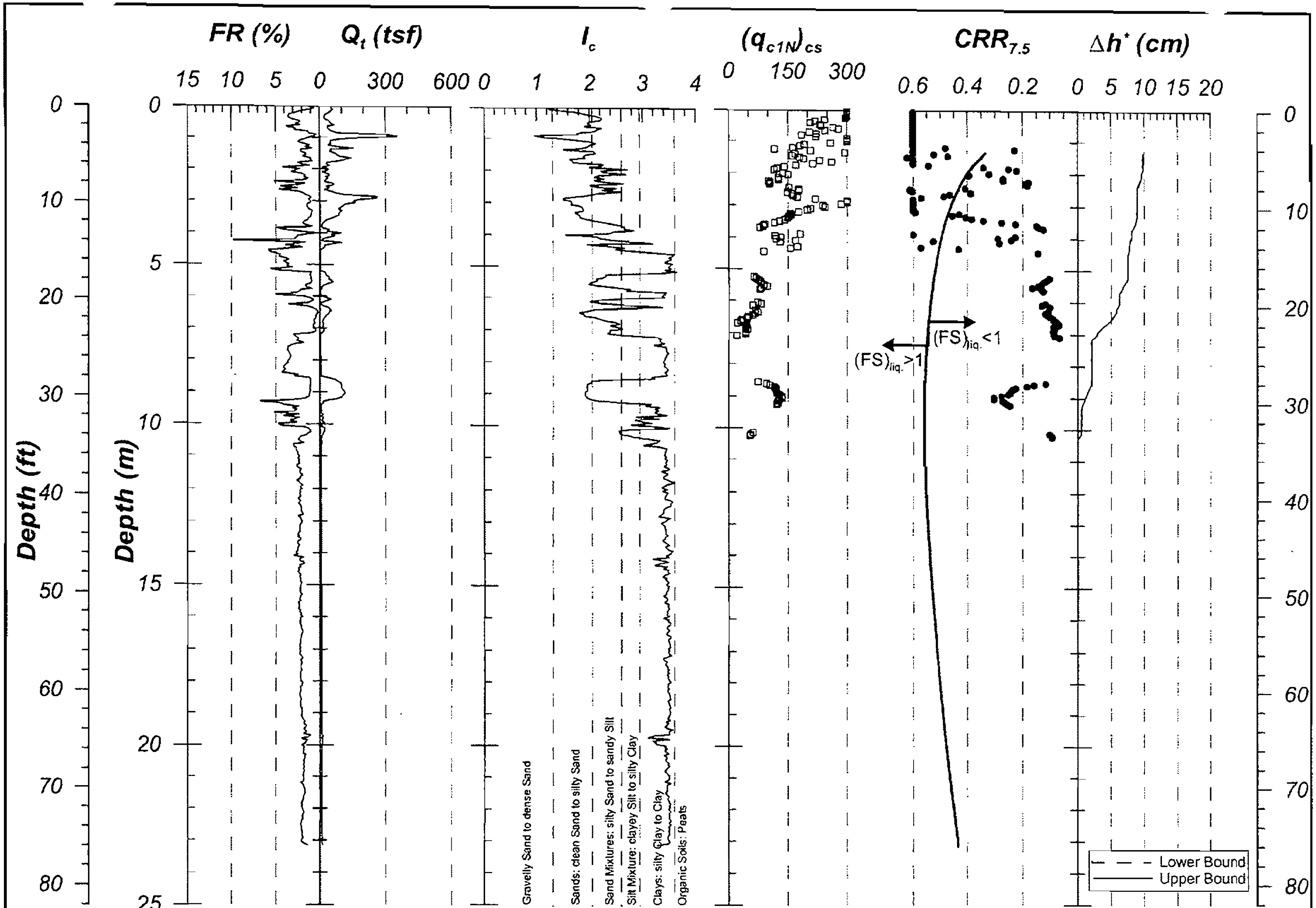
ALAMEDA NAS - Alameda Point, Alameda, CA
Project No. 01-0810
HUSHMAND ASSOCIATES INC.

Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-11E

Figure L14

O:\HAI\Projects\Project\2002\Site2&Site12-CPTs\CPT11E-liq.xls, CPT11E-liq.gif

Date: July 2002

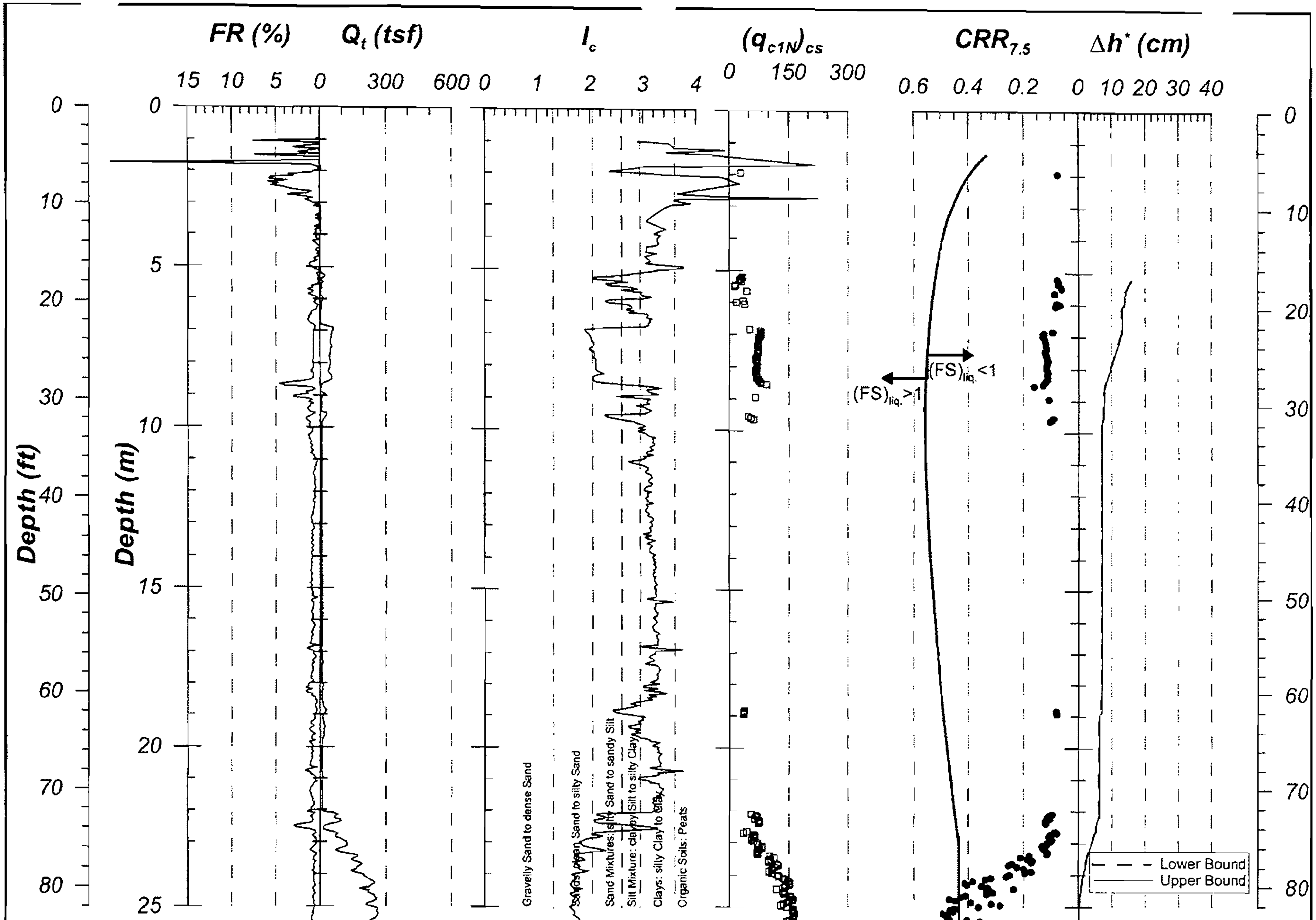


NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

ALAMEDA NAS - Alameda Point, Alameda, CA	**Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-12A**
Project No. 01-0810	
HUSHMAND ASSOCIATES INC.	**Figure L15**

Opt\HAI\Projects\Project-2002\Site28Site12\CPTs\CPT12A-liq.xls, CPT12A-liq.grf

Date: July 2002



NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

ALAMEDA NAS - Alameda Point, Alameda, CA

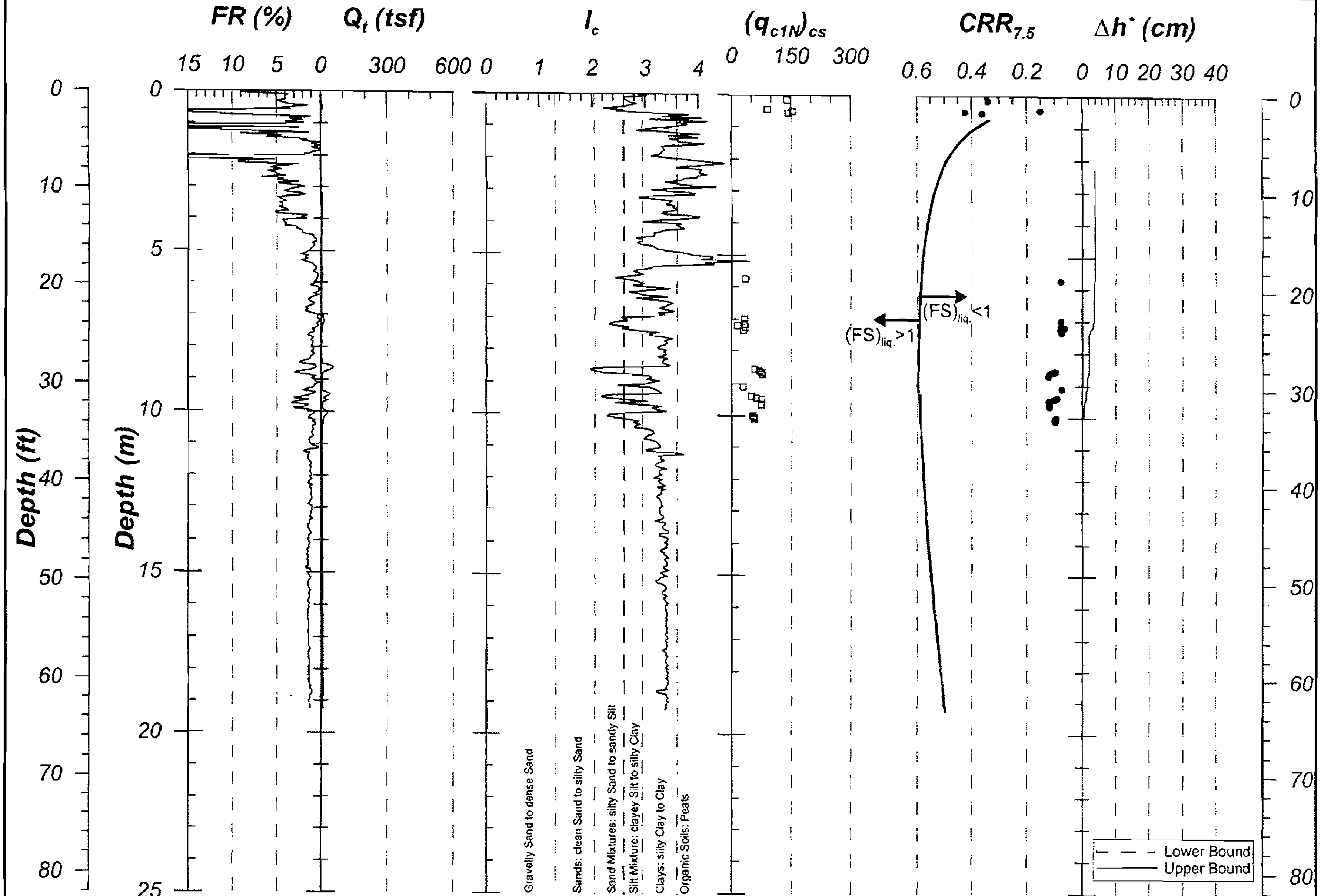
Project No. 01-0810

HUSHMAND ASSOCIATES INC.

Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-13

Figure L16

Date: July 2002



NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

ALAMEDA NAS - Alameda Point, Alameda, CA

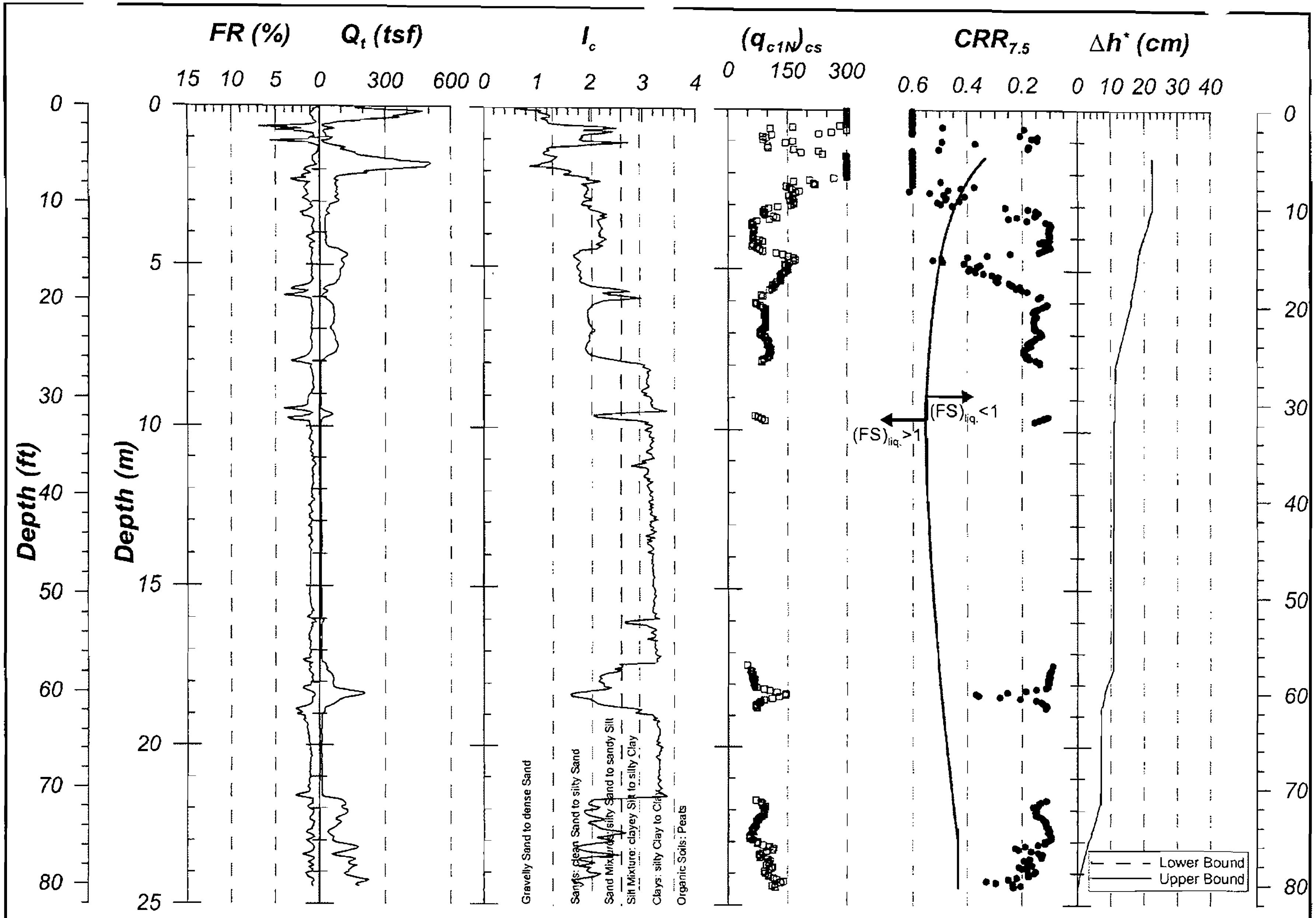
Project No. 01-0810

HUSHMAND ASSOCIATES INC.

Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-14

Figure L17

Date: July 2002



NOTE:
$(q_{c1N})_{cs}$ and CRR plots are truncated at 300 and 0.6, respectively.
* Δh is liquefaction-induced settlement and does not include earthquake-induced settlement of unsaturated soils.

ALAMEDA NAS - Alameda Point, Alameda, CA	Integrated CPT Method for Estimating Subsurface Stratification at CPT C-2-15A
Project No. 01-0810	
HUSHMAND ASSOCIATES INC.	Figure L18

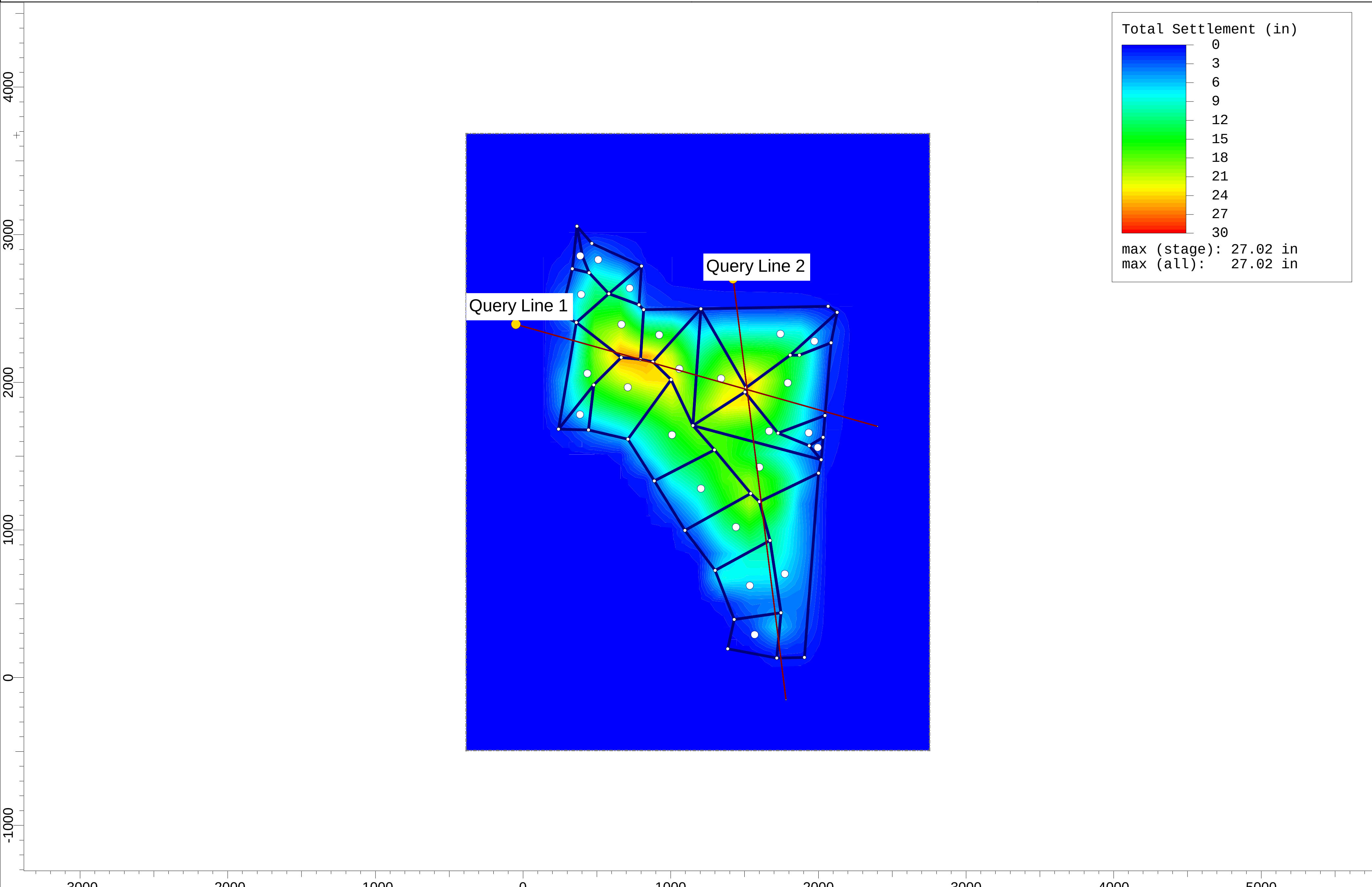
Date: July 2002

Static Long-Term Settlements

Stage 2 = 15000 mon

Data Type: Total Settlement

KCH-2622-0006-0027



rocscience

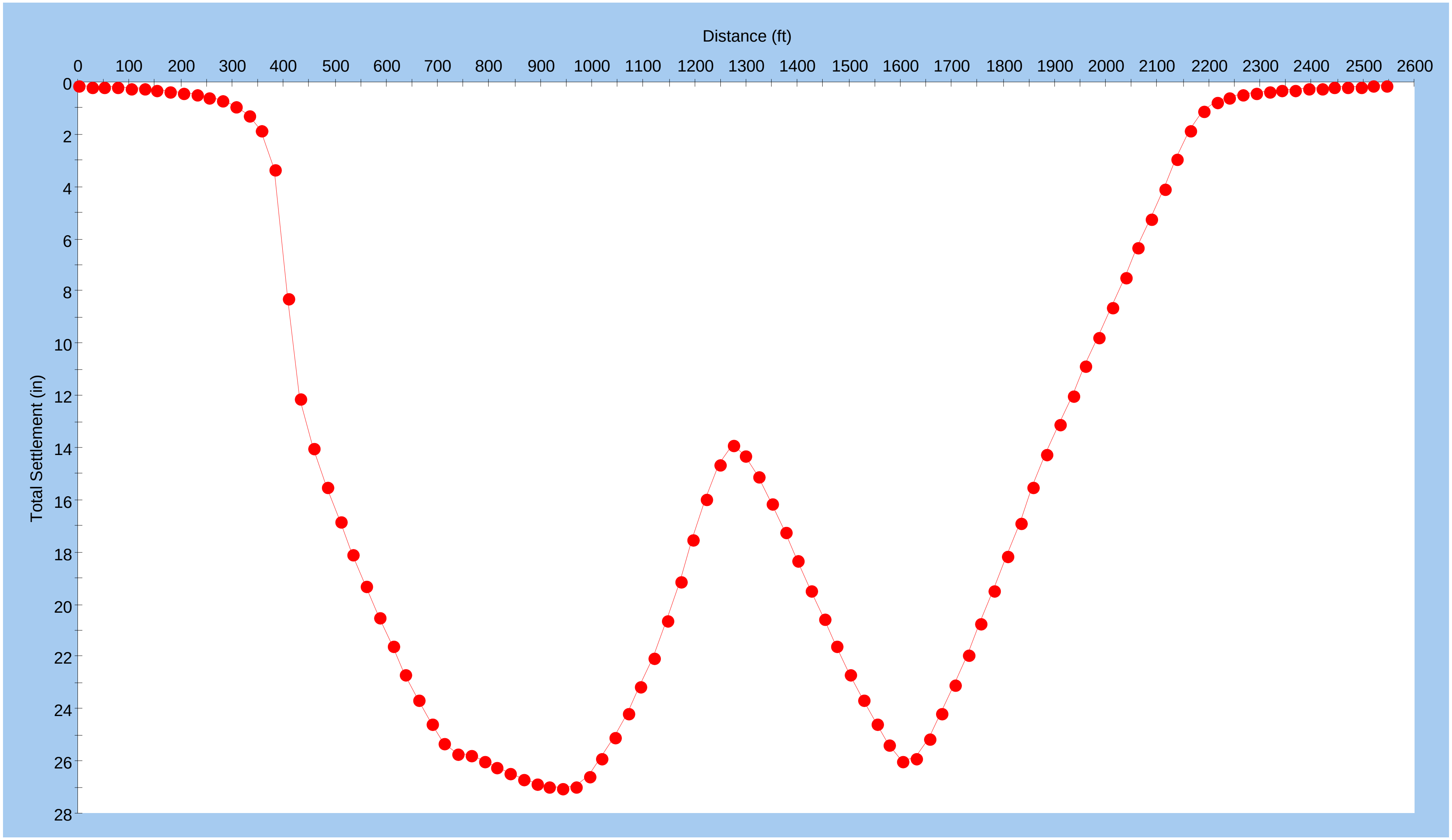
Project	Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California		
Analysis Description	Consolidation settlement calculation		
Drawn By	John Liao	*Company*	Kleinfelder
Date	6/9/2011, 1:46:30 PM	*File Name*	Alameda_Point_ThickYBM.s3z

SETTLE3D 2.010

KCH-2622-0006-0027

Data Type:

Distance vs. Total Settlement



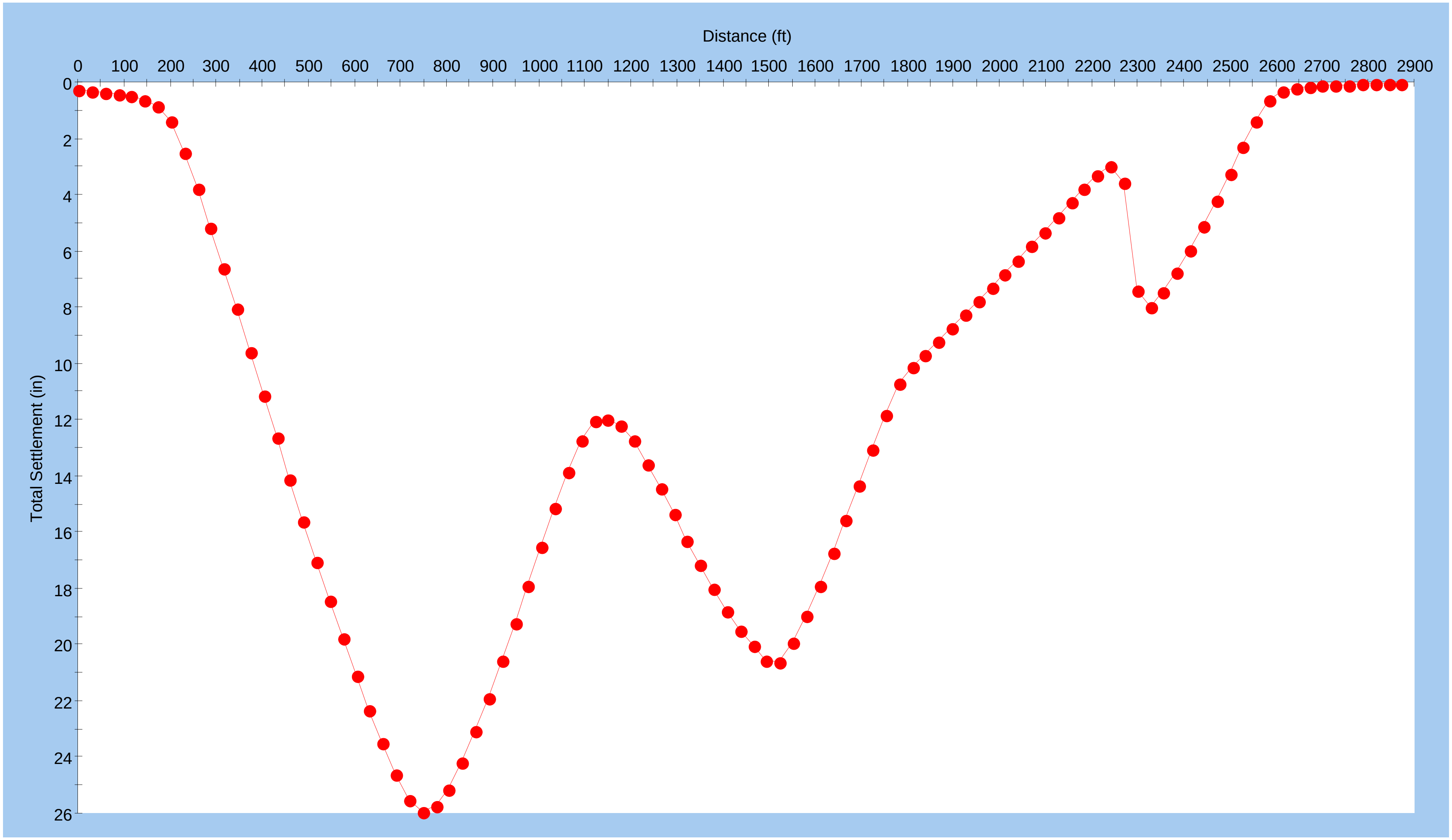
Query Line 1 (Stage 2 = 15000 mon)
Total Settlement at Depth = 0 ft
Reference Stage: None

rocscience	*Project* Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California		
	Analysis Description Consolidation settlement calculation		
	Drawn By John Liao	*Company* Kleinfelder	
SETTLE3D 2.010	*Date* 6/9/2011, 1:46:30 PM	*File Name* Alameda_Point_ThickYBM.s3z	

KCH-2622-0006-0027

Data Type:

Distance vs. Total Settlement



Query Line 2 (Stage 2 = 15000 mon)
Total Settlement at Depth = 0 ft
Reference Stage: None

Project	Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California
Analysis Description	Consolidation settlement calculation
Drawn By	John Liao
Company	Kleinfelder
Date	6/9/2011, 1:46:30 PM
File Name	Alameda_Point_ThickYBM.s3z

SETTLE3D 2.010

Settle3D Analysis Information

Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California

Project Settings

Document Name: Alameda_Point_ThickYBM
Project Title: Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California
Analysis: Consolidation settlement calculation
Author: John Liao
Company: Kleinfelder
Date Created: 6/9/2011, 1:46:30 PM
Stress Computation Method: Westergaard
Time-dependent Consolidation Analysis
Time Units: months
Permeability Units: feet/day
Include buoyancy effect when material settles below water table
Include vertical stress reduction due to settlement above a point
Use average properties to calculate layered stresses
Groundwater method: Water Table
Water Unit Weight: 0.0624 kips/ft^3
Depth to water table: 5 [ft]

Stage Settings

Stage #	Name	Time [months]
1	Stage 1	0
2	Stage 2	15000

Results

Time taken to compute: 120.241 seconds

Stage: Stage 1 = 0 mon

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.100112
Consolidation Settlement [in]	-0.00224142	0
Immediate Settlement [in]	0	0.102354
Secondary Settlement [in]	0	0
Loading Stress [ksf]	0	1.86432
Effective Stress [ksf]	0	6.102
Total Stress [ksf]	0	14.1025
Total Strain	-5.26433e-006	0.000186288
Pore Water Pressure [ksf]	0	8.00136
Excess Pore Water Pressure [ksf]	0	1.83606

Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	0.0312517	6.10042
Over-consolidation Ratio	1	1.00091
Void Ratio	0	1.10001
Permeability [ft/d]	0	0.00010475
Coefficient of Consolidation [ft^2/d]	0	0.03
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0

Stage: Stage 2 = 15000 mon

Data Type	Minimum	Maximum
Total Settlement [in]	0	27.0154
Consolidation Settlement [in]	0	26.9131
Immediate Settlement [in]	0	0.102354
Secondary Settlement [in]	0	0
Loading Stress [ksf]	0	1.86432
Effective Stress [ksf]	0	7.36335
Total Stress [ksf]	0	13.9153
Total Strain	0	0.0676856
Pore Water Pressure [ksf]	0	6.552
Excess Pore Water Pressure [ksf]	-2.76396e-015	2.34892e-015
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.0312517	7.54752
Over-consolidation Ratio	1	1.06034
Void Ratio	0	1.09998
Permeability [ft/d]	0	0.00010475
Coefficient of Consolidation [ft^2/d]	0	0.03
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	100

Loads

1. Polygonal Load

Load Type: Flexible
Area of Load: 139792 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1501.78	1934.05	1.8
1510.63	1963.64	1.795
1204.59	2498.01	0

2. Polygonal Load

Load Type: Flexible
Area of Load: 269218 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1204.59	2498.01	0
1510.63	1963.64	1.795
1808.94	2184.04	0.95
2127.44	2473.4	0
2065.23	2514.83	0

3. Polygonal Load

Load Type: Flexible
Area of Load: 29372.5 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1808.94	2184.04	0.95
1871.09	2183.54	0.78
2086.17	2268.35	0
2127.44	2473.4	0

4. Polygonal Load

Load Type: Flexible
Area of Load: 217081 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1501.78	1934.05	1.8
1726.82	1656.55	0.72
2044.89	1775.48	0
2086.17	2268.35	0
1871.09	2183.54	0.78
1808.94	2184.04	0.95
1510.63	1963.64	1.795

5. Polygonal Load

Load Type: Flexible
Area of Load: 32879.3 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]

1726.82	1656.55	0.72
1938.02	1570.41	0.58
2032.35	1627.51	0
2044.89	1775.48	0

6. Polygonal Load

Load Type: Flexible
Area of Load: 6809.44 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1938.02	1570.41	0.58
2019.34	1475.26	0
2032.35	1627.51	0

7. Polygonal Load

Load Type: Flexible
Area of Load: 125800 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
2019.34	1475.26	0
1938.02	1570.41	0.58
1726.82	1656.55	0.72
1501.78	1934.05	1.8

8. Polygonal Load

Load Type: Flexible
Area of Load: 189257 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1296.49	1542.13	1.07
1542.2	1247.36	1.41
1600.2	1191.3	1.44
2000.65	1384.81	0
2019.34	1475.26	0

9. Polygonal Load

Load Type: Flexible

Area of Load: 299326 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1600.2	1191.3	1.44
1671.98	928.94	0.58
1745.85	439.07	0.67
1717.51	132.05	0
1904.89	136.11	0
2000.65	1384.81	0

10. Polygonal Load

Load Type: Flexible
Area of Load: 82286 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1745.85	439.07	0.67
1429.33	393.33	0
1386.04	194.22	0
1717.51	132.05	0

11. Polygonal Load

Load Type: Flexible
Area of Load: 153887 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1671.98	928.94	0.58
1300.87	725.24	0.67
1429.33	393.33	0
1745.85	439.07	0

12. Polygonal Load

Load Type: Flexible
Area of Load: 164034 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1600.2	1191.3	1.44
1542.2	1247.36	1.41

1096.55	997.03	0
1300.87	725.24	0
1671.98	928.94	0.58

13. Polygonal Load

Load Type: Flexible
Area of Load: 186618 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1296.49	1542.13	1.07
888.48	1331.85	0.33
1096.55	997.03	0
1542.2	1247.36	1.41

14. Polygonal Load

Load Type: Flexible
Area of Load: 194611 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1002.17	2017.68	1.62
710.16	1614.14	0.26
888.48	1331.85	0.33
1296.49	1542.13	1.07

15. Polygonal Load

Load Type: Flexible
Area of Load: 108938 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1204.59	2498.01	0
878.48	2138.48	1.89
1002.17	2017.68	1.62

16. Polygonal Load

Load Type: Flexible
Area of Load: 199581 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1002.17	2017.68	1.62
878.48	2138.48	1.89
794.7	2155.41	1.85
664.75	2168.87	1.8
478.3	1982.32	1.02
442.61	1677.49	0.27
710.16	1614.14	0.26

17. Polygonal Load

Load Type: Flexible
Area of Load: 30991.9 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
478.3	1982.32	1.02
239.88	1682.69	0
442.61	1677.49	0.27

18. Polygonal Load

Load Type: Flexible
Area of Load: 118453 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
478.3	1982.32	1.02
664.75	2168.87	1.8
360.37	2404.97	0.8
239.88	1682.69	0

19. Polygonal Load

Load Type: Flexible
Area of Load: 83068.7 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
878.48	2138.48	1.89
1204.59	2498.01	0
816.48	2491.98	0
794.7	2155.41	1.85

20. Polygonal Load

Load Type: Flexible
Area of Load: 126184 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
794.7	2155.41	1.85
816.48	2491.98	0
785.42	2525.17	0.49
580.87	2599.84	0.79
360.37	2404.97	0.8
664.75	2168.87	1.8

21. Polygonal Load

Load Type: Flexible
Area of Load: 27467.6 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
785.42	2525.17	0.49
801.71	2787.79	0.13
580.87	2599.84	0.79

22. Polygonal Load

Load Type: Flexible
Area of Load: 76658.8 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
801.71	2787.79	0.13
465.61	2940.15	0.11
365.43	3057.87	0.31
401.79	2854.51	0.28
446.65	2741.47	0.51
580.87	2599.84	0.79

23. Polygonal Load

Load Type: Flexible
Area of Load: 14152.7 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
401.79	2854.51	0.28
365.43	3057.87	0.31
334.3	2768.92	0.11
446.65	2741.47	0.51

24. Polygonal Load

Load Type: Flexible
Area of Load: 67249.4 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

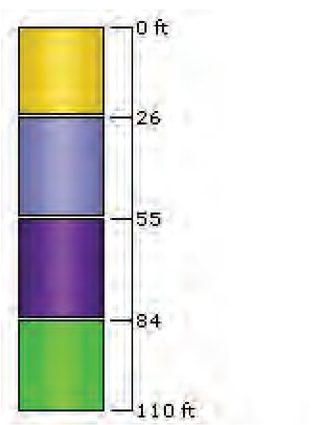
Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
580.87	2599.84	0.79
446.65	2741.47	0.51
334.3	2768.92	0.11
255.02	2458.76	0.15
360.37	2404.97	0.8

Soil Layers

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	Existing Fill	26	0	Yes
2	YBM	29	26	No
3	OBM	29	55	Yes
4	SC	26	84	Yes

Ground Surface Drained: Yes



Soil Properties

Property	Existing Fill	YBM	OBM	SC
Color				
Unit Weight [kips/ft^3]	0.125	0.107	0.107	0.123

Saturated Unit Weight [kips/ft^3]	0.125	0.107	0.107	0.123
Immediate Settlement	Enabled	Disabled	Disabled	Enabled
Es [ksf]	10000			10000
Esur [ksf]	10000			10000
Primary Consolidation	Disabled	Enabled	Enabled	Disabled
Material Type		Non-Linear	Non-Linear	
Cce		0.25	0.2	
Cre		0.03	0.03	
OCR	1	1	1	1
Cv [ft^2/d]		0.03	0.03	
B-bar		1	1	

Query Lines

Line #	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	-48.668, 2392.49	2400.73, 1701.1	100	Auto: 71
2	1422.65, 2700.24	1781, -149.652	100	Auto: 71

Field Point Grid

Number of points: 494
Expansion Factor: 2

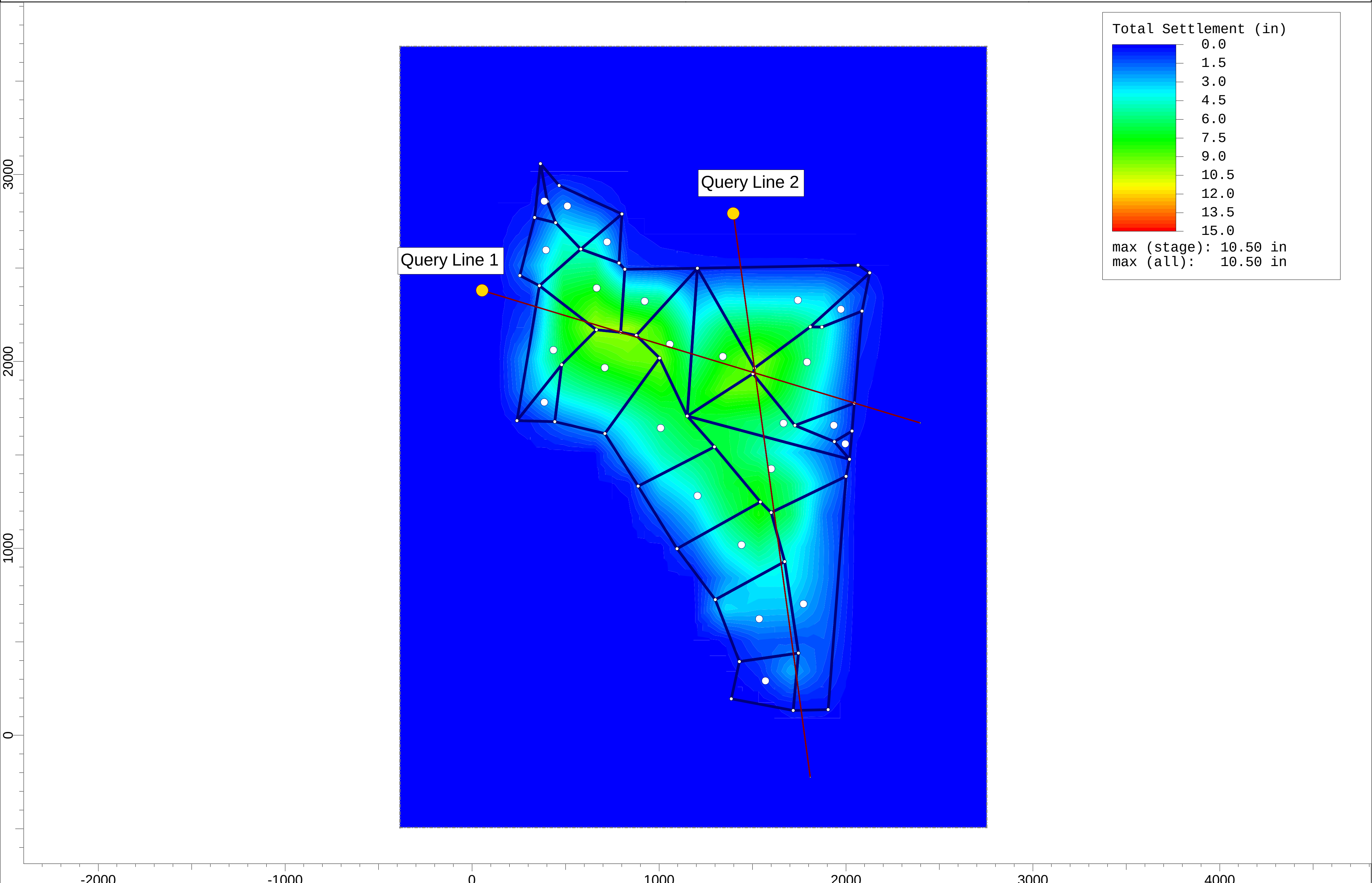
Grid Coordinates

X [ft]	Y [ft]
2753.82	3684.25
2753.82	-494.33
-386.5	-494.33
-386.5	3684.25

KCH-2622-0006-0027

Stage 2 = 15000 mon

Data Type: Total Settlement



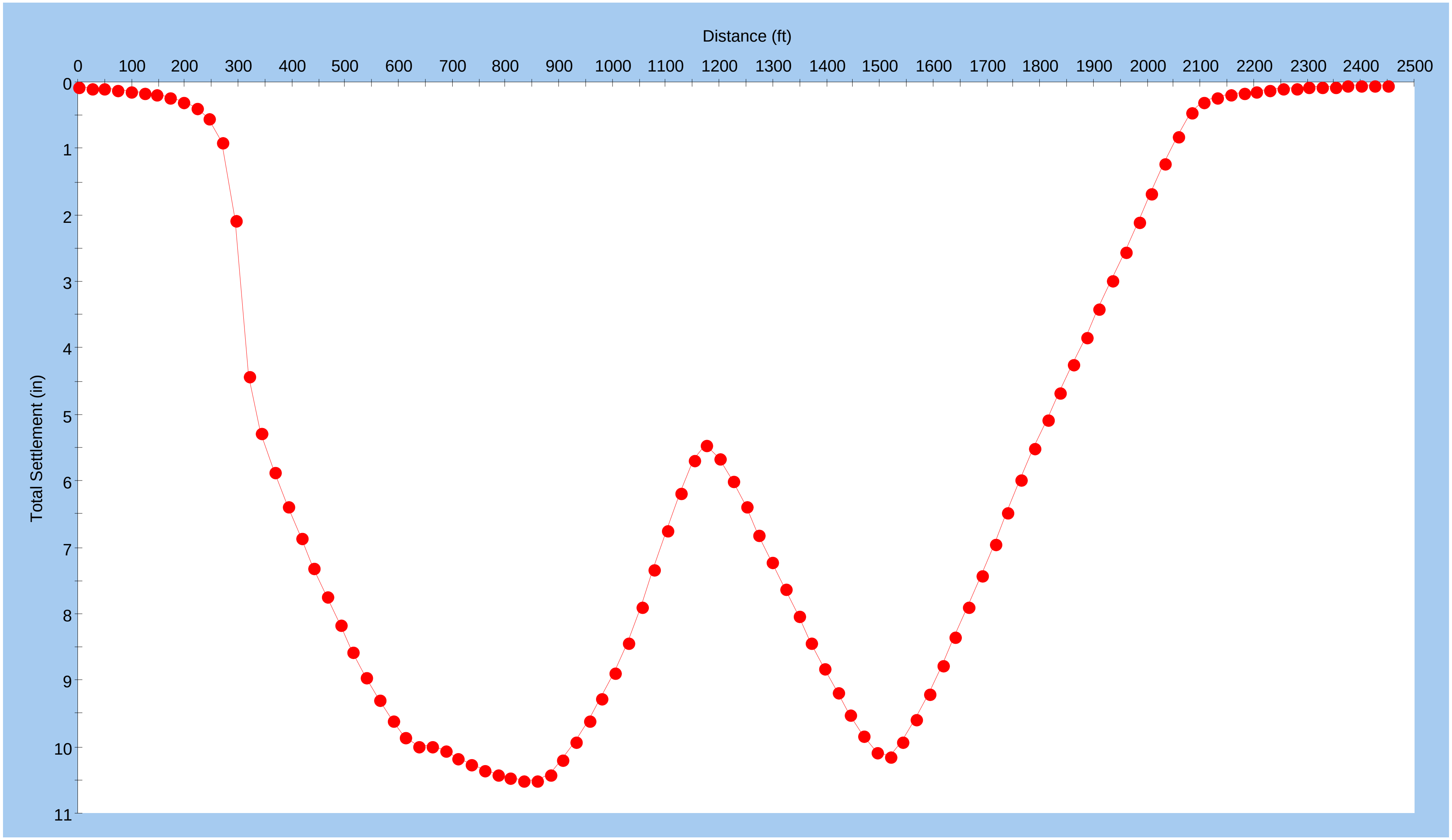
Project	Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California
Analysis Description	Consolidation settlement calculation
Drawn By	John Liao
Company	Kleinfelder
Date	6/9/2011, 1:46:30 PM
File Name	Alameda_Point_ThinYBM.s3z

SETTLE3D 2.010

KCH-2622-0006-0027

Data Type:

Distance vs. Total Settlement



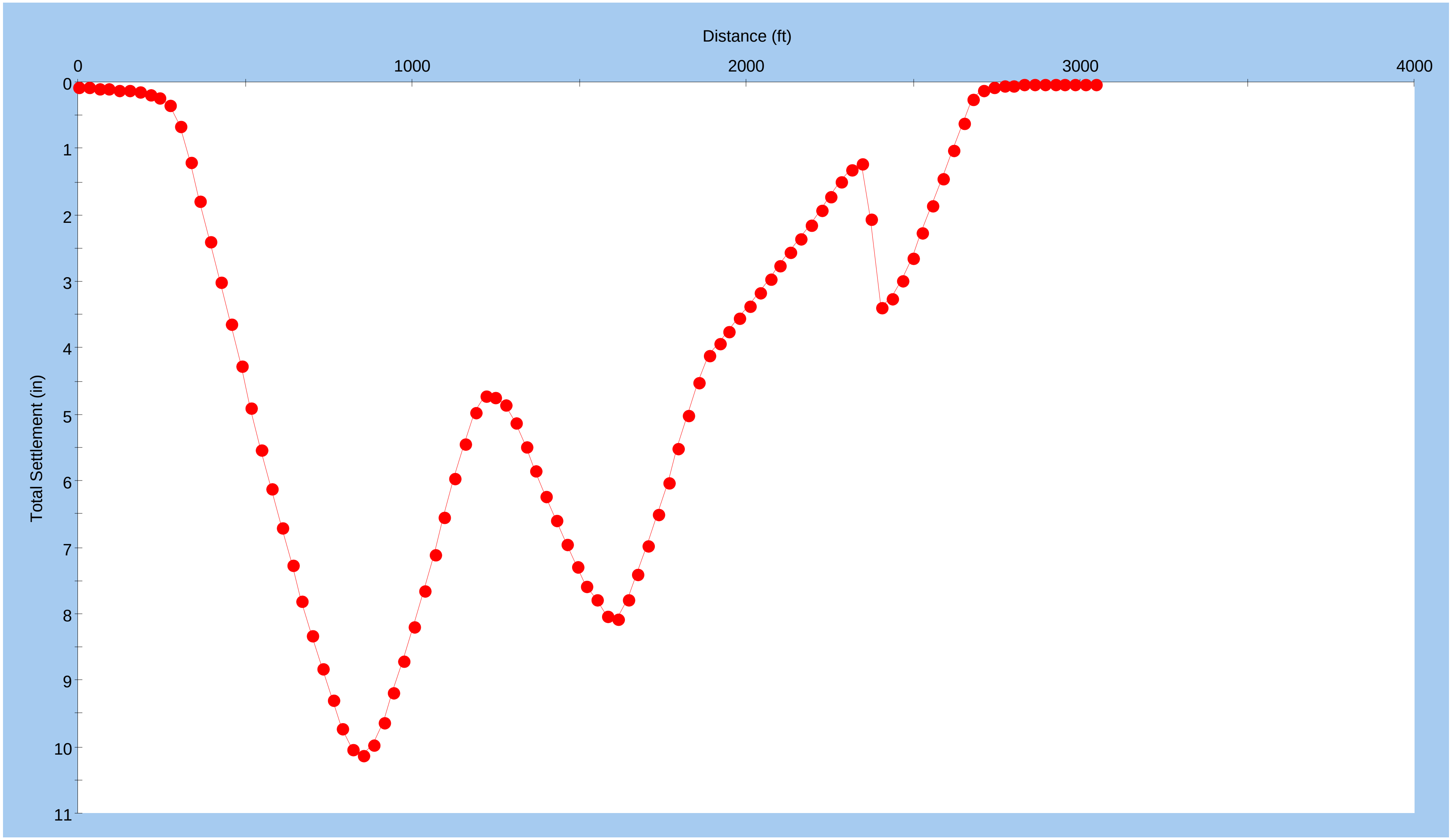
Query Line 1 (Stage 2 = 15000 mon)
Total Settlement at Depth = 0 ft
Reference Stage: None

Project	Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California		
Analysis Description	Consolidation settlement calculation		
Drawn By	John Liao	*Company*	Kleinfelder
Date	6/9/2011, 1:46:30 PM	*File Name*	Alameda_Point_ThinYBM.s3z

SETTLE3D 2.010

Data Type:

Distance vs. Total Settlement



Query Line 2 (Stage 2 = 15000 mon)
Total Settlement at Depth = 0 ft
Reference Stage: None

Project	Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California		
Analysis Description	Consolidation settlement calculation		
Drawn By	John Liao	*Company*	Kleinfelder
Date	6/9/2011, 1:46:30 PM	*File Name*	Alameda_Point_ThinYBM.s3z

SETTLE3D 2.010

Settle3D Analysis Information

Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California

Project Settings

Document Name: Alameda_Point_ThinYBM
Project Title: Alameda Installation Restoration Site 2, Former Naval Air Station Alameda, Alameda County, California
Analysis: Consolidation settlement calculation
Author: John Liao
Company: Kleinfelder
Date Created: 6/9/2011, 1:46:30 PM
Stress Computation Method: Westergaard
Time-dependent Consolidation Analysis
Time Units: months
Permeability Units: feet/day
Include buoyancy effect when material settles below water table
Include vertical stress reduction due to settlement above a point
Use average properties to calculate layered stresses
Groundwater method: Water Table
Water Unit Weight: 0.0624 kips/ft^3
Depth to water table: 5 [ft]

Stage Settings

Stage #	Name	Time [months]
1	Stage 1	0
2	Stage 2	15000

Results

Time taken to compute: 116.269 seconds

Stage: Stage 1 = 0 mon

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.174685
Consolidation Settlement [in]	-0.00129762	0
Immediate Settlement [in]	0	0.175982
Secondary Settlement [in]	0	0
Loading Stress [ksf]	0	1.86012
Effective Stress [ksf]	0	6.803
Total Stress [ksf]	0	14.8033
Total Strain	-7.783e-006	0.000185874
Pore Water Pressure [ksf]	0	8.00173
Excess Pore Water Pressure [ksf]	0	1.83428

Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	0.0312517	6.80118
Over-consolidation Ratio	1	1.00151
Void Ratio	0	1.10002
Permeability [ft/d]	0	0.000104544
Coefficient of Consolidation [ft^2/d]	0	0.03
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0

Stage: Stage 2 = 15000 mon

Data Type	Minimum	Maximum
Total Settlement [in]	0	10.4964
Consolidation Settlement [in]	0	10.3204
Immediate Settlement [in]	0	0.175982
Secondary Settlement [in]	0	0
Loading Stress [ksf]	0	1.86012
Effective Stress [ksf]	0	8.17946
Total Stress [ksf]	0	14.7315
Total Strain	0	0.0674566
Pore Water Pressure [ksf]	0	6.552
Excess Pore Water Pressure [ksf]	-2.53493e-033	2.52497e-033
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.0312517	8.20265
Over-consolidation Ratio	1	1.00805
Void Ratio	0	1.09998
Permeability [ft/d]	0	0.000104544
Coefficient of Consolidation [ft^2/d]	0	0.03
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	100

Loads

1. Polygonal Load

Load Type: Flexible
Area of Load: 139792 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1501.78	1934.05	1.8
1510.63	1963.64	1.795
1204.59	2498.01	0

2. Polygonal Load

Load Type: Flexible
Area of Load: 269218 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1204.59	2498.01	0
1510.63	1963.64	1.795
1808.94	2184.04	0.95
2127.44	2473.4	0
2065.23	2514.83	0

3. Polygonal Load

Load Type: Flexible
Area of Load: 29372.5 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1808.94	2184.04	0.95
1871.09	2183.54	0.78
2086.17	2268.35	0
2127.44	2473.4	0

4. Polygonal Load

Load Type: Flexible
Area of Load: 217081 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1501.78	1934.05	1.8
1726.82	1656.55	0.72
2044.89	1775.48	0
2086.17	2268.35	0
1871.09	2183.54	0.78
1808.94	2184.04	0.95
1510.63	1963.64	1.795

5. Polygonal Load

Load Type: Flexible
Area of Load: 32879.3 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]

1726.82	1656.55	0.72
1938.02	1570.41	0.58
2032.35	1627.51	0
2044.89	1775.48	0

6. Polygonal Load

Load Type: Flexible
Area of Load: 6809.44 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1938.02	1570.41	0.58
2019.34	1475.26	0
2032.35	1627.51	0

7. Polygonal Load

Load Type: Flexible
Area of Load: 125800 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
2019.34	1475.26	0
1938.02	1570.41	0.58
1726.82	1656.55	0.72
1501.78	1934.05	1.8

8. Polygonal Load

Load Type: Flexible
Area of Load: 189257 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1296.49	1542.13	1.07
1542.2	1247.36	1.41
1600.2	1191.3	1.44
2000.65	1384.81	0
2019.34	1475.26	0

9. Polygonal Load

Load Type: Flexible

Area of Load: 299326 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1600.2	1191.3	1.44
1671.98	928.94	0.58
1745.85	439.07	0.67
1717.51	132.05	0
1904.89	136.11	0
2000.65	1384.81	0

10. Polygonal Load

Load Type: Flexible
Area of Load: 82286 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1745.85	439.07	0.67
1429.33	393.33	0
1386.04	194.22	0
1717.51	132.05	0

11. Polygonal Load

Load Type: Flexible
Area of Load: 153887 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1671.98	928.94	0.58
1300.87	725.24	0.67
1429.33	393.33	0
1745.85	439.07	0

12. Polygonal Load

Load Type: Flexible
Area of Load: 164034 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1600.2	1191.3	1.44
1542.2	1247.36	1.41

1096.55	997.03	0
1300.87	725.24	0
1671.98	928.94	0.58

13. Polygonal Load

Load Type: Flexible
Area of Load: 186618 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1296.49	1542.13	1.07
888.48	1331.85	0.33
1096.55	997.03	0
1542.2	1247.36	1.41

14. Polygonal Load

Load Type: Flexible
Area of Load: 194611 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1002.17	2017.68	1.62
710.16	1614.14	0.26
888.48	1331.85	0.33
1296.49	1542.13	1.07

15. Polygonal Load

Load Type: Flexible
Area of Load: 108938 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1150.19	1706.87	1.15
1204.59	2498.01	0
878.48	2138.48	1.89
1002.17	2017.68	1.62

16. Polygonal Load

Load Type: Flexible
Area of Load: 199581 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
1002.17	2017.68	1.62
878.48	2138.48	1.89
794.7	2155.41	1.85
664.75	2168.87	1.8
478.3	1982.32	1.02
442.61	1677.49	0.27
710.16	1614.14	0.26

17. Polygonal Load

Load Type: Flexible
Area of Load: 30991.9 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
478.3	1982.32	1.02
239.88	1682.69	0
442.61	1677.49	0.27

18. Polygonal Load

Load Type: Flexible
Area of Load: 118453 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
478.3	1982.32	1.02
664.75	2168.87	1.8
360.37	2404.97	0.8
239.88	1682.69	0

19. Polygonal Load

Load Type: Flexible
Area of Load: 83068.7 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
878.48	2138.48	1.89
1204.59	2498.01	0
816.48	2491.98	0
794.7	2155.41	1.85

20. Polygonal Load

Load Type: Flexible
Area of Load: 126184 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
794.7	2155.41	1.85
816.48	2491.98	0
785.42	2525.17	0.49
580.87	2599.84	0.79
360.37	2404.97	0.8
664.75	2168.87	1.8

21. Polygonal Load

Load Type: Flexible
Area of Load: 27467.6 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
785.42	2525.17	0.49
801.71	2787.79	0.13
580.87	2599.84	0.79

22. Polygonal Load

Load Type: Flexible
Area of Load: 76658.8 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
801.71	2787.79	0.13
465.61	2940.15	0.11
365.43	3057.87	0.31
401.79	2854.51	0.28
446.65	2741.47	0.51
580.87	2599.84	0.79

23. Polygonal Load

Load Type: Flexible
Area of Load: 14152.7 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
401.79	2854.51	0.28
365.43	3057.87	0.31
334.3	2768.92	0.11
446.65	2741.47	0.51

24. Polygonal Load

Load Type: Flexible
Area of Load: 67249.4 ft^2
Depth: 0 ft
Installation Stage: Stage 1 = 0 mon

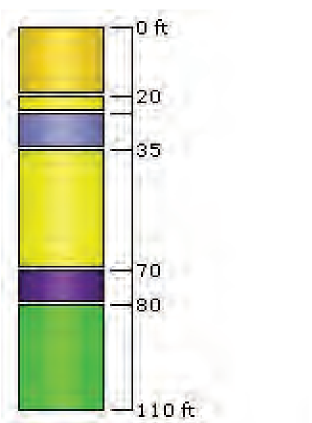
Coordinates and Load

X [ft]	Y [ft]	Load Magnitude [ksf]
580.87	2599.84	0.79
446.65	2741.47	0.51
334.3	2768.92	0.11
255.02	2458.76	0.15
360.37	2404.97	0.8

Soil Layers

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	Existing Fill	20	0	Yes
2	SP	5	20	Yes
3	YBM	10	25	Yes
4	SP (2)	35	35	Yes
5	OBM	10	70	Yes
6	SC	30	80	Yes

Ground Surface Drained: Yes



Soil Properties

Property	Existing Fill	SP	YBM	SP (2)	OBM	SC

Color						
Unit Weight [kips/ft^3]	0.125	0.13	0.107	0.125	0.107	0.123
Saturated Unit Weight [kips/ft^3]	0.125	0.13	0.107	0.125	0.107	0.123
Immediate Settlement	Enabled	Enabled	Disabled	Enabled	Disabled	Enabled
Es [ksf]	10000	10000		10000		10000
Esur [ksf]	10000	10000		10000		10000
Primary Consolidation	Disabled	Disabled	Enabled	Disabled	Enabled	Disabled
Material Type			Non-Linear		Non-Linear	
Cce			0.25		0.2	
Cre			0.03		0.03	
OCR	1	1	1	1	1	1
Cv [ft^2/d]			0.03		0.03	
B-bar			1		1	

Query Lines

Line #	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	53.647, 2379.18	2397.61, 1670.79	100	Auto: 71
2	1397.52, 2790.68	1809.02, -225.219	100	Auto: 71

Field Point Grid

Number of points: 494
Expansion Factor: 2

Grid Coordinates

X [ft]	Y [ft]
2753.82	3684.25
2753.82	-494.33
-386.5	-494.33
-386.5	3684.25

ATTACHMENT 2

RADIOLOGICAL WORK PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 2

FINAL
RADIOLOGICAL WORK PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

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TABLES

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ABBREVIATIONS AND ACRONYMS

μR	microroentgen
μR/hr	microroentgens per hour
AEC	Atomic Energy Commission
ALARA	as low as reasonably achievable
APP	Accident Prevention Plan
BRAC	Base Realignment and Closure
CFR	*Code of Federal Regulations*
cm^2	square centimeter
cm/s	centimeters per second
^{60}Co	cobalt-60
cpm	counts per minute
^{137}Cs	cesium-137
DAC	derived air concentration
DCGL	derived concentration guideline level
$DCGL_W$	wide-area DCGL
DoD	Department of Defense
DON	Department of the Navy
dpm	disintegrations per minute
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
GPS	Global Positioning System
HRA	Historical Radiological Assessment
IC	institutional control
IR	Installation Restoration (Program)
ISO	International Organization for Standardization
LBGR	lower boundary of the gray region
LLRW	low-level radioactive waste

ABBREVIATIONS AND ACRONYMS
(Continued)

m^2	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
$MDCR_{SURVEYOR}$	MDCR calculated assuming a surveyor efficiency
MDER	minimum detectable exposure rate
MeV	megaelectron volt
min	minute
mrem	millirem
m/s	meters per second
NaI	sodium iodide
NAS	Naval Air Station
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
pCi/g	picocuries per gram
pCi/L	picocuries per liter
pCi/mL	picocuries per milliliter
PMO	Program Management Office
PPE	personal protective equipment
QC	quality control
R	roentgen
^{226}Ra	radium-226
RASO	Radiological Affairs Support Office
RAWP	Remedial Action Work Plan
RCA	radiological control area
RCT	Radiological Control Technician
RML	Radioactive Materials License
ROC	radionuclide of concern
ROD	Record of Decision

ABBREVIATIONS AND ACRONYMS
(Continued)

RPM	Remedial Project Manager
RPP	Radiation Protection Plan
RSO	Radiation Safety Officer
RSOR	Radiation Safety Office Representative
RSSI	Radiation Survey and Site Investigation
RWP	Radiation Work Permit
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
^{90}Sr	strontium-90
SSHP	Site Safety and Health Plan
TCRA	time-critical removal action
^{232}Th	thorium-232
TtEC	Tetra Tech EC, Inc.
^{238}U	uranium-238
VTA	Vehicle Towed Array
WRS	Wilcoxon Rank-Sum (test)

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1.0 INTRODUCTION

This Radiological Work Plan for IR Site 2 (Rad Work Plan) describes survey, decontamination procedures, and methodologies to support implementation of the remedial action for soil at Installation Restoration Program (IR) Site 2, Alameda Point, Alameda, California. Tetra Tech EC, Inc. (TtEC) was contracted by the Department of the Navy (DON) to prepare the Remedial Action Work Plan (RAWP), to which this Radiological Work Plan is attached, under Contract Task Order 0009, Contract No. N62473-10-D-0809 for the Base Realignment and Closure (BRAC) Program Management Office (PMO) West under Naval Facilities Engineering Command Southwest.

The selected remedy for soil, as outlined in the Record of Decision (ROD) for IR Site 2, is the installation of a multilayer soil cover (cover), engineering and institutional controls (ICs), and monitoring (DON 2010). The RAWP in conjunction with the 100% Remedial Design (Attachment 1) provides details, specifications, and design drawings for the construction of the cover. The methodologies and processes described in this Rad Work Plan apply to operational radiological activities performed by TtEC in relation to this project. A basic concept in radiation protection specifies that exposures to ionizing radiation and releases of radioactive material should be managed to reduce collective doses to workers and the public and ensure that exposure is as low as reasonably achievable (ALARA). The ALARA principle will be considered during the course of the radiological work carried out under the Rad Work Plan for survey activities.

The objective of this Rad Work Plan is to provide the radiological procedures and methodologies for:

- Clearance of vegetation and subgrading IR Site 2
- Performing an initial survey of the subgrade prior to installing the cover to establish baseline risk and dose estimates
- Removing identified radioactive contamination at twice background radiation levels based on the initial survey
- Disposing of soil exceeding the release criteria for the radionuclides of concern (ROCs) from the ROD (Navy 2010) as low-level radioactive waste (LLRW)
- Performing a final survey of the 2-foot cover to establish final risk and dose estimates
- Providing modeling to demonstrate that, with the 2-foot cover installed, the maximum annual dose to an individual of 15 mrem, and the excess lifetime cancer risk (ELCR) at 3×10^{-4} for the critical group, are not exceeded.

The radiological activities that support the objective of the Rad Work Plan include:

- Reference (background) surveys

- Scoping surveys
- Remedial action support surveys
- Final Status Surveys (FSSs)
- Personnel surveys
- Equipment and material surveys
- Truck surveys
- Decontamination

Where applicable, radiological survey activities will be conducted in accordance with the guidelines in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Nuclear Regulatory Commission (NRC) NUREG-1575 (DoD et al. 2000), as incorporated into this Rad Work Plan. Other survey activities as well as activities not addressed by MARSSIM will be performed in accordance with this Rad Work Plan and the Standard Operating Procedures (SOPs) and the Radiation Protection Plan (Attachment 3 to the RAWP). Table 1-1 lists each of the TtEC field SOPs developed for performing radiological work at Alameda Point.

This Rad Work Plan is organized as follows:

Section 1.0 Introduction – Section 1.0 provides an overview of the project scope, work objectives, and organization of the Rad Work Plan.

Section 2.0 Background – Section 2.0 describes Alameda Point, provides a historical summary of IR Site 2, and includes an overview of the radiological history of IR Site 2.

Section 3.0 Key Radiological Personnel and Work Control Procedures – Section 3.0 discusses the project organization, roles and responsibilities of key project personnel, personnel qualifications, and work control activities.

Section 4.0 ALARA – Section 4.0 discusses ALARA quantitative and qualitative analysis.

Section 5.0 Radiological Controls – Section 5.0 includes a summary of field implementation procedures and practices for the radiological control elements of the project.

Section 6.0 Project-Specific Radiological Control Practices – Section 6.0 describes the overall project in terms of radiological impacts and project-specific radiological control practices.

Section 7.0 Radiological Survey Types, Area Classification, and Selection – Section 7.0 identifies the types of surveys that will be conducted, and discusses survey area classification and survey type selection.

Section 8.0 Survey Overview – Section 8.0 presents an overview of survey planning, survey implementation, and data assessment.

Section 9.0 Release Criteria and Investigation Levels – Section 9.0 identifies the criteria for radiological release for unrestricted use.

Section 10.0 Instrumentation – Section 10.0 identifies field instrumentation that will be used to perform surveys.

Section 11.0 Survey Implementation – Section 11.0 presents the approach to implementing surveys that will be conducted as well as associated sampling activities.

Section 12.0 Decontamination and Disposition – Section 12.0 discusses the survey and construction activities that will be implemented to perform remedial action at sites contaminated by radiation above release limits.

Section 13.0 Radioactive Materials Management – Section 13.0 describes how radioactive materials will be managed, including control of samples, work areas, and wastes.

Section 14.0 Documentation and Records Management – Section 14.0 presents procedures that will be used to manage records/documentation, as well as to assess, interpret, and report data.

Section 15.0 References – Section 15.0 presents references cited in this Rad Work Plan.

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2.0 BACKGROUND

The following section provides a brief radiological history of IR Site 2. The location, description, general site history, and a summary of previous investigations including radiologic surveys and removal actions can be found in Section 2.0 of the RAWP. A figure showing site features is included as Figure 2-2 in the RAWP.

2.1 RADIOLOGICAL HISTORY

IR Site 2 consists of a former landfill, wetlands area, the interior margin (location of the RadShack Area discussed below), and the coastal margin. The landfill covers approximately 60 acres and is bounded to the north by the interior margin and the east by runways and tarmacs. The former landfill was reportedly used for disposal of wastes generated by Former Naval Air Station (NAS) Alameda activities from 1956 through early 1978 (DON 2010). Radioactive items potentially disposed of in the IR Site 2 (West Beach) landfill could have included but are not limited to wastes from radium painting operations, damaged instruments, and other radioluminescent devices including both radium and strontium deck or bridge markers, thoriated glass optical devices, depleted uranium counterweights, and residue from washdown of aircraft participating in observations of nuclear weapons testing and the aftermath. The Historical Radiological Assessment (HRA) and the ROD list cesium-137 (^{137}Cs), cobalt-60 (^{60}Co), radium-226 (^{226}Ra), strontium-90 (^{90}Sr), thorium-232 (^{232}Th), and uranium-238 (^{238}U) as ROCs. The ROCs and their respective release criteria can be found in Table 2-1.

As part of the environmental investigations being performed to facilitate transfer of Alameda Point, an HRA that documents the history of radiological materials at Alameda Point was generated (Weston 2007). As early as 1973, the radioactive wastes generated by NAS, Naval Air Rework Facility, and Naval Air Depot were being disposed of by licensed radioactive waste disposal firms at approved disposal facilities. In 1983, a DON Initial Assessment Study (E&E 1983) reported the use of radioactive materials at Alameda Point starting in the 1940s, particularly at the dial painting section of the instrument shop at Building 5. Dial painting consisted of a two-step process. First, refurbished old aircraft dials were scraped and cleaned in solvent. Then the dials were repainted with radioluminescent paint containing ^{226}Ra. Radium-impacted waste (scraping solids, rags, used paint brushes, and so forth from refurbishing dials and gauges) was collected from the shop and discarded at IR Sites 1 and 2. The radium painting shop was closed in the early 1960s (exact date unknown), and a contractor decontaminated the facility.

Disposal of radioluminescent devices containing radium was not controlled by specific procedures until the late 1960s. Before that time, it was common practice throughout private industry and the military to dispose of radioluminescent instruments and articles by burial in landfills. Other radionuclides were used in radioluminescent devices, but ^{226}Ra is the primary ROC. This survey and previous radiation surveys by PRC Environmental Management, Inc.

(1997) and Supervisor of Shipbuilding, Conversion and Repair, Portsmouth (1999) substantiated these conclusions.

Preliminary radiological surveys were completed at IR Site 2 in September 1995. One anomaly was recovered from the landfill based on this survey. In 1998/1999, a gamma radiation survey using 2-inch by 2-inch sodium-iodide (NaI) scintillation detectors was conducted at the landfill. Fifty locations with the highest readings were excavated and discrete anomalies removed. In 2004, Tetra Tech FW, Inc. conducted radiological characterization surveys at IR Site 2 (TtFW 2005). Soil samples collected indicated ^{226}Ra at levels above background concentrations.

In 2006, TtEC performed additional radiological surveys of the shoreline and the former RadShack Area. The results of these surveys were used to determine the location of radiological anomalies. These anomalies were subsequently removed under a time-critical removal action (TCRA) scope of work (TtEC 2009). The primary objective of the TCRA was to mitigate the potential risk posed by material potentially presenting an explosive hazard and radiological contamination at IR Sites 1, 2, and 32 and the threatened release of hazardous substances to the environment. The radiological removal action objectives were: 1) To prevent ingestion, dermal contact, or inhalation of radiological anomalies with concentrations that significantly exceed background concentrations (6,000 counts per minute [cpm]) and 2) To ensure that the total effective dose equivalent received through all potential pathways from the radium-impacted waste in the surface and subsurface to any member of the public does not exceed 15 millirems per year. During the TCRA, items and soils contaminated with ^{226}Ra were identified and removed from IR Site 2. However, the horizontal and vertical extent of contamination was greater than expected and complete removal was not feasible. Field conditions indicated that ^{226}Ra contamination is still present throughout IR Site 2.

2.1.1 RadShack Area

The RadShack Area is an approximately 32-foot by 42-foot area formerly the site of a small structure (RadShack) used to store radioactive material while awaiting disposal. The RadShack Area was originally a small wood frame structure surrounded by a locked security fence north of the former landfill and west of the ammunition bunkers. At various points throughout its operation from approximately 1973 to 1980, the RadShack was used as a turn-in point for radioactive items to be disposed of either within IR Site 2 or at an off-site location. A number of remedial actions to remove ^{226}Ra devices were conducted. Soil samples in the area of the RadShack indicate that ^{226}Ra levels are still above background concentrations.

3.0 KEY RADIOLOGICAL PERSONNEL AND WORK CONTROL PROCEDURES

This section describes the responsibilities of key personnel necessary for management of radiological activities at Alameda Point. In addition, this section identifies the minimum training requirements for workers at Alameda Point and work control procedures including Radiation Work Permits (RWPs) and radiological notifications.

3.1 KEY RADIOLOGICAL PERSONNEL

Specific personnel are essential in performing radiological activities at Alameda Point. Qualified and experienced personnel will fulfill the necessary functions to ensure the consistent and successful implementation of radiological work activities at Alameda Point. All key radiological personnel are expected to have the requisite skills necessary to perform these functions. The key radiological personnel include the following:

3.1.1 Radiation Safety Officer

The Radiation Safety Officer (RSO) is responsible for implementing, directing, and supervising all radiological project-related activities. The RSO or designee has the responsibility and authority to perform the following:

- Providing oversight of implementation and ensuring compliance with the applicable NRC (or Agreement State, if applicable) Service Provider Radioactive Materials License (RML)
- Serving as contact for NRC site inspections
- Assisting DON representatives during site audits
- Controlling exposure conditions for site workers
- Implementing a dosimetry program for all site workers entering radiologically controlled areas
- Enforcing radiological controls
- Coordinating radiological activities with other NRC or Agreement State licensed contractors
- Ensuring all radiological work activities comply with RML requirements
- Identifying radiological analysis needs
- Providing health physics guidance on an as-needed basis
- Providing radiological control protection services, if required
- Directing and assisting radiological personnel in proper completion of radiological records

- Assisting the Radiation Safety Officer Representative (RSOR) to determine if an external dose is to be assigned to an individual who reported lost or damaged dosimetry devices
- Reviewing all changes to the Sampling and Analysis Plan (SAP) to ensure radiological requirements are met
- Ensuring that the required radiological safety training is provided
- Reviewing and approving project field procedures associated with the handling of radioactive materials or access to radiological areas
- Ensuring timely and thorough review of records, in accordance with the NLP-07 Radiological Records corporate SOP, prior to approval
- Approving records with verifiable signature and date once records meet the quality standards as described in the NLP-07 Radiological Records corporate SOP
- Conducting radiation incident investigations
- Conducting radiological inspections
- Conducting data assessments and evaluations

3.1.2 Radiation Safety Officer Representative

The RSOR will report directly to the RSO and will perform on-site duties as designated by the RSO. In accordance with DON requirements, the RSO or a qualified designee will be on-site during radiological work activities conducted under this Rad Work Plan. The RSOR has the responsibility and authority to perform and/or delegate the following:

- Implementing, directing, and supervising on-site radiological activities
- Assisting in identifying radiological analysis needs
- Providing health physics guidance
- Assisting in establishment of radiological controls
- Overseeing preparation and approval of radiological documents and field procedures
- Establishing personnel monitoring requirements
- Establishing, implementing, and monitoring on-site radiological training programs
- Conducting assessments of field practices and procedures
- Reviewing and approving data from radiological investigations, surveys, and remediations
- Assisting the RSO in ensuring adequate radiological controls are in place at the work site
- Assuring that specified radiological safety procedures are followed and that the radiological safety tests and inspections are complete and acceptable

- Conducting daily oversight and field safety inspections and tests required by the project technical specifications and applicable professional standards
- Attending required meetings, including the pre-construction conference, weekly quality control (QC) meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Administering the on-site dosimetry program
- Verifying compliance with on-site RWPs and SOPs (including laboratory SOPs)
- Assisting the RSO in reviewing changes to the SAP to ensure radiological requirements are met
- Approving issuance of any work document pertaining to radiological safety issues
- Providing surveillance of radiological-related activities
- Assisting the RSO in directing the production of radiological work documents and reports
- Conferring with radiological personnel to provide technical advice and to resolve problems
- Preparing daily project status reports
- Notifying the RSO regarding radioactive anomalies
- Managing the storage of radioactive waste in accordance with the RML
- Overseeing task-specific radiological field activities for compliance with the RML and approved plans, work instructions, SOPs, instrument specifications, and state-of-the-art health physics practices
- Preparing RWPs to outline field conditions, radiological control requirements, and personal protective equipment requirements in the field for RSO approval
- Ensuring all field staff are properly trained and comply with the RWP
- Supervising field staff during survey, site remediation, and decontamination activities, use of survey equipment and instrumentation, and support of other radiological activities
- Ensuring compliance with the applicable SOPs for safety program, survey, and/or remediation activities
- Interpreting and verifying task-specific data accumulated during surveys and monitoring activities

3.1.3 Radiological Control Technicians

Radiological Control Technicians (RCTs) will support projects in the field and have the responsibility and authority to perform the following:

- Performing radiological field activities under the direction of the RSOR or designee in accordance with approved work documents and RML requirements

- Documenting field survey activities in accordance with the Rad Work Plan and SOPs
- Interpreting and verifying field data gathered during survey and monitoring activities
- Supporting dose assessments, and ensuring compliance with emergency plans and procedures
- Performing effluent monitoring and radioactive material inventories
- Performing survey equipment response checks and daily checks of the survey instruments
- Conducting safety evaluations of health physics field and laboratory equipment
- Implementing use of RWPs, including being present at active work areas to ensure compliance

3.2 MINIMUM TRAINING REQUIREMENTS

The minimum training requirements for personnel working in the field at NAS include the following:

- Occupational Safety and Health Administration 40-Hour and Annual 8-Hour Refresher
- Radiation awareness and RWP training
- Activity Hazard Analysis training for the specific task
- Training as required by the implemented Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP)

3.3 WORK CONTROL PROCEDURES

Prerequisites for the initiation of survey activities include review of the Rad Work Plan, radiological evaluation of the designated work areas, and identification of any potential safety concerns. Work control procedures include the preparation and review of RWPs, work instructions, and appropriate notifications of anomalies or significant radiological events.

3.3.1 Radiological Health and Safety

SOPs and work instructions will be used to address controls necessary for radiologically safe operations. Table 1-1 lists each of the TtEC field SOPs developed for performing radiological work at Alameda Point.

Dose rate, contamination, and air monitoring, including initial baseline sampling to determine radiological background conditions, will be performed as necessary and in accordance with the APP/SSHP. Field activities will be performed in accordance with the approved RWP and APP/SSHP. RWPs will be prepared in accordance with the Radiation Protection Plan (RPP) (Attachment 3 to the RAWP) and SOP 10, Issue and Use of Radiation Work Permits. Personnel protective equipment (PPE) levels, dictated by radiological considerations and physical and chemical safety issues identified at each work location, will be assigned or modified, according to the approved RWP and APP/SSHP and SOP 5, Radiological Protective Clothing Selection, Monitoring, and Decontamination.

3.3.2 Task-specific Work Instructions

In limited situations involving ancillary radiological activities (e.g., monitoring well destruction in radiologically impacted areas), or to further augment SOPs, radiological work instructions may be prepared to facilitate a specific activity. These radiological work instructions, when used, will be provided to the BRAC PMO and the Radiological Affairs Support Office (RASO) for review and approval.

3.3.3 Notifications

During survey activities, radioactive anomalies may be identified and significant radiological events could occur. For the purposes of the Rad Work Plan, an anomaly is described as a reading or result that appears to be an outlier in the professional judgment of the RSOR. When an anomaly is identified, the RSOR will notify the RSO and Supervising Project Manager who will notify the BRAC PMO Remediation Project Manager (RPM) and the RASO. If neither the RSO nor the Supervising Project Manager is available, the RSOR will leave a voice mail and confirmatory e-mail describing the anomaly and follow up with a call to the appointed designee, if any.

Significant events include regulatory visits (such as by the NRC or other regulatory agencies), radiological issues, injuries, and breaches in security. All significant events will be disclosed to the RPM and RASO as described above. Any radiological issues will also be reported to the RSO.

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4.0 ALARA

ALARA is a philosophy of striving for excellence in the practice of health physics and is an important aspect of radiation-safety regulations. The National Council on Radiation Protection and Measurements has stated "ALARA is simply the continuation of good radiation-protection programs and practices which traditionally have been effective in keeping the average and individual exposures for monitored workers well below the limits." The application of ALARA clearly includes the consideration of economic and social factors, and thus will inherently be different for different sources or facilities.

The ALARA concept is founded in the professional judgment of radiation-safety managers and personnel and, therefore, cannot be used as a measure for whether or not a particular radiation-safety program is adequate in comparison with other programs. Additionally, the ALARA concept does not provide a numerical limit below which the ALARA concept is achieved.

Steps to be taken to implement the environmental ALARA policy are:

- Identification of Potential Radiological Impacts
- Review of Radiological Impacts
- Performance of Qualitative ALARA Analyses
- Performance of Quantitative ALARA Analyses

4.1 IDENTIFICATION OF POTENTIAL RADIOLOGICAL IMPACTS

Each new radiological operation is subjected to ALARA reviews before work begins to ensure that radiation exposures to workers, the public, and the environment meet ALARA principles. ALARA reviews are conducted for all operations, practices, and procedures that have potential for individual or collective doses to workers. Reviews culminate in changes or additions to work planning documents, SOPs, and radiological work permits.

These documents are used to identify activities that have potential for radiological environmental impacts and could require environmental ALARA analysis. If a radiological impact that could significantly affect the environment is identified, the RSO communicates the impact to the work staff and the RASO.

4.2 REVIEW OF RADIOLOGICAL IMPACTS

Radiological impacts to the environment, workers, and the public from field operations are assessed for compliance with ALARA principles. Results from radiological survey activities, and air, soil, sediment, and water samples are used to assess the radiological impacts of removal activities.

Determination of environmental radiological impacts from radiological activities is performed using nine methods: 1) air monitoring stations located around intrusive work site perimeters to track radiological impacts; 2) field monitoring and sampling to identify areas requiring additional remediation; 3) remediation of contaminated areas at or above the release criteria; 4) control of radiologically impacted areas and work sites; 5) frisking of personnel and examining equipment leaving a radiologically controlled area; 6) use of release criteria that equate to dose and risk; 7) review of historical radiological operations to allow complete investigation of all areas of radiological concern; 8) complete characterization of radiologically impacted sites to ensure complete removal of radioactive material above the release criteria; and 9) dosimetry worn by personnel to measure time-averaged doses from gamma radiation.

4.3 PERFORMANCE OF QUALITATIVE ALARA ANALYSES

For FSSs, laboratory analyses of soil samples are performed for all ROCs to ensure that any possible radioactive contamination is identified. An assessment of the qualitative radiological impacts is conducted by performing a dose and risk assessment. The results of analyses and assessments are provided to the RASO and regulatory agencies for review.

4.4 PERFORMANCE OF QUANTITATIVE ALARA ANALYSES

Based on qualitative ALARA analyses, excavation projects that could cause a potential dose to the public are subjected to quantitative ALARA analyses using the steps described below.

Quantitative ALARA analyses include societal, technological, economic, and public policy considerations. In addition, these ALARA analyses consider NRC guidance for performing the following environmental ALARA assessments:

- Identification of possible radiation protection systems, such as alternative operating methods or controls, that are reasonably achievable. The options should range from the most rudimentary (base case) to the most technologically sophisticated systems.
- Quantification of exposures and doses to workers and the public in the vicinity of the work through air monitoring and dosimetry.
- Quantification of the economic factors, including the costs of purchasing, installing, operating, and maintaining the radiological equipment, and the potential health effects associated with the exposure of people and any other direct or indirect cost resulting from exposures to radiation during investigations and/or remediations.
- Identification and estimation of other health and nonhealth detriments and benefits, such as equipment loss and accidents.
- Evaluation of process alternatives using a quantitative cost-benefit analysis, when possible. When evaluations included assumptions, judgments, and limitations that could be quantified, and potential doses were well below the dose limit, qualitative analyses are used with full documentation.
- Implementation of the ALARA principles and monitoring of the results.

The following specific factors are used when performing a quantitative ALARA analysis:

- Dose to workers, the public, and the environment before and during work processes
- Residual dose to the local population
- Applicable alternative processes (treatments, operating methods, or controls) for site investigations or remediations
- Costs for each alternative evaluated
- Societal and environmental (positive and negative) impacts associated with alternatives

Based on recent estimates of dose to the public from removal action activities at former NAS Alameda, only qualitative ALARA analyses are required. Much of the data and analysis used for environmental ALARA evaluations is developed as part of the routine work processes.

To ensure that ALARA levels are met, project actions are designed to 1) reduce ionizing radiation to a level below risk based goals for institutional controls and 2) eliminate identified pathways of exposure to ionizing radiation via cover installation.

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5.0 RADIOLOGICAL CONTROLS

This section details activities and procedures or references the applicable SOPs that are necessary to provide for overall radiological control during the project. This section includes a summary of field implementation procedures and practices for the radiological control elements of the project.

The following sections describe the components of the overall radiological control plan for the project.

5.1 RADIOLOGICAL ACCESS CONTROL

Radiologically Controlled Areas (RCAs) are areas to which access is controlled in order to protect individuals from exposure to radiation or radioactive materials, and/or prevent the inadvertent release of radioactive materials to uncontrolled areas. RCAs can also serve as a buffer zone between areas. RCA is also a generic term used to describe any area posted for radiological purposes including, but not limited to, Radioactive Materials Areas, Airborne Radioactivity Areas, Contaminated Areas, and Radiation Areas. All work performed during the project that involves potential exposure to radiologically impacted material will be performed within an appropriate RCA. RCAs will be posted and controlled in accordance with TtEC's NRC RML and SOP 12, Radiologically Controlled Areas Posting and Access Control. Only properly trained personnel will be allowed entrance to RCAs. RCAs will be closed and locked if unattended.

Control points will be staffed by a trained RCT to ensure personnel entering the RCA have the required dosimetry and have signed the appropriate RWP. All workers entering an RCA will sign in and out on an RWP access log. In addition, all personnel exiting the RCA will be subject to a personnel survey by an RCT in accordance with TtEC's SOP 5, Radiological Protective Clothing Selection, Monitoring, and Decontamination.

Equipment and materials brought to the site to be used in an RCA will be subject to an incoming survey prior to entering an RCA. Equipment used in an RCA will remain in an RCA until surveyed for free release. Equipment incoming surveys will be performed in accordance with TtEC's SOP 1, Radiation and Contamination Surveys. Free Release Surveys will be performed in accordance with TtEC's SOP 3, Release of Materials and Equipment from Radiologically Controlled Areas.

5.2 RADIOLOGICAL HEALTH AND SAFETY CONTROL

TtEC will provide radiation awareness training to all personnel involved in radiological work during the project. The type and amount of instruction will be based on regulatory requirements (as found in Part 10 of the *Code of Federal Regulations* [CFR] Sections 19.12[a] and 19.12[b]), the TtEC NRC license requirements, and past documented experience, and will be commensurate with potential radiological health protection in the areas in which the employees are expected to work.

In accordance with 10 CFR 19.12, workers will receive general and site-specific radiation awareness instruction prior to beginning work with licensed materials. Successful completion of this training will be demonstrated by a worker attaining a minimum score of 80 percent on a written exam. The elements of this training will include but are not limited to:

- Types and sources of ionizing radiation contributing to personnel exposure
- Biological effects and risks associated with exposure to ionizing radiation
- Radiation exposure limits, declared pregnant workers, and control levels
- Specifics for using time, distance, and shielding to maintain individual exposures ALARA
- Specific personnel dosimetry requirements
- Operating, maintenance, handling, and accountability procedures for radioactive sources
- Facility or site survey requirements and procedures
- Responsibilities of individuals
- Emergency procedures
- Specific survey instrument requirements and operating procedures

Specific training will be provided to pregnant female radiation workers to address the requirements of 10 CFR 20.1208 (Dose Equivalent to an Embryo/Fetus). An acknowledgement form will be completed by pregnant radiation workers indicating they have received the training, have been provided copies of NRC Regulatory Guide 8.29 Instruction Concerning Risks from Occupational Radiation Exposure (NRC 1996), and have been provided an opportunity to ask questions.

In addition to basic classroom instruction, performance-based (on-the-job) training specific to an individual's duties may be conducted. This will ensure safe handling of radioactive materials in accordance with ALARA principles.

5.3 PERSONNEL DOSIMETRY

As part of the radiological health and safety program for the project, occupational whole-body radiation exposures will be monitored, tracked, and recorded. Any personnel in RCAs will be issued and required to wear personal dosimetry.

Only National Voluntary Laboratory Accreditation Program (NVLAP)-approved dosimeters from an NVLAP-certified provider will be used. Personnel issued dosimetry will complete and sign an NRC Form 4. The official Form 4 will be maintained by the TtEC RSO with a copy of the original kept at the project field office.

5.4 AIR MONITORING

Radiological air monitoring will be conducted during the course of the project, in accordance with TtEC's SOP 9, Air Sampling and Sample Analysis, to monitor potential occupational exposures, establish PPE, and determine respiratory protection requirements. Trending for airborne radioactive material will be performed as necessary. Additional details can be found in the Dust Control and Air Monitoring Plan included as Attachment 9 to the RAWP.

Radiological air monitoring data will be evaluated by the RSOR and in consultation with the RASO. Airborne radioactive particulate concentration monitoring will be conducted to ensure no work areas exceed 10 percent of a derived air concentration (DAC) for ROCs for the project. Note that a separate DAC value is used for radioactive particulate alpha and beta/gamma concentrations because the ROCs emit alpha, beta, and gamma radiation. DAC values can be found by consulting the NRC regulation Title 10, CFR, Part 20, Appendix B for the relevant radionuclides. The more restrictive DAC value will be used for both alpha and beta/gamma radiation based upon the given ROCs. Therefore, the DAC values for ^{232}Th and ^{90}Sr will be used. Ten percent DAC values are listed in Table 5-1. If, during the course of work, an airborne concentration exceeds 10 percent of the DAC, ongoing activities will cease and the affected location will be posted as an airborne radioactivity area until the source of the airborne concentration is eliminated and levels are confirmed to be below 10 percent of the DAC. The RSOR will immediately notify the RASO of any air samples that exceed 10 percent of the DAC. Engineering controls, with concurrence from the RASO, will be implemented if required to maintain airborne concentrations below 10 percent of the DAC. In order to ensure that the MDC for the air samples based on the 10 percent DAC value for ^{232}Th is met, a minimum volume of 1.4×10^8 millimeters will be collected.

Air monitoring stations will be established at a minimum of two individual sites to collect ambient measurements during the project. Specifically, one upwind and one downwind monitoring station will be established. The number of monitoring locations may be altered in the field in consultation with the RASO.

An electronic master air sample tracking log will be maintained by the RSOR. The log will list items such as sample identification, location, type of sample (e.g., "upwind sample"), start and stop times, volumes, results, and result relative to the DAC.

5.5 BIOASSAYS

It is considered highly unlikely that personnel will receive an internal deposition of radioactive material during the project. However, should one occur or if the results of air monitoring suggest the need, bioassay measurements will be collected as necessary to determine the potential for internally deposited radioactive material. Selection of the bioassay type will be made by the RSO in consultation with the RASO.

5.6 RADIATION WORK PERMIT

All work performed in RCAs will be governed by an RWP. RWPs will be prepared in accordance with SOP 10, Issue and Use of Radiation Work Permits, and approved by the RSOR. All personnel assigned to work in RCAs will be required to review, understand, and sign the appropriate RWP prior to beginning work.

Each RWP will specify the appropriate personnel protective measures within the scope of the work based upon the radiological conditions in the area. The RWPs will also address radiological conditions, work scope and limitations, radiological limitations, PPE requirements, dosimetry requirements, ALARA considerations, and specific instructions to personnel.

5.7 DUST CONTROL

Dust prevention in the areas of the site where potentially radiologically impacted materials are staged or handled will be accomplished primarily by maintaining the material in a sufficiently moist condition to eliminate the possibility of dust generation. As needed, contingencies will be implemented to control dust generation and/or airborne hazards. These contingencies could include wetting material, applying a nontoxic "lockdown" material to suppress dust, or covering material with a fabric layer. Additional details can be found in the Dust Control and Air Monitoring Plan included as Attachment 9 to the RAWP.

Visible dust will not be permitted during the execution of the project. If visible dust is observed, work will stop and contingency measures (i.e., wetting, applying lockdown, or covering with fabric) will be implemented immediately. Work will not be allowed to continue until contingency measures have been determined to be effective.

5.8 DECONTAMINATION CONTROL

General vehicle and equipment cleaning will be conducted throughout the project for general housekeeping purposes and to prevent the spread of loose material and/or contamination.

In addition, radiological decontamination may be required for equipment used during the project to address radiological impacts and to prevent the spread of radiological contamination. Radiological decontamination will be performed in accordance with TtEC's SOP 7, Decontamination of Equipment and Tools. Equipment or material that cannot be easily or cost-effectively decontaminated will be evaluated for possible limited use in radioactive material areas or disposed of as LLRW.

5.9 RADIOLOGICAL WASTE CONTROL

Several steps will be followed to properly characterize project wastes for potential radiological impacts and to separate LLRW from non-LLRW for handling, management, and disposal. This process includes radiological scan surveys and radiological sampling to segregate LLRW from non-LLRW. All non-LLRW hauling vehicles will be screened using a radiation portal monitor prior to the vehicles being loaded and again prior to departing the site. The use of the radiation portal monitor is described further in Section 10.1.11.

LLRW will be immediately segregated and relinquished to the sole custody of the radiological waste broker selected and contracted separately by the Army Joint Munitions Command on behalf of the DON.

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6.0 PROJECT-SPECIFIC RADIOLOGICAL CONTROL PRACTICES

This section briefly describes the overall project in terms of radiological impacts and project-specific radiological control practices. Construction details, design drawings and specifications for the multi-layer cover are provided in the RAWP and the 100% Remedial Design (Attachment 1 to the RAWP).

6.1 PROJECT OVERVIEW

This project involves installing a cover over the IR Site 2 landfill. The project will be broken up into the following radiological work phases: Building up to subgrade, initial MARSSIM survey of subgrade prior to installation of cover, installation of the cover, final MARSSIM survey of the cover, and miscellaneous activities that will require radiological safety support.

6.2 BUILDING UP TO SUBGRADE

The first phase of the project is to build up to subgrade. This will involve grubbing plants, cutting into some of the current land surfaces, and building up the grade of some of the land surfaces with import material and materials that are cut from other areas. In order to minimize the hazards of disturbing the wastes found within the perimeter berm area, all efforts will be made to avoid any cuts within the berm as well as to the former land surface beneath the berm. Planned cuts will be of the berm itself and areas outside the berm to minimize potential exposure to waste materials. Soils from these cuts will be used to help bring other portions of the site up to subgrade.

IR Site 2 is currently posted as an RCA and will continue to be controlled as such. Radiological controls while performing cuts of the berms and areas outside of the berms will be minimal due to the unlikelihood of waste materials being found within the berm. RCTs will periodically scan the cut areas and the materials that are cut with Ludlum 2350 meters coupled to Ludlum 44-10 NaI scintillation detectors to ensure that no gross contamination is encountered greater than twice background in the berm. If levels are encountered greater than twice background within the berm material, then the work in the area will stop and RSOR will be immediately notified to assess the levels and determine a new course of action for these cuts.

All efforts will be taken to avoid making cuts within the landfill are within the berms to help keep dose to workers ALARA. However, if for some reason it becomes necessary to perform cuts within this area, the area to be cut will be posted as a Contaminated Area and controlled in accordance with TtEC's NRC Radioactive Materials License and SOP 12, Radiologically Controlled Areas Posting and Access Control. Specific radiological controls will be determined by the RSOR based upon the nature of the cut and documented in a RWP prior to performing any cuts within the berm. Cut materials will be laid out in 6-inch lifts and scanned with the Vehicle Towed Array (VTA) to ensure that no material greater than twice background was disturbed.

Operation of the VTA will be performed in accordance with TtEC's SOP 13, Vehicle Towed Array. If levels are found greater than twice background, then these areas will be remediated. Materials that do not indicate levels greater than twice background may be used to bring other portions of the site up to subgrade. VTA surveys of the cut areas will be performed to verify radiation levels prior to down posting the Contaminated Area. If levels are found greater than twice background, remediations will be performed in these areas up to a depth of 1 foot. Remediated areas will be filled in to bring the surface back up to subgrade. Remediated materials will be turned over to the sole custody of the radiological waste broker selected and contracted separately by the Army Joint Munitions Command on behalf of the DON.

6.3 INITIAL MARSSIM SURVEY OF SUBGRADE PRIOR TO INSTALLATION OF COVER

The initial MARSSIM survey will be performed once the subgrade is complete and prior to installation of the cover. The entire footprint of the subgrade will be subdivided into survey units no larger than 2,000 square meters in surface area. Each survey unit will be 100 percent gamma surveyed with the VTA or, in cases where the VTA is physically incapable of surveying, a Ludlum 2350 meter coupled to a Ludlum 44-10 NaI scintillation detector. Areas that indicate levels greater than twice the background during the gamma survey will be remediated to a depth of 1 foot and then filled in to bring the surface back up to subgrade. Remediated materials will be turned over to the sole custody of the radiological waste broker selected and contracted separately by the Army Joint Munitions Command on behalf of the DON.

Once the gamma surveys and any subsequent remediations are performed, a number of samples as determined in Section 8.0 will be collected and analyzed from each survey unit so as to perform baseline dose and risk assessments using RESRAD prior to installation of the cover. Samples will be analyzed by gamma spectroscopy for ^{137}Cs, ^{60}Co, and ^{226}Ra at a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) accredited laboratory per the SAP. Samples locations will be generated using Visual Sampling Plan in a triangular grid pattern originating from a random start point. Additionally, 10 percent of the samples from each survey unit will be analyzed by alpha spectroscopy for ^{238}U and ^{232}Th, and total Sr/^{90}Sr analysis for ^{90}Sr. Furthermore, any soil sample exceeding the ^{137}Cs release criterion will be analyzed for total Sr/^{90}Sr analysis for ^{90}Sr. Once the samples have been collected from a given survey unit, the cover over that survey unit may be installed.

6.4 INSTALLATION OF THE COVER

During installation of the cover, the site will continue to be controlled as an RCA. Periodic coverage from the RCTs is required due to the reduced risk of encountering gross contamination within the area to be covered.

6.5 FINAL MARSSIM SURVEY OF THE COVER

The final MARSSIM survey of the cover will again entail subdividing the entire footprint of the cover into survey units no larger than 2,000 square meters in surface area. Each survey unit will be 100 percent gamma surveyed with the VTA or, in cases where the VTA is physically incapable of surveying, a Ludlum 2350 meter coupled to a Ludlum 44-10 NaI scintillation detector. Areas indicating levels exceeding the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area will be further investigated to ensure no further action is needed. A number of samples as determined in Section 8.0 will be collected and analyzed from each material source used for cover material as characterization samples to ensure that the cover material meets the release criteria in Table 2-1. Samples will be analyzed by gamma spectroscopy for ^{137}Cs, ^{60}Co, and ^{226}Ra at a DoD ELAP accredited laboratory per the SAP. Additionally, 10 percent of the samples from each survey unit will be analyzed by alpha spectroscopy for ^{238}U and ^{232}Th, and total Sr/^{90}Sr analysis for ^{90}Sr.

6.6 MISCELLANEOUS ACTIVITIES THAT WILL REQUIRE RADIOLOGICAL SAFETY SUPPORT

Miscellaneous activities that will require radiological safety support include installation of monitoring wells.

Monitoring well installation will be performed within small Contamination Areas that will be set up around the drill rigs. Contamination Areas will be established and controlled in accordance with TtEC's NRC Radioactive Materials License and SOP 12, Radiologically Controlled Areas Posting and Access Control. Cuttings will be placed in drums and sampled to determine if they will be considered LLRW or non-LLRW.

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7.0 RADIOLOGICAL SURVEY TYPES, AREA CLASSIFICATION, AND SELECTION

Several types of radiological surveys will be conducted during the project. Surveys will be used to support the release of materials, equipment, open areas; support remedial actions; identify radionuclides and levels of contamination present; and support unforeseen work that may be necessary.

7.1 SURVEY TYPES

This section describes the types of surveys that will be performed.

7.1.1 Reference (Background) Area Survey

The reference area is a geographical area or structure from which representative radioactivity measurements are performed for comparison with measurements performed in an impacted area. The reference area selected should have physical, chemical, radiological, and biological characteristics similar to the impacted area(s) being investigated. The reference area must not be identified as impacted by the HRA (Weston 2007). All on-site and off-site locations selected as reference areas will be approved by the RASO. The same survey methods and equipment that will be used for conducting a survey in an impacted area will be used for the background area survey.

7.1.2 Initial and Final MARSSIM Surveys

These surveys provide data to use with RESRAD to model potential risk and dose prior to and once the cover has been installed. The purpose of these surveys is to identify and remove any radioactive contamination that exceeds twice the background, provide a baseline dose and risk estimate prior to installation of the cover, and provide a final dose and risk estimate once the cover is in place. One hundred percent of the surface of each survey unit will be surveyed with a RASO-approved towed array gamma radiation survey system such as the VTA and/or a Ludlum 2350-1 survey meter with 44-10 NaI detector or equivalent. Additionally, a number of samples as determined in Section 8.0 will be collected and analyzed by gamma spectroscopy for ^{137}Cs, ^{60}Co, and ^{226}Ra at a DoD ELAP accredited laboratory per the SAP. Additionally, 10 percent of the samples from each survey unit will be analyzed by alpha spectroscopy for ^{238}U and ^{232}Th, and total Sr/^{90}Sr analysis for ^{90}Sr. These sample results will provide information on the radionuclide concentrations in each survey unit to be used in subsequent RESRAD modeling for dose and risk to the public.

7.1.3 Personnel Surveys

Surveys will be performed on personnel leaving a radiological area to ensure that individuals are free of radiological contamination as identified in the RPP (Attachment 3 to the RAWP) and TtEC's SOP 5, Radiological Protective Clothing Selection, Monitoring, and Decontamination.

7.1.4 Equipment and Materials Surveys

Before being put into service or leaving a radiological work area, equipment and/or materials will be surveyed in an area of low background concentrations to ensure that the equipment and materials release criteria are not exceeded, using appropriate SOPs. Equipment incoming surveys will be performed in accordance with TtEC's SOP 1, Radiation and Contamination Surveys. Free release surveys will be performed in accordance with TtEC's SOP 3, Release of Materials and Equipment from Radiologically Controlled Areas.

- Equipment and/or materials being put into service in a radiological work area at Alameda Point that exceed the release criteria will be returned to the supplier for replacement or decontamination.
- Outgoing equipment and/or materials that do not meet the release criteria will be decontaminated before leaving the radiological work area or stored for disposal.

7.1.5 Truck Surveys

A radiation portal monitor will be used to screen all outbound non-LLRW hauling vehicles prior to the vehicles being loaded and again prior to the vehicles departing the site. The portal monitor will be operated in accordance TtEC's SOP 11, Gamma Screening of Trucks Using the Stationary Portal Monitor.

7.2 SURVEY AREA CLASSIFICATION

The HRA has identified IR Site 2 at Alameda Point as being radiologically impacted. All areas are considered Class 1 areas in accordance with recommendations from MARSSIM (DoD et al. 2000). Class 1 areas have (or had prior to remediation) a potential for radioactive contamination. This potential is based on site operating history or known contamination based on previous radiation surveys above the wide-area derived concentration guideline level ($DCGL_W$).

Examples of Class 1 areas include:

- Site areas previously subjected to remedial actions
- Locations where leaks or spills are known to have occurred
- Former burial or disposal sites
- Waste storage sites

7.3 CLASSIFICATION AND SURVEY UNIT SIZE

A survey unit is a physical area consisting of structures or land areas of specified size and shape for which a separate decision will be made as to whether or not that area exceeds the release criterion. This decision is made as a result of the FSS. As a result, the survey unit is the primary entity for demonstrating compliance with the release criteria.

Survey units will be limited in size to 2,000 square meters (m^2) based on the survey unit sizes recommended in MARSSIM (DoD et al. 2000).

7.4 REFERENCE COORDINATE SYSTEM

A triangular grid reference coordinate system will be laid out for each survey unit to identify survey/sample locations. The length between triangular grid data points (*L*) is determined by the total number of samples or measurements to be taken, using the following equation:

Equation 7-1

$$L = \sqrt{\frac{A}{0.866 * N}}$$

Where:

L	=	length of spacing (meters)
A	=	surface area of the survey unit (m^2)
0.866	=	constant factor from MARSSIM
N	=	number of data points

A second row of points is then developed, parallel to the first row, at a distance of 0.866 × L from the first row. Survey points along that second row are midway (on the X-axis) between the points on the first row. This process is repeated to identify a pattern of survey locations throughout the survey unit. If identified points fall outside the survey unit or at a location that cannot be surveyed, additional points are determined using the random process described above, until the desired total number of points is identified.

The triangular grid system is generally more efficient for locating small areas of elevated activity. A more detailed discussion is provided in Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3: Reference Based Standards for Soils and Solid Media (EPA 1992).

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8.0 SURVEY OVERVIEW

This section provides an overview of survey planning, implementation, and data assessment. Survey details are given in later sections of this Rad Work Plan.

8.1 DATA LIFE CYCLE

Compliance demonstration is simply a decision as to whether or not a survey unit meets the release criterion. This decision is based on the results of one or more surveys. Positive actions must be taken to manage the uncertainty in the survey results so that sound, defensible decisions may be made. These actions include proper survey planning to control known causes of uncertainty, proper application of QC procedures during implementation of the survey plan to detect and control significant sources of error, and careful analysis of uncertainty before the data are used to support decision making. These actions describe the flow of data throughout each type of survey, referred to as the Data Life Cycle.

There are four phases of the Data Life Cycle:

- *Planning Phase.* The survey design is developed and documented using the DQO process, which is summarized in Section 8.2.3.
- *Implementation Phase.* The survey design is carried out resulting in the generation of raw data. In addition, quality assurance and QC measurements will generate data and other important information that will be used during the Assessment Phase.
- *Assessment Phase.* The data generated during the Implementation Phase are first verified to ensure that the plans were actually followed and that the measurement systems were performed in accordance with the criteria specified in this plan. Then the data are validated to ensure that the results of data collection activities support the objectives of the survey or permit a determination that these objectives should be modified.
- *Decision-making Phase.* A decision is made, in coordination with the responsible regulatory agency, based on the conclusions drawn from the assessment process. The ultimate objective is to make technically defensible decisions with a specified level of confidence.

8.2 SURVEY PLANNING

The Radiation Survey and Site Investigation (RSSI) process includes a series of surveys that will be used at Alameda Point to demonstrate compliance with the release criterion. This process will be used as a framework for collecting the information required for scoping, characterization, remediation, and FSS activities. The methodology used at Alameda Point to implement the RSSI process consists of the following six principal steps:

1. Site identification

2. Historical site assessment
3. Scoping survey
4. Characterization survey
5. Remedial action support survey
6. FSS

Table 8-1 provides a simplified overview of the principal steps in the RSSI process and how the Data Life Cycle can be used in an iterative fashion within the process.

Figure 2.4 of MARSSIM (DoD et al. 2000) illustrates the RSSI process in terms of area classification and lists the major decision to be made for each type of survey. The flow chart, illustrated on Figures 2.5 through 2.8 of MARSSIM, presents the principal steps and decisions in the site investigation process and shows the relationship of the survey types to the overall assessment process.

The initial and final MARSSIM surveys described in Sections 6.0 and 7.0 will serve as RSSI principal steps 3 through 6.

8.2.1 Survey Design Elements

Survey and sampling process design includes, but is not limited to, the following elements:

- The *types of samples and sampling matrices* for the survey; solid samples for outdoor surveys and fixed measurements for indoor surveys
- The *measurement frequency* for direct measurement locations for each survey unit and scan percentage of each survey unit
- The *sampling frequency* for solid sample collection locations in the survey unit(s)
- The *methods* for performing remedial action support surveys and other ancillary surveys

However, before these elements can be established, a general strategy must be determined.

8.2.2 Survey Strategy

The selection of specific survey types for each area investigated under the Rad Work Plan will be based on information in the HRA (Weston 2007). The standard survey strategy will be based on using a MARSSIM (DoD et al. 2000) Scenario A approach.

8.2.3 Data Quality Objectives

MARSSIM recommends using the seven-step data quality objective (DQO) process in the design of radiological surveys. This process tailors the survey to the particular conditions of each survey situation. DQO elements are applicable to all the surveys to be performed under this Rad Work Plan.

The seven steps in the DQO process are as follows:

1. State the problem.

   It must be determined if the site-specific guideline has been met or if remediation is warranted. The decision to be made for the initial MARSSIM survey can be stated as, "Do the gamma scan survey results exceed two times background?" The decision to be made for the final MARSSIM survey can be stated as, "Do the risk and dose assessments meet the restricted release criteria of 15 millirems (mrem) per year and 3.0×10^{-4} for the critical group?"

   The successful completion of activities described in this Rad Work Plan will provide sufficient data for the restricted release of the IR Site 2 landfill with ICs. Resources available to provide the necessary data include the following:

   - Activities outlined in this Rad Work Plan
   - MARSSIM guidance (DoD et al. 2000) for ensuring statistically valid data
   - The use of trained and experienced workers

2. Identify the goal of the study.

   The need to provide data for the restricted release of the IR Site 2 survey units requires performing radiological surveys and sampling as specified in this Rad Work Plan. The primary uses of these data are to provide information and statistical verification of data obtained to support the restricted release of IR Site 2.

3. Identify information inputs.

   To support restricted radiological release of IR Site 2, the radiological surveys will include:

   - Gamma scan surveys of each survey unit with a RASO-approved towed array gamma survey system and/or 2-inch by 2-inch NaI detectors or equivalent
   - Systematic soil sampling of the survey units
   - Statistical analysis of collected radiological data

4. Define the boundaries of the study.

   The spatial boundaries for this effort are confined to the radiologically impacted IR Site 2. Each survey unit will undergo a 100 percent gamma scan of the exposed surfaces. Solid samples will be collected from systematic locations in each of the initial MARSSIM survey units. For the final MARSSIM survey units, systematic samples will be collected from each import source for the cover material.

5. Develop the analytical approach.

   Soil with readings greater than twice background during the initial MARSSIM survey will be remediated up to 1 foot in depth. For the final MARSSIM survey, risk and dose assessments will be performed, based on sample analytical results, with the cover installed, to ensure that the maximum annual dose to an individual of 15 mrem, and the excess lifetime cancer risk (ELCR) at 3×10^{-4} for the critical group, are not exceeded.

6. Specify performance or acceptance criteria.

   Actions to minimize errors will be instituted during the data collection phase of the radiological survey. Qualified radiation survey personnel will perform the survey and record the data. Automated recording of survey data will be used where possible to minimize errors. Data transcribing is the second phase where errors may arise. To avoid data errors for manual surveys, experienced personnel will record and transcribe data. The ongoing analyses and evaluation of survey results provide a final check for errors, which can be corrected if detected.

   A knowledgeable individual who is not involved in the direct data collection process will review the collected survey data on a daily basis. This will ensure an ongoing independent review for consistency of all survey data collected.

   There are two types of decision errors that can be made when performing the statistical tests described in this plan:

   - A Type I error occurs when the null hypothesis is rejected when it is actually true. Sometimes called a "false positive," the probability of a Type I error is usually denoted by α and the error rate is often referred to as the significance level or size of the test.
   - A Type II error occurs when the null hypothesis is not rejected when it is actually false. Sometimes called a "false negative," the probability of a Type II error is usually denoted by β. The power of a statistical test is defined as the probability of rejecting the null hypotheses when it is false. It is numerically equal to 1- β, where β is the Type II error rate.

   The surveys are designed to minimize the chances that areas exceeding the release criteria will be missed (Type I Error) and areas meeting the release criteria will be rejected as too high (Type II Error). The probability of either of these occurring will be set at a maximum of 5 percent. In demonstrating that this objective is met, the null hypothesis (H_o) is tested that residual contamination exceeds the release criterion; the alternative hypothesis (H_a) is then tested that residual contamination meets the release criterion.

7. Develop the plan for obtaining data.

   Data outputs and existing data will be reviewed for consistency. Radioactive source readings will be used to check instruments for consistency prior to use in each daily shift. The instrument will only be used after readings are compared and agree within +/- 20 percent of predetermined responses. The on-site Radiological Task Supervisor will review the information each day to verify that equipment is operating satisfactorily.

   A knowledgeable individual not involved in the direct data collection process will review the generated survey data on a daily basis. This will ensure an ongoing independent review for consistency of all survey data collected.

   Data collection design alternatives may be developed. The MARSSIM guidelines (DoD et al. 2000) will be used and a 95 percent confidence level for detecting radioactivity above the release levels will be assumed with Type I and Type II errors limited to 5 percent. The data collection design alternatives may change slightly if assumptions are revised based on conditions in the field being different than the furnished information derived from historical research and current knowledge of the area.

   The survey design specified for use in this Rad Work Plan was developed to perform radiological FSSs. Combined with the use of qualified and experienced personnel, this design is both efficient and resource effective.

   Operational details and theoretical assumptions will be documented. Operational details for the radiological survey process were developed for and are included as part of this Rad Work Plan. The theoretical assumptions are based on guidelines contained in MARSSIM (DoD et al. 2000). Specific assumptions regarding types of radiation measurements, instrument detection capabilities, quantities and locations of data to be collected, and investigation levels are contained in this Rad Work Plan.

8.3 SURVEYS

Survey implementation for each type of survey to be conducted at Alameda Point is discussed below. While implementation requires instrumentation and survey techniques, this section will concentrate on the general approach. The instrumentation to be used is discussed in Section 10.0 and survey techniques are presented in Section 11.0.

8.3.1 Scoping and Characterization Surveys

These surveys will be implemented as described in Sections 6.0 and 7.0 for the initial MARSSIM survey prior to cover installation.

8.3.2 Remedial Action Support Surveys

These surveys are implemented during the remedial activity. If areas indicate levels greater than twice background, coordinates will be recorded and the location marked or flagged. The field survey team will notify the TtEC RSOR. The TtEC RSOR will notify the RSO and Navy. Radiological support personnel under the supervision of an RCT will remove the radioactive material as directed by the RSOR in accordance with TtEC SOPs and best management practice radiological controls. Areas known or suspected to contain radioactive material will be isolated pending removal of the material. The assigned RCT will ensure that the removal action will first be evaluated by the RSOR for radiological impact.

Typical removal actions will involve an area within a radius of 1 foot around the coordinates of the suspected radioactive material. Under RCT oversight, the location with an elevated radiation level will then be excavated and placed directly into a waste bin. Soil removal will continue until a depth of one foot is reached. Following removal of the source of elevated gamma activity, an additional foot of soil in all directions from the source will be removed and disposed of as radioactive waste. After the radioactive material and surrounding soil are excavated, the resulting pit will be resurveyed by the assigned RCT. If significantly greater than twice background elevated gamma radiation levels persist, the project team will be consulted to determine whether additional actions, prior to bringing the surface back to subgrade, are warranted to ensure gamma radiation levels after placement of the cover are protective of the critical group.

If the radioactive material is a point source, it will be given a unique identification number and recorded in the radioactive material inventory. Radioactive point sources will be placed in plastic bags within metal drums and stored in a designated and posted radioactive material storage area for subsequent packaging and disposal by a certified waste broker under the direction of the DON LLRW Disposal Program. Areas that have been remediated will subsequently be filled in to bring the surface back to subgrade.

8.3.3 Final Status Surveys

For the FSS, the data analysis framework is critical to survey development because it drives the sampling requirements. The final MARSSIM survey after installation of the cover described in Sections 6.0 and 7.0 will serve as the FSS. For contaminants present in background, the analysis uses the Wilcoxon Rank-Sum (WRS) test. For contaminants not present in background, the analysis uses the Sign test. In each case, the minimum number (N) of samples (or fixed measurements) is calculated as follows: the method to calculate any additional number of required data points is stated in Section 9.1, and grid spacing methods and requirements are listed in Section 7.4. The statistical tests are described in Section 8.4. Although the FSS of IR Site 2 is not intended to provide for radiological release of IR Site 2, the sample density is designed to ensure data commensurate with a Class 1 survey is collected. Derived concentration guideline level (DCGLs) for each ROC are based on the exposure pathways and parameters presented in the Final Remedial Investigation Report IR Site 2, West Beach Landfill and Wetlands (Battelle and BBL 2006), and limit the maximum annual dose to an individual to 15 mrem and the ELCR to 3×10^{-4} for the critical group.

8.3.3.1 Determination of the Relative Shift

Using Equation 8-1, the value of the relative shift can be determined. For single radionuclide analysis, the values for the lower boundary of the gray region (LBGR) will be set at half the DCGL during the planning phase, and at the median concentration in a survey unit for the data assessment phase.

When analyzing multiple radionuclides, the values for the LBGR and σ are determined using Equation 8-1:

Equation 8-1

$$\frac{\Delta}{\sigma} = \frac{DCGL_W - LBGR}{\sigma}$$

Where:

$DCGL_W$	=	$DCGL_W$ as appropriate
$LBGR$	=	lower boundary of the gray region, as appropriate
σ	=	standard deviation from the survey unit, as appropriate

The value of the relative shift is used with the appropriate random measurement probability presented in MARSSIM (DoD et al. 2000) Tables I.2a and I.2b.

As multiple radionuclides are evaluated, $DCGL_W$ is set to 1. The LBGR and σ based on previous sample results in IR Site 2 are 0.05 and 0.01, respectively, resulting in a relative shift of 95 and a random measurement probability, P_r, of 1.

8.3.3.2 Determination of the Number of Data Points

When the contaminant is present in background, Equation 8-2 is used with the WRS test:

Equation 8-2

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{3\left(P_r - 0.5\right)^2}(1.2)$$

Where:

$Z_{1-\alpha}$	=	Type I decision error level

$Z_{1-\beta}$	=	Type II decision error level
P_r	=	random measurement probability
(1.2)	=	20 percent increase in number of samples over the minimum

At the 95 percent confidence level, $Z_{1-\alpha} = Z_{1-\beta} = 1.645$. Using these values gives a result of N=18 samples required to be taken: 9 in the background area, and 9 in each survey unit. In the interests of further conservatism, this number is increased to 10 samples in the background area, and 10 in each survey unit.

8.3.4 Error Control

Actions to minimize errors will be instituted during the data collection phase of the surveys. Qualified radiation survey personnel will perform the survey and record the data. Automated recording of survey data will be used where possible to minimize errors. Data transcribing is an activity where errors may arise. To minimize data errors for manual surveys, experienced personnel will record and transcribe data.

Standard applicable quality assurance and QC measures will be implemented to control error.

The ongoing on-site analyses and evaluation of survey results provide a verification check for errors, which will be corrected if detected.

A knowledgeable individual who is not involved in the direct data collection process will review the survey data on a daily basis. This will ensure an ongoing independent review for consistency of survey data collected.

8.4 ASSESSMENT OF SURVEY RESULTS

A preliminary evaluation of the data set will be conducted to better understand the structure of the data and thereby identify appropriate approaches and limitations for utilization. For non-FSSs, this may be merely identifying areas of elevated contamination or reviewing the mean, median, and standard deviation of the data set. FSS evaluations include, but are not limited to, reviewing quality assurance reports, calculating statistical quantities, and graphing the data.

8.4.1 Scoping and Characterization Surveys

Basic statistical quantities (mean, maximum, standard deviation) will be calculated from the data collected. Measurements that are twice background will be assessed for further action as described in Sections 6.0 and 7.0.

8.4.2 Remedial Action Support Surveys

The focus of these data assessments will also be the comparison of the survey data to the DCGL for the area. If measurements are twice background, the area will be remediated to a depth of 1 foot and then filled in to be brought back up to grade.

8.4.3 Final Status Surveys

When determining compliance with FSS goals, the survey data are examined. Compliance tests are summarized as follows:

- Compare the largest measurement to the DCGL (net of background, if present in background). If all measurements are lower than the release limits (net of background, if present in background), no statistical test is necessary.
- Compare the average measurement to the DCGL (net of background, if present in background).
- Use the appropriate statistical test to determine if the survey data exceed the release limits, if necessary.
- If scan measurements are above the DCGL, then a fixed measurement will be taken to confirm the elevated reading. If the elevated reading is confirmed, then the unit would fail.

This Rad Work Plan will use an analysis structure incorporating three possible common statistical procedures, as well as conventional qualitative and semi-quantitative comparisons for FSS data. The statistical tests are only applied to measurements made at fixed locations. The tests are:

- **Sign test** – The Sign test is a one-sample, nonparametric test that can be used to evaluate compliance with the release limit. The Sign test is the recommended compliance evaluation procedure when the contaminant(s) under evaluation are not present at significant levels in background. Any one of the individual samples (each individual survey unit is a "sample" in this context) or any combination can be compared to the release limit with the Sign test. For example, each of the Class 1 survey units could be pooled for an overall building comparison to the release limits rather than comparing an individual survey unit to the release limit.
- **Wilcoxon Rank-Sum test** – The WRS test is a two-sample, nonparametric procedure that can be used to evaluate compliance when the contaminant is present in background. The WRS test can be used as a two-sample test to compare medians between samples (contamination concentration measured in reference background materials versus the same parameter measured in site investigative materials) when either or both sampling distributions deviate significantly from normal.
- **Normal means test** – This is the traditional two-sample t-test based on the central limit theorem (i.e., normality). It can be used to assess compliance, derive confidence intervals, and compare between samples (mean removable surface contamination concentration in one survey unit versus the same parameter measured in another survey unit) when both sample distributions are normal or do not deviate appreciably from normality.

Both scan and fixed measurements are subject to the elevated measurement comparison. The result of this comparison is not conclusive as to whether the survey unit meets or exceeds the release criterion, but is a flag or trigger for further investigation.

8.5 DECISION MAKING

8.5.1 Scoping and Characterization Surveys

For a scoping survey, the decision rule is, "If the survey results meet the criteria defined, then design and perform an optimized FSS. If the survey results do not meet the criteria defined, then design and perform an optimized characterization survey." In practice, most scoping surveys will be tested against DCGLs. If contamination is found, then a characterization survey would be performed.

For a characterization survey, the decision rule is, "If the survey results meet the criteria defined, then design and perform an optimized FSS. If the survey results do not meet the criteria defined, then perform remedial action."

8.5.2 Remedial Action Support Surveys

The decision rule is, "If the survey results indicate that the remediation is complete, then design and perform an optimized FSS. If the survey results indicate that the remediation is incomplete, then reevaluate the remedial alternative and continue remediation if necessary."

8.5.3 Final Status Surveys

The results of the statistical testing of the data set for each survey unit will be used to evaluate whether to accept or reject the null hypothesis. Using the MARSSIM (DoD et al. 2000) Scenario A methodology, the null hypothesis is stated as "the residual activity in the survey unit exceeds the release criterion." Thus, in order to pass the survey unit (that is, release the area), the null hypothesis must be rejected. The objective of FSSs will be to demonstrate that residual radioactivity levels meet the release criterion. In demonstrating that the objective is met, the null hypothesis (H_o) is tested that residual contamination exceeds the release criterion; the alternative hypothesis (H_a) is then tested that residual contamination meets the release criterion.

To validate the use of a test, an evaluation will be made to determine that the data are consistent with the underlying assumptions made for the statistical procedure. Assumptions that can be made in the survey design are:

- The sample sizes determined for the tests are sufficient to achieve the DQO set for the Type I and Type II error.
- The data from the reference area or survey unit consist of independent samples from each distribution.

- The reference area and survey unit data distribution are similar, except for a possible shift in the medians.
- Whether the data represent a normal or asymmetric distribution.

Certain departures from these assumptions may be acceptable when given the actual data and other information about the study. One of the primary advantages of the nonparametric test is that it involves fewer assumptions about the data than the parametric test.

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9.0 RELEASE CRITERIA AND INVESTIGATION LEVELS

The release criteria for IR Site 2 are listed in Table 2-1. Release criteria for equipment and material are taken from Atomic Energy Commission (AEC) Regulatory Guide 1.86 (AEC 1974). Release criteria for soils are taken from the U.S. Environmental Protection Agency's (EPA's) (risk-based) Preliminary Remediation Goals for two future-use scenarios, or from negotiated agreements with regulators, as specified in the ROD. These release criteria are also listed in Table 2-1. Note that the soil release criteria apply to soils that are excavated from IR Site 2 and evaluated to determine if the material is LLRW. The site will have a cover installed to achieve a restricted release with institutional controls. Based on EPA guidance (EPA 1997), risk and dose assessments for the critical group will be used to demonstrate that the installed cover ensures that the maximum annual dose to an individual of 15 mrem, and the ELCR of 3×10^{-4} for the critical group are not exceeded.

To accomplish this goal, it is necessary to provide a means for calculating residual dose to the critical group. The most current version of RESRAD software will be used to model a scenario for the maximally exposed individual with the cover in place. All exposure pathways will be turned off for modeling with the exception of external exposure, soil inhalation, and soil ingestion. Soil ingestion rates, gamma shielding factors, and lifetime occupancy will reflect EPA recommended values. Occupancy will be modeled as 1 hour per day indoors and 1 hour per day outdoors, with a total of 250 days on-site per year. The actual surface area of the survey unit, cover depth, and net concentrations above background will also be used. All other input parameters will remain as default values. Additional RESRAD modeling changes from default values may be approved by the DON based on physical parameters of the survey units and the professional judgment of the project team.

Release criteria organized by survey type are as follows:

- A remedial action support survey will use the release criteria for equipment, material, structures, and soil.
- An FSS will use the limit of the maximum annual dose to an individual of 15 mrem and the ELCR of 3×10^{-4} for the critical group.

9.1 ASSESSING MULTIPLE RADIONUCLIDES

Because multiple radionuclides are present, a combined DCGL is calculated using Equation 9-1:

Equation 9-1

$$\text{Combined DCGL} = \frac{1}{\frac{f_1}{DCGL_1} + \frac{f_2}{DCGL_2} + \ldots + \frac{f_n}{DCGL_n}}$$

Where f_n is the anticipated fraction of each radionuclide versus the total, and $DCGL_n$ is the DCGL for each radionuclide present, the sum of f_1, f_2,…f_n equals one.

9.1.1 $DCGL_W$ for Multiple Radionuclides

As stated in MARSSIM (DoD et al. 2000) the $DCGL_W$, when using multiple radionuclides, is established by definition at 1.0. The unity rule, represented in the expression below (Equation 9-2), is satisfied when the radionuclide mixture yields a combined fractional concentration limit that is less than or equal to 1.0. Statistical tests will be used to prove that the total sum of all radionuclides does not exceed the applicable release criterion.

9.1.2 Determination of LBGR for Multiple Radionuclides

The LBGR is the net median concentration of the contaminant in the survey unit. Since this value is unknown, MARSSIM (DoD et al. 2000) suggests using a value for the LBGR of half the DCGL during planning purposes. However, once the median concentration activity in the survey unit is established, this value is used as a ratio to the lowest DCGL for the decay method to determine the LBGR. Equation 9-2, taken from MARSSIM, gives the method used to determine the LBGR:

Equation 9-2

$$LBGR = \frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + \frac{C_2}{DCGL_2} + \ldots + \frac{C_i}{DCGL_i} \leq 1$$

Where:

C_i = median concentration of radionuclide "i"
$DCGL_i$ = DCGL of radionuclide "i"

9.1.3 Determination of Standard Deviation for Multiple Radionuclides

There is no estimate of the standard deviation of the contaminant in a survey unit, especially if no contaminant is initially expected or if concentrations of radionuclides are spatially unrelated. Therefore, σ is assigned the value of the standard deviation of the adjusted measurement values in the survey unit as shown in Equation 6-8 from Section 6.2.3 of Decommissioning Health Physics (Abelquist 2001):

Equation 6-8

$$\sigma = \sqrt{\left(\frac{\sigma_{C1}}{DCGL_1}\right)^2 + \left(\frac{\sigma_{C2}}{DCGL_2}\right)^2 + \ldots + \left(\frac{\sigma_{Ci}}{DCGL_i}\right)^2}$$

Where:

σ_{Ci} = standard deviation from radionuclide "i"
$DCGL_i$ = DCGL of radionuclide "i"

9.2 CONVERTING DCGL UNITS

At times, it may be necessary to convert the DCGL from pCi/g to cpm in order to calculate the number of samples required in a given survey unit. To perform this conversion, an arbitrary concentration of the radionuclide is divided by the associated exposure rate produced by the concentration. The resulting number is then divided by the average net cpm per microroentgens per hour (μR/hr) for the detector being used. Once the number is derived, the release criterion is divided by this number, as shown in Equation 9-3 below:

Equation 9-3

$$cpm = \frac{DCGL}{DCGL_{AC} / M * DCGL_{AC} / \mu Rcpm}$$

Where:

$DCGL$ = release criterion (pCi/g)
$DCGL_{AC}$ = arbitrary concentration of radionuclide (pCi/g)
M = exposure rate calculated by MicroShield™ (Grove Engineering 1996)
$\mu Rcpm$ = counts per minute per μR/hr for the detector

9.3 INVESTIGATION LEVELS

Investigation levels are specific levels of radioactivity used to indicate when additional investigation may be necessary. Investigation levels also serve as a QC check. For example, in addition to indicating potential contamination, a measurement that exceeds the investigation level may indicate that the survey unit has been improperly classified or may indicate a failing instrument.

When determining an investigation level using a statistical-based parameter (e.g., standard deviation), the following may be considered: survey objectives, underlying radionuclide distributions (e.g., normal, log normal, nonparametric), data population descriptors (e.g., standard deviation, mean, median), and prior survey and historical information.

When an investigation level is exceeded, the measurement will be confirmed to ensure that the initial measurement/sample actually exceeds the particular investigation level. This will involve taking further measurements to confirm the initial result, and as appropriate, to quantify the area of elevated residual radioactivity.

9.3.1 Investigation Levels for Gamma Radiation Surveys Prior to Installation of Cover

For gamma surveys prior to installation of the 2-foot cover, the investigation level is established at twice the reference area mean or twice background. The purpose of this survey is to identify and remove any radioactive anomalies or gross radioactive contamination to ensure the health and safety of the workers installing the cover, and is not intended as a radiological free release of the surface. Any area exceeding twice the background radiation level will be removed to a depth of 1 foot for further investigation on a radiological screening pad. The soil will be scan surveyed and soil samples will be collected at a rate of two samples per 40 cubic yards. Samples will be analyzed by gamma spectroscopy for ^{137}Cs, ^{60}Co, and ^{226}Ra. ^{90}Sr will be analyzed for total strontium/^{90}Sr; ^{238}U by Isotopic Uranium, and ^{232}Th by Isotopic Thorium. All samples will be analyzed at a DoD ELAP accredited laboratory in accordance with the SAP. If any of the release criteria listed in Table 2-1, the associated pile will be disposed of as LLRW.

9.3.2 Investigation Levels for Gamma Radiation Surveys After Cap Installation

For gamma surveys after installation of the 2-foot cover, the investigation level is established at the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area. Any area exceeding the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area, will be further investigated to determine if further action is required.

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10.0 INSTRUMENTATION

Instruments will be selected that are suitable for the physical and environmental conditions at the site. The instruments and measurement methods selected will be able to detect the ROC or radiation types of interest, and are, in relation to the survey or analytical technique, capable of measuring levels sufficient to support the DQOs. Table 10-1 identifies the instrumentation resources available to support the survey objectives.

10.1 FIELD SURVEY INSTRUMENTS

Portable survey instruments will be used to perform measurements in the field. Table 10-1 lists the types of portable survey equipment expected to be used during survey activities at Alameda Point, and Table 10-2 provides examples of field radiological survey instrument calculations.

10.1.1 Calibration

Portable survey instrument calibration will be completed on an annual frequency. Instrument calibration will also be performed after repairs or modifications have been performed on the instrument. The instrument will be calibrated in accordance with the manufacturer's recommended method.

10.1.2 Daily Performance

Prior to use of the portable survey instruments, calibration verification, physical inspection, battery check, and source-response check will be performed per SOP 2, Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use.

All portable survey instruments will have a current calibration label that will be verified daily prior to use of the instrument.

Physical inspection of the portable survey instrument will include:

- General physical condition of the instrument and detector prior to each use
- Knobs, buttons, cables, connectors
- Meter movements/displays
- Instrument cases
- Probe/probe window(s)
- Other physical properties that may affect the proper operation of the instrument or detector

Any portable survey instrument or detector having a questionable physical condition will not be used until the problems have been corrected.

A battery check will be performed to ensure that sufficient voltage is being supplied to the detector and instrument circuitry for proper operation. This check will be performed in accordance with the instrument's operations manual.

The instrument will be exposed to the appropriate (alpha, beta, gamma) check source to verify that the instrument response is within the plus or minus percent range determined during the initial response check.

The results of the daily operation checks discussed above will be documented. Instruments that do not pass the daily operation checks will be removed from service until all deficiencies have been corrected.

10.1.3 Instruments for Surface Scan Surveys for Alpha Activity

Scan surveys for alpha radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43 series alpha-beta gas proportional probes (or equivalent) or a Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

10.1.4 Instruments for Surface Scan Surveys for Beta Activity

Scan surveys for beta radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

10.1.5 Instruments for Direct Measurement Static Surveys for Alpha Activity

Static surveys for alpha radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

10.1.6 Instruments for Direct Measurement Static Surveys for Beta Activity

Static surveys for beta radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

10.1.7 Instruments for Scan Surveys for Gamma Activity

Scan surveys for gamma radiation will be performed using a Ludlum Model 2350-1 data logger (or equivalent) equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent) and/or VTA with a TSA SC-770 data controller coupled to two TSA DA372 gamma scintillation detector assemblies.

10.1.8 Instruments for Direct Measurement Static Surveys for Gamma Activity

Direct measurement static surveys for gamma radiation will be performed using a Ludlum Model 2350-1 data logger (or equivalent) equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent).

10.1.9 Instruments for Direct Measurement Surveys for Beta Gamma Activity

Direct measurement surveys for beta and gamma radiation will be performed using Ludlum Model 3, Model 12, Model 177, Model 2360 or equivalent, with a model 44-9 Geiger Mueller pancake probe, Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent). These instrument combinations are normally used for routine surveys associated with operational aspects of decommissioning activities such as monitoring personnel and equipment exiting a radiologically controlled area.

10.1.10 Instrument for Exposure Rate Surveys

Exposure rate surveys are conducted with use of a Ludlum Model 19 MicroR meter (or equivalent). Compatible with anticipated exposure rates, the instrument is equipped with an internally mounted 1-inch by 1-inch NaI scintillation detector that is integral to the meter housing.

10.1.11 Instrument for Portal Monitor Truck Surveys

The Ludlum Model 3500-1000RWM Radiation Monitor System is designed to detect low levels of radiation in loads passing through the system. Two scintillation detectors, each containing approximately 480 cubic inches of plastic detector media, provide coverage to both sides of the vehicle. The detector's large size (48 inches long by 5 inches wide by 2 inches thick) provides a large area for the detection of gamma radiation.

10.2 INSTRUMENTATION EQUATIONS

The following equations are used to calculate efficiencies, MDCs, and minimum detectable count rates (MDCRs).

10.2.1 Instrument Efficiency

The instrument efficiency (ε_i) is defined as the ratio between the net count rate, in cpm, of the instrument and the surface emission rate of the calibration source for a specified geometry. The surface emission rate is the 2π particle fluence that is affected by both the attenuation and backscatter of the radiation emitted from the calibration source.

Equation 10-1 will be used to calculate the instrument efficiency in counts per particle, although efficiency is typically reported as having no units or unitless:

Equation 10-1

$$\varepsilon_i = \frac{R_{S+B} - R_B}{q_{2\pi}\left(\frac{W_A}{S_A}\right)}$$

Where:

R_{S+B}	=	the gross count rate of the calibration measurement (cpm)
R_B	=	the background count rate in cpm
$q_{2\pi}$	=	surface emission rate of the calibration source (National Institute of Standards and Technology [NIST] traceable) in particles per minute
W_A	=	active area of the detector window (square centimeters [cm^2])
S_A	=	area of the source (cm^2)

The instrument efficiency procured from the instrument calibration service is determined by obtaining static counts with the detector over a calibration source that has a NIST-traceable surface emission rate. The 2π particle fluence rate is corrected for decay, attenuation, and scatter. Then the surface emission rate of the source must be corrected for the area subtended by the probe. Factors that can also affect instrument efficiency are discussed below:

- Efficiency Check Sources. Efficiency check sources that emit alpha or beta radiation with energies similar to those expected from the contaminant in the field (similar to the expected ROCs) will be selected.
- Source Geometry Factors. Instrument efficiency will usually be determined with an efficiency check source equal to or greater than the area of the probe. If a source smaller than the probe is used, a conversion factor is applied to the minimum detectable concentration (MDC) to account for the active region of the probe.
- Source-to-Detector Distance. The detector efficiency will be calculated at a source-to-detector distance the same as the detector-to-surface distance used in the field.

10.2.2 Surface Activity Measurements

Surveillance measurements are used to quantify surface activity levels on concrete and other building surfaces. International Organization for Standardization (ISO) 7503-1 (ISO 1988), NUREG/CR-1507 (NRC 1997), and Selection and Use of Portable Radiological Survey Instruments for Performing In-Situ Radiological Assessments in Support of Decommissioning (American Society for Testing and Materials 1998) are used as technical guidance to ensure accuracy in the measurement of surface activity.

Equation 10-1a is used to calculate the surface activity in units of disintegrations per minute (dpm) per 100 cm^2:

Equation 10-1a

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_s \frac{W_A}{100\,cm^2}}$$

Where:

A_S	=	total surface activity (dpm/100 cm^2)
R_{S+B}	=	the gross count rate of the measurement in cpm
R_B	=	the background count rate in cpm
ε_i	=	the instrument efficiency
ε_s	=	the contaminated surface efficiency
W_A	=	the area of the detector window (cm^2)

10.2.3 Count Detection Probability for Alpha Scans (≤ 126-cm^2 Probe)

Scanning for alpha emitters differs significantly from scanning for beta and gamma emitters in that the expected background response of most alpha detectors is very close to zero. The following sections cover scanning for alpha emitters.

Since the time a contaminated area is under the probe varies and the background count rate of some alpha instruments is less than 1 cpm, it is not reasonable to determine a fixed MDC for scanning. Instead, it is more practical to determine the probability of detecting an area of contamination at a predetermined DCGL for given scan rates.

For alpha survey instrumentation with backgrounds ranging from less than 1 to 3 cpm, a single count provides a surveyor sufficient cause to stop and investigate further. Assuming this to be true, the probability of detecting given levels of alpha surface contamination can be calculated by use of Poisson summation statistics.

Given a known scan rate and a surface contamination release limit, the probability of detecting a single count while passing over the contaminated area is given by Equation 10-2:

Equation 10-2

$$P(n \geq 1) = 1 - e^{-\frac{GEd}{60v}}$$

Where:

$P(n \geq 1)$	=	probability of observing a single count
G	=	contamination activity (dpm)
E	=	detector efficiency (4π)
d	=	width of detector in direction of scan (cm)
v	=	scan speed (centimeters per second [cm/s])

Once a count is recorded and the guideline level of contamination is present, the surveyor should stop and wait until the probability of getting another count is at least 90 percent. This time interval can be calculated using Equation 10-3:

Equation 10-3

$$t = \frac{13,800}{CAE}$$

Where:

t	=	time period for static count(s)
C	=	contamination guideline (dpm/100 cm^2)
A	=	physical probe area (cm^2)
E	=	detector efficiency (4π)

10.2.4 Count Detection Probability for Alpha Scans (582-cm^2 Probe)

The larger (582 cm^2) gas-proportional detectors have background count rates on the order of 5 to 10 cpm, and a single count will not cause a surveyor to investigate further. A counting period long enough to establish that a single count indicates an elevated contamination level would be prohibitively inefficient. For these types of instruments, the surveyor usually will need to get at least two counts while passing over the source area before stopping for further investigation.

Assuming this to be a valid assumption, the probability of getting two or more counts can be calculated using Equation 10-4:

Equation 10-4

$$P(n \geq 2) = 1 - \left[1 + \frac{(GE + B)t}{60}\right]\left[e^{\frac{-(GE+B)t}{60}}\right]$$

Where:

$P(n\geq 2)$	=	probability of getting two or more counts during the time interval t
t	=	time interval (s)
G	=	contamination activity (dpm)
E	=	detector efficiency (4π)
B	=	background count rate (cpm)

10.2.5 Minimal Detectable Count Rate and Minimum Detectable Concentration for Beta Scans

The minimum detectable number of net source counts in the scan interval can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in d') as shown in Equation 10-5:

Equation 10-5

$$MDCR = \mathrm{d'}\sqrt{\mathrm{b_i}}\left(\frac{60}{i}\right)$$

Where:

d'	=	index of sensitivity (α and β errors [performance criteria])
b_i	=	number of background counts in scan time interval (count)
i	=	scan or observation interval(s)

The required rate of true positives will be 95 percent, and the false positives will be 5 percent. From Table 6.5 of MARSSIM (DoD et al. 2000), the value of d', representing this performance goal, is 3.28.

The minimum detectable number of net source counts in the interval is given by S_i. Therefore, for an ideal observer, the number of source counts required for a specified level of performance can be arrived at by multiplying the square root of the number of background counts by the detectability value associated with the desired performance (as reflected in d'), as shown in Equation 10-5a:

Equation10-5a

$$S_i = d'\sqrt{b_i}$$

The scan MDC is determined from the MDCR by applying conversion factors that account for detector and surface characteristics and surveyor efficiency. As discussed below, the MDCR accounts for the background level, performance criteria (d'), and observation interval. The observation interval during scanning is the actual time that the detector can respond to the contamination source. This interval depends on the scan speed, detector size in the direction of the scan, and area of elevated activity.

The scan MDC for structure surfaces is calculated using Equation 10-6:

Equation 10-6

$$Scan\ MDC = \frac{MDCR}{\sqrt{p}\ \varepsilon_i \varepsilon_s \dfrac{W_A}{100\ cm^2}}$$

Where:

MDCR is discussed above
p = surveyor efficiency factor
ε_i = instrument efficiency (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = area of the detector window (cm^2)

10.2.6 MDC for Static Alpha and Beta Counts

The static MDC is the level of radioactivity practically achievable by the overall measurement process. Equation 10-7 is used to calculate instrument MDC in dpm per 100 cm^2 when the background and sample are counted for the same time intervals:

Equation 10-7

$$MDC = \frac{3 + 4.65\sqrt{R_B T_B}}{\varepsilon_s \varepsilon_i \frac{W_A}{100} T_B}$$

Where:

R_B = background count rate (cpm)
T_B = background counting time (minute [min])
ε_i = instrument efficiency (counts per particle)
ε_s = contaminated surface efficiency (particles per disintegration)
W_A = active area of the detector window (cm^2)

In Equation 10-7, W_A is the size of the "active" area of the detector window. If the area of the detector window (cm^2) does not equal 100 cm^2, it is necessary to convert the detector response to units of dpm per 100 cm^2.

If the background and sample are counted for different time intervals, Equation 10-8 is used to calculate the MDC in dpm per 100 cm^2:

Equation 10-8

$$MDC = \frac{3 + 3.29\sqrt{R_B T_{S+B}\left(1 + \frac{T_{S+B}}{T_B}\right)}}{\varepsilon_i \varepsilon_s \frac{W_A}{100\ cm^2} T_{S+B}}$$

Where:

R_B	=	background count rate (cpm)
T_B	=	background counting time (min)
T_{S+B}	=	sample counting time (min)
ε_i	=	instrument efficiency (counts per particle)
ε_s	=	contaminated surface efficiency (particles per disintegration)
W_A	=	active area of the detector window (cm^2)

10.2.7 Surface Efficiency (ε_s) for Surface Activity Measurements

The surface efficiency term in the preceding equations is used to determine the 4π total efficiency for a particular surface and condition. Suitable values are based on the radiation and radiation energy, and are primarily impacted by the backscatter and self-absorption characteristics of the surface on which the contamination exists in the field. Backscatter is most affected by the energy of the radiation and the density of the surface material. Self-absorption characteristics or attenuation are also a function of the radiation's energy and surface condition. Surfaces typically encountered in the field include concrete, asphalt, wood, drywall, plaster, carpet, and metal. Surface conditions include both physical effects, such as scabbled concrete, and the effect of surface coatings: dust, paint, rust, water, and oil.

In the absence of experimentally determined surface efficiencies, ISO-7503-1 (ISO 1988) and NUREG-1507 (NRC 1997) provide conservative recommendations for surface efficiencies. ISO-7503-1 recommends a surface efficiency of 0.5 for maximum beta energies exceeding 0.5 megaelectron volt (MeV) and to use a surface efficiency of 0.25 for beta energies between 0.15 and 0.4 MeV and for alpha emitters (ISO 1988; NRC 1997). NUREG-1507 provides surface efficiencies based on studies performed for the NRC. In general, NUREG-1507 indicates that the ISO rule of thumb for surface efficiencies is conservative, particularly for beta-emitting radionuclides with end-point energies between 0.25 MeV and 0.4 MeV. A surface efficiency of 0.25 will be used for alpha and beta emitters at Alameda Point.

10.2.8 MDC for Gamma Scans of Surface Areas

The scan MDC (in pCi/g) for land areas is based on the area of elevated activity, depth of contamination, and the radionuclide (energy and yield of gamma emissions). To establish the scan MDC, the relationship between the detector's net count rate to net exposure rate must be established first. This is accomplished by determining the MDCR using Equation 10-5 and then applying a surveyor efficiency factor *p* to get the minimum detectable count rate calculated assuming a surveyor efficiency ($MDCR_{Surveyor}$) as shown below in Equation 10-9:

Equation 10-9

$$MDCR_{Surveyor} = MDCR \big/ \sqrt{p}$$

The $MDCR_{Surveyor}$ is then converted into the corresponding minimum detectable exposure rate (MDER) by use of a calibration constant specific to the detector being used and the ROC. For example, when used with the Ludlum Model 2350-1, the calibration records for the Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector provide a calibration constant that can be used to determine the ratio of cpm to μR/hr, as shown in Equation 10-10 below:

Equation 10-10

$$MDER\ (\mu R / hr) \quad = \quad \frac{MDCR_{Surveyor} * 6 \times 10^{7}}{cc}$$

Where:

$MDCR_{Surveyor}$	=	as calculated in Equation 10-9
6×10^{7}	=	a conversion factor accounting for differences in time and activity units ([μR-min]/[R-hr])
cc	=	calibration constant ([counts]/[R])

Next, the relationship between the radionuclide concentration and exposure rate is established. This is accomplished by modeling (using MicroShield) to determine the net exposure rate produced by the radionuclide at a distance above the ground. The factors considered in modeling include:

- The dose point above the surface
- The density of material in grams per cubic centimeter
- DCGL of the ROC in pCi/g
- The depth of detection for the DCGL
- The circular dimension of the cylindrical area of detector capability (m^2)

The concentration of the ROC (Scan MDC) necessary to yield the MDER may be calculated by taking the ratio of the MDER to the exposure rate calculated by MicroShield or Monte Carlo *N*-Particle code, as shown in Equation 10-11:

Equation 10-11

$$Scan\ MDC\,(pCi / g) = \frac{DCGL\ pCi / g * MDER\,\mu R / hr}{Microshield\ Exposure\ Rate\,\mu R / hr}$$

10.2.9 Minimum Detectable Count Rate for Static Gamma Counts

For gamma surveys, MDCR, rather than MDC, is calculated in cpm. If the background and sample are counted for the time intervals, Equation 10-12 is used to calculate the MDCR:

Equation 10-12

$$MDCR = \frac{3 + 4.65\sqrt{R_B T_B}}{T_B}$$

Where:

3 + 4.65	=	constant factor provided by MARSSIM
R_B	=	background count rate (cpm)
T_B	=	background counting time (min)

Surveys will not normally be designed to use different background and sample count times for gamma scan surveys; any deviation from this requires RASO approval. If the background and sample are counted for different time intervals, Equation 10-13 is used to calculate the MDC:

Equation 10-13

$$MDC = \frac{3 + 3.29\sqrt{R_B \cdot T_{S+B} \cdot (1 + \frac{T_{S+B}}{T_B})}}{T_{S+B}}$$

Where:

3 + 3.29	=	constant factor provided by MARSSIM
R_B	=	background count rate (cpm)
T_{S+B}	=	background counting time (min)
T_B	=	background counting time (min)

10.3 LABORATORY INSTRUMENTS

Laboratory equipment will be used to analyze samples collected in the field. The SAP lists the types of laboratory equipment expected to be used at for sample analysis.

10.3.1 Quality Assurance Checks

Quality assurance checks shall be performed on laboratory instrumentation to ensure proper operation and to maintain calibration. The quality checks shall be documented, reviewed, and maintained. Data trends outside the tolerance limits shall be investigated to determine the cause and potential effect on measurement results.

10.3.2 Gross Alpha/Beta Loose Surface Contamination Surveys

Swipe samples will be processed using a Ludlum Model 3030P scaler and scintillation probe (or equivalent). Data are reported in units of dpm per 100 cm^2.

10.3.3 Gamma Spectroscopy

Gamma spectroscopy analysis is performed using EG&G ORTEC® detector systems equipped with beryllium end caps (windows), which allow for enhanced quantification of low-energy gammas (such as ^{226}Ra). Hardware features include a High-Purity Germanium Detector (gamma photon detector) supported by a multi-channel analyzer and analysis software. Instrument hardware is calibrated using a multi-energy NIST-traceable source ranging from 50 kiloelectron volts to 2.6 MeV. All results are reported in pCi/g, picocuries per milliliter (pCi/mL), or picocuries per liter (pCi/L), depending on the media analyzed. The Laboratory Manager reviews all data results, including energy spectrums, for quality assurance and to verify count integration, efficiency, and background corrections, as well as the identification of overlapping peaks. If there is any question on the analysis results, the sample is reprocessed and possibly counted for a longer interval.

10.3.4 Total Strontium/Strontium-90 Analysis

Total strontium analysis will be performed in accordance with the SAP by a DoD ELAP accredited laboratory. If the total strontium release criterion is exceeded for any sample, ^{90}Sr analysis will be performed in accordance with the SAP by a DoD ELAP accredited laboratory. The results of ^{90}Sr analysis typically are reported in pCi/g, pCi/mL, or pCi/L, depending on the media analyzed.

10.3.5 Alpha Spectroscopy Analysis

Analysis of alpha-emitting radioisotopes will be performed in accordance with the SAP by a DoD ELAP accredited laboratory. The results of alpha spectroscopy analysis are reported in pCi/g, pCi/mL, or pCi/L, depending on the media analyzed. Alpha spectroscopy will be used to determine concentrations of ^{238}U through Isotopic Uranium analysis and ^{232}Th by Isotopic Thorium analysis.

11.0 SURVEY IMPLEMENTATION

This section discusses the types of surveys and their implementation in the field with a focus on the methods for conducting each type of survey. The survey procedures described in this section will be performed in accordance with approved SOPs.

11.1 REFERENCE (BACKGROUND) AREAS

An average background level will be determined by performing measurements at systematic or random locations within the designated background area. The detector probe will be held approximately 10 centimeters (4 inches) from the surface area for gamma radiation and 0.25 inch from the surface area for alpha/beta radiation. Instrumentation will be allowed to stabilize before background readings are taken. The average of the larger of the readings or the method detection limit or minimum detectable activity reported by the laboratory for all of the readings taken will determine the background. Background scan ranges, swipes, and exposure rates will also be collected for reference data. In some cases, solid samples will need to be collected in the background area for comparative analyses of specific survey units. The same survey methodology and instruments used to collect the background data will be used to perform measurements within survey units.

For the FSS of survey units with the cover installed, a reference area constructed from import fill material used in cover construction will be established with concurrence from the RASO in a non-radiologically impacted area.

11.2 SCAN SURVEYS

Scan surveys are an integral part of survey programs conducted to determine contamination levels. The surveys are an evaluation technique performed by moving a detection device over a surface at a specified speed and distance above the surface to detect radiation. It will be used to identify areas that may require additional survey measurements.

11.2.1 Scan Surveys for Alpha/Beta Radiation

Surface scan surveys for alpha and beta radiation will be performed by moving the detector over the surface being surveyed at a rate of approximately 1 inch per second. The detector will be held within 0.635 centimeter (0.25 inch) over the surface being surveyed.

11.2.2 Scan Surveys for Gamma Radiation

Gamma scan survey measurements are obtained by traversing a path at a maximum speed (scan rate) of approximately 0.5 meter per second (m/s) and slowly moving the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 centimeters

(4 inches) above the area being surveyed. Gamma scan surveys with VTA will be performed at a rate not to exceed 0.5 m/s with the detector's height at approximately 4 inches.

11.3 STATIC SURVEYS

Static contamination surveys are used to determine contamination levels on surface areas for scoping, characterization, and/or release surveys. The surveys are an evaluation technique performed by holding a detection device over a surface for a specified time at a set distance to detect radiation.

11.3.1 Static Surveys for Alpha and Beta Surface Activity

Direct measurements will be conducted with the detector within 0.635 centimeter (0.25 inch) above the surface. Count time for conducting the measurement will be dependent upon the ROC.

11.3.2 Static Surveys for Gamma Radiation

Static gamma measurements require positioning the detector assembly approximately 10 centimeters (4 inches) above the surface and completing a stationary 60-second survey.

11.4 EXPOSURE RATE MEASUREMENTS

Exposure rate surveys are performed to measure ambient gamma radiation levels. These measurements are obtained by holding the detection device at the required distance from the surface being surveyed. Instrumentation will be allowed to stabilize before taking the measurement.

11.5 SWIPE SAMPLE MEASUREMENTS

Swipe sampling will be performed to assess the presence of radioactive contamination that is readily removed from a surface. Swipe samples will be taken to evaluate the presence of alpha and beta surface activity.

11.6 EQUIPMENT AND MATERIAL SURVEYS

Equipment and materials surveys will be performed in accordance with SOPs. Table 2-1 lists acceptable levels of contamination based on the AEC Regulatory Guide 1.86 limits. In the event that survey results indicate levels of contamination exceeding the limits listed in Table 2-1 (for surfaces), appropriate decontamination methods will be performed using methods described in these SOP 7, Decontamination of Equipment and Tools.

11.7 PERSONNEL SURVEYS

Properly trained staff will perform personnel surveys in a predesignated low-background area before leaving a radiologically controlled area, as specified in the RWP or when deemed necessary by the RCT. Personnel who are not qualified to administer a self-survey will be monitored by a qualified technician. Personnel surveys will be performed using the appropriate survey methods described above and in accordance with appropriate SOP 1, Radiation and Contamination Surveys.

11.8 MEDIA SAMPLING

Various samples may be collected for radiological analysis; however, soil is the only planned media type. The SAP describes the methods for collecting samples, sample numbering, sample labeling, sample shipment, and completion of the associated chain-of-custody and other required documentation.

11.9 TRUCK SURVEYS

During the course of work at Alameda Point, soils and debris may be transported via truck to recycling centers, landfills, and other licensed disposal sites. Most of these items and materials will require radiological surveys prior to leaving the site. However, some stockpiles of soil, debris, and miscellaneous materials may not be surveyed because the likelihood of contamination is very low. As an added measure against inadvertently sending radioactive materials to a landfill or disposal site, trucks carrying material from potentially impacted sites will be surveyed for gamma radiation. Truck surveys will be performed using SOP 11. The RSO, RSOR, and Project Manager will be immediately notified of any truck rejected at the Alameda Point portal monitor.

11.10 GLOBAL POSITIONING SYSTEM MEASUREMENTS

Global positioning system (GPS) units will be used while performing area field surveys. For example, during an outdoor gamma scan survey, a GPS unit may be carried adjacent to the gamma detector. The GPS output will be logged along with the gamma count rates, so that each gamma reading will have an associated location point. After the survey, gamma data may be color coded and plotted on a survey map.

In addition, outdoor survey units may be mapped by walking the perimeter with a GPS unit. Once the outline is digitized, static reading locations for that survey unit can be generated in latitude and longitude, using Visual Sample Plan software (Gilbert et al. 2001). These points can be located using the GPS unit followed by the collection of static readings and samples, as appropriate.

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12.0 DECONTAMINATION AND DISPOSITION

Decontamination and disposition activities will be performed as part of radiological remedial action activities at Alameda Point. Decontamination is the removal, by chemical or physical means, of radioactive material from various types of internal and external surfaces including equipment, materials, components, systems, and structures. To assess the extent and type of contaminants identified during the course of ongoing fieldwork, various remedial activity support surveys will be necessary.

12.1 DECONTAMINATION

To support ongoing work at Alameda Point, decontamination of materials, equipment, and structures may be necessary. There are numerous decontamination methods available for use. If practical, manual decontamination methods should be used. Abrasive methods may be necessary if areas of fixed contamination are identified. Chemical decontamination can also be advantageous by using detergents for nonporous surfaces with contamination present. Chemicals should be selected for decontamination that will minimize the creation of mixed waste.

Decontamination activities will be conducted using SOP 7, Decontamination of Equipment and Tools.

12.2 DISPOSITION

Disposition is the methodology of identifying the radiological status of equipment, materials, and structures for its end use. Disposition will be conducted after the decontamination and/or dismantling activities have been completed. This will include the following key elements:

- Control of equipment and materials
- Free release
- Decontaminate for free release
- Off-site disposal

Controlling equipment and materials is essential to ensure that contaminated items are not used in uncontrolled areas to prevent the inadvertent spread of contamination. If decontamination methods are unsuccessful, some materials and equipment may be stored for future use in radiologically controlled areas. If it is not feasible or cost-effective to control contaminated equipment and materials, they will be disposed of as LLRW.

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13.0 RADIOACTIVE MATERIALS MANAGEMENT

Planned site activities are expected to involve the presence of radioactive materials. These activities will be conducted by trained and qualified personnel who are designated to apply management and control measures as regulated by the appropriate regulatory agencies. The management of radioactive materials including handling and control will be performed in accordance with TtEC's NRC radioactive materials license number 29-31396-01 and the RPP (Attachment 3 to the RAWP).

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14.0 DOCUMENTATION AND RECORDS MANAGEMENT

The purpose of this section is to define standards for the maintenance and retention of radiological records. Radiological records provide historical data, document radiological conditions, and record personnel exposure.

Sample collection, field measurements, and laboratory data will be recorded both electronically and on paper, to the extent practicable. Electronically recorded data and information will be backed up to the Alameda server and TtEC's mainframe on a weekly basis. Data and information recorded on paper will be recorded using indelible ink. Both electronic and paper records of field-generated data will be reviewed by the RSOR or a designee knowledgeable in the measurement method for completeness, consistency, and accuracy. Data manually transposed to paper from electronic data collection devices will be compared to the original data sets to ensure consistency and to resolve noted discrepancies. Electronic copies of original electronic data sets will be preserved on a nonmagnetic retrievable data storage device. No data reduction, filtering, or manipulation will be performed on the original electronic versions of data sets.

Changes or corrections to project documentation will be made by crossing out the erroneous item with a single line, initialing (by the person performing the correction), and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out line. The new information will be written above the crossed-out item. Corrections must be written clearly and legibly with indelible black or blue ink.

14.1 REQUIREMENTS

Records resulting from implementation of this Rad Work Plan shall meet the quality standards as outlined herein. All records must be retrievable and maintained for their prescribed retention time defined in the Project Contractor Quality Control Plan (Attachment 5 to the RAWP). Working copies of records used for reference will be stored separately from the original.

Completed records awaiting transfer to long-term storage shall be stored in an appropriate manner to minimize loss and damage that could result from exposure to weather, fire, or other conditions.

Principal personnel who create, review, and approve radiological records must sign and date the record and follow quality standards specified in the Project Contractor Quality Control Plan.

14.2 DOCUMENT QUALITY STANDARDS

Records shall be legible and completed with an indelible ink that provides reproducible and legible copies. Records shall be dated and contain a verifiable signature of the originator. Errors shall be corrected by marking a single line through the error and by initialing and dating the correction. Radiological records shall not be corrected using an opaque substance. Shorthand or nonstandardized terms may not be used.

To ensure traceability, each record shall clearly indicate:

- Identification of the facility
- Specific location
- Function and process
- Date
- Document number (if applicable)

The quantities used in records shall be clearly indicated in standard units (curie, rad, rem, dpm, becquerel), including multiples and subdivisions of these units.

14.3 DOCUMENTATION

The types of documentation that will be maintained and assessed are field operation records, laboratory records, and work support documents.

14.3.1 Field Operation Records

The information contained in field operation records will document overall field operations and may consist of the following:

- Field measurement records – At a minimum, this documentation will identify the names of the persons conducting the activity, measurement identification, measurement locations, measurement results, maps and diagrams, equipment, and unusual observations. Data record forms, bound field notebooks, and electronic data loggers will be used to record raw data and make references to prescribed procedures and changes in planned activities.
- Sample tracking records – These records will be documented as identified in the SAP.
- QC records – QC records will be prepared as indicated in the Project Contractor Quality Control Plan.
- Deficiency and problem identification reports – These reports will be prepared as indicated in the Project Contractor Quality Control Plan.
- Corrective action reports – Corrective action reports will be prepared as identified in the Project Contractor Quality Control Plan.

14.3.2 Laboratory Records

Laboratory records will be prepared as indicated in the SAP.

14.3.3 Work Support Documents

Work support documents may include RWPs, reports, and work instructions that will be prepared, reviewed, and approved.

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15.0 REFERENCES

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TABLES

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TABLE 1-1

ALAMEDA POINT STANDARD OPERATING PROCEDURES[a]

SOP	Title
1	Radiation and Contamination Surveys
2	Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use
3	Release of Materials and Equipment From Radiologically Controlled Areas
4	Radiological Records
5	Radiological Protective Clothing Selection, Monitoring, and Decontamination
6	Sampling Procedures for Radiological Surveys
7	Decontamination of Equipment and Tools
8	Drum Handling Procedures
9	Air Sampling and Sample Analysis
10	Issue and Use of Radiation Work Permits
11	Gamma Screening of Trucks Using the Stationary Portal Monitor
12	Radiologically Controlled Areas Posting and Access Control
13	Vehicle Towed Array (VTA)
14	Transfer of LLRW to Another Contractor

Notes:

[a] The most current version of each controlled SOP and Work Instruction is available in the TtEC offices at Alameda Point and can be provided to the DON and regulatory agencies upon request.

Abbreviations and Acronyms:

DON – Department of the Navy
LLRW – low-level radioactive waste
SOP – Standard Operating Procedure
TtEC – Tetra Tech EC, Inc.
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TABLE 2-1
RELEASE CRITERIA

Radionuclide[a]	Soil[b] (pCi/g)	Surfaces Fixed[g] (dpm/100cm^2)	Water[h] (pCi/L)
Cesium-137+D	0.113[c]	5,000 βγ	119
Cobalt-60	0.0361[c]	5,000 βγ	100
Radium-226	1.0 [c,d]	100 α	5
Strontium-90	0.331[c]	1,000 βγ	8
Thorium-232	1.69[c,f]	1,000 βγ	15
Uranium-238+D	0.742[e,f]	5,000 α	30

Notes:

Table 2-1 values for soil and notes a through e are directly taken from Table 2-6 of the Final Record of Decision for IR Site 2 (DON 2010).

[a] Ra-226 was identified as posing a potentially unacceptable risk to one or more of the human receptors considered in the site-specific HRA conducted at IR Site 2. All radionuclides are identified based on the findings of the Final HRA (Weston Solutions, Inc. 2007).

[b] The RGs for radionuclides meet or are more protective than the 15 millirem per year residual dose level consistent with the 1997 U.S. EPA Office of Solid Waste and Emergency Response Directive 9200.4-18. The RGs for radionuclides are conservatively based on residential or outdoor construction worker receptors even though institutional controls will be implemented throughout IR Site 2 to effectively mitigate potential risks to these receptors.

[c] DON. 2006. Final Basewide Radiological Removal Action Memorandum, Revision 2006, Hunters Point Shipyard, San Francisco, California. April 21.

[d] Remediation goal is 1 pCi/g above background per agreement with EPA.

[e] EPA. 2009. Preliminary Remediation Goals for Radionuclides. http://epaprgs.ornl.gov/radionuclides/.

[f] Background concentrations will be added to NORM radionuclides.

[g] These limits are based on AEC Regulatory Guide 1.86 (1974). Limits for removable surface activity are 20 percent of these values.

[h] Release criteria for water have been derived from Radionuclides Notice of Data Availability Technical Document (EPA 2000) by comparing the limits from two criteria and using the most conservative limit.

Abbreviations and Acronyms:

AEC – Atomic Energy Commission
cm^2 – square centimeter
+D – daughter products
dpm – disintegrations per minute
EPA – U.S. Environmental Protection Agency
HRA – Historical Radiological Assessment
IR – Installation Restoration (Program)
NORM – naturally occurring radioactive material
pCi/g – picocuries per gram
pCi/L – picocuries per liter
RG – remediation goal

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TABLE 5-1

DERIVED AIR CONCENTRATION

Radionuclide	Radiation	DAC (μCi/mL)	10% DAC (μCi/mL)
Radium-226	Alpha (α)	3.0×10^{-10}	3.0×10^{-11}
Thorium-232		5.0×10^{-13}	5.0×10^{-14}
Uranium-238		2.0×10^{-11}	2.0×10^{-12}
Strontium-90	Beta (β^-)	8.0×10^{-9}	8.0×10^{-10}
Cobalt-60	Beta/gamma (β^-, γ)	7.0×10^{-8}	7.0×10^{-9}
Cesium-137		6.0×10^{-8}	6.0×10^{-9}

Abbreviations and Acronyms:
μCi/mL – microcuries per milliliter
CFR – *Code of Federal Regulations*
DAC – derived air concentration (10 CFR 20 Appendix B)

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TABLE 8-1

DATA LIFE CYCLE USED TO SUPPORT THE RADIATION SURVEY AND SITE INVESTIGATION PROCESS

RSSI Process	Data Life Cycle	Phases	MARSSIM Guidance
Site Identification	N/A	N/A	Provides information on identifying potential radiation sites (Section 3.3)[a]
Historical Site Assessment	Historical Site Assessment Data Life Cycle	Plan Implement Assess Decide	Provides information on collecting and assessing existing site data (Sections 3.4 through 3.9) and potential sources of information (Appendix G)
Scoping Survey	Scoping Data Life Cycle	Plan Implement Assess Decide	Discusses the purpose and general approach for performing scoping surveys, especially as sources of information when planning FSSs (Section 5.2)
Characterization Survey	Characterization Data Life Cycle	Plan Implement Assess Decide	Discusses the purpose and general approach for performing characterization surveys, especially as sources of information when planning FSSs (Section 5.3)
Remedial Action Support Survey	Remedial Action Data Life Cycle	Plan Implement Assess Decide	Discusses the purpose and general approach for performing remedial action support surveys, especially as sources of information when planning FSSs (Section 5.4)
FSS	Final Status Data Life Cycle	Plan Implement Assess Decide	Provides detailed guidance for planning FSSs (Chapter 4 and Section 5.5), selecting measurement techniques (Chapters 6 and 7, and Appendix H), and assessing the data collected during FSSs (Chapters 8 and 9)

Notes:

[a] Section numbers refer to chapters in MARSSIM (DoD et al. 2000).

Abbreviations and Acronyms:

FSS – Final Status Survey
MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual
N/A – not applicable
RSSI – Radiation Survey and Site Investigation

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TABLE 10-1

PORTABLE SURVEY INSTRUMENTS

Measurement/ Technique	Primary Use	Type of Instrumentation: Detector Type and Model Number(s)	Type of Instrumentation: Meter Description and Model Number(s)	Typical Background	Typical Total Efficiency (%)	Detection Sensitivity	Typical Minimum Detectable Concentration
Surface alpha/beta scans	Structures	Large-area gas - proportional 43-37 Series (582 cm^2)	Data logger 2360	800–1,200 cpm β 10-15 cpm α	~12 β total efficiency ~12 α total efficiency	474 dpm/100 cm^2 β 56 dpm/100 cm^2 α	900 dpm/100 cm^2 β 80 dpm/100 cm^2 α
	Equipment, materials, debris, structures	Large-area gas - proportional 43-68 (126 cm^2)		150–250 cpm β 0–2 cpm α	~6 β total efficiency ~6 α total efficiency	900 dpm/100 cm^2 β 100 dpm/100 cm^2 α	553 dpm/100 cm^2 β 53 dpm/100 cm^2 α
Direct measurement static alpha/beta		Scintillation, Ludlum Model 43-89 or 43-93 or equivalent (100 cm^2)		100–200 cpm β 0–5 cpm α	~6 β total efficiency ~6 α total efficiency	900 dpm/100 cm^2 β 100 dpm/100 cm^2 α	553 dpm/100 cm^2 β 53 dpm/100 cm^2 α
				150–300 cpm β 0–3 cpm α	~10% β total efficiency ~10% α total efficiency	700 dpm/100 cm^2 β 100 dpm/100 cm^2 α	350 dpm/100 cm^2 β 50 dpm/100 cm^2 α
Surface gamma scans Direct measurement static gamma	Equipment, materials, debris structures	NaI 2-inch × 2-inch scintillation Ludlum Model 44-10	Data logger 2350-1	5,000 cpm γ	N/A	1,500 cpm γ 1.6 pCi/g ^{137}Cs 0.58 pCi/g ^{226}Ra	353 cpm γ
Low energy gamma scans and statics	Soil, structures, debris	Fiddler Model G-5	Data logger 2350-1	50–100 cpm γ	Dependent on threshold settings	Dependent on threshold settings	Dependent on threshold settings

TABLE 10-1

PORTABLE SURVEY INSTRUMENTS

Measurement/ Technique	Primary Use	Type of Instrumentation: Detector Type and Model Number(s)	Type of Instrumentation: Meter Description and Model Number(s)	Typical Background	Typical Total Efficiency (%)	Detection Sensitivity	Typical Minimum Detectable Concentration
Towed array surface gamma scans	Surfaces	(2) TSA 12 inches × 39 inches × 1.5 inches (30.5 cm × 99 cm × 3.8 cm) DA372 organic plastic scintillators	TSA SC-770	750 cps γ	N/A	0.2 pCi/g ^{226}Ra	110 cps γ
Surface beta/gamma scans	Equipment, materials, debris, personnel	Geiger-Mueller Ludlum Model 44-9 or equivalent	Ratemeter 3	50–100 cpm β γ	~ 10 β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
Direct measurement static beta/gamma			Ratemeter 12	50–100 cpm β γ	~ 10% β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
			Ratemeter 177	50–100 cpm β γ	~ 10% β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
Exposure rates	All inclusive	MicroR Meter with integral 1-inch × 1-inch NaI scintillation	Ratemeter 19	7–8 μR/hr	N/A	2 μR/hr	N/A
Beta, gamma, X-ray surveys	Devices, gauges, dials	220 cm^2 Ion chamber/RO20	Analog movement with 5 linear ranges	Less than 1 μR/hr	N/A	N/A	N/A

Abbreviations and Acronyms:

μR/hr – microroentgens per hour
cm^2 – square centimeter
γ – gamma
cpm – counts per minute
cps – counts per second
^{137}Cs – cesium-137
dpm – disintegrations per minute
N/A – not applicable
NaI – sodium iodide
^{226}Ra – radium-226

TABLE 10-2

EXAMPLES OF FIELD RADIOLOGICAL SURVEY INSTRUMENT CALCULATIONS

Measurement Technique	Calculation Type and Applicable Equations	Meter [a]	Detector [a]	Probe Area (cm^2)	Typical Detector Efficiency (%)	Surface Efficiency (%) [b]	Bkg Count Time (min)	Sample Count Time (min)	Bkg Count Rate (cpm)	Required Detection Sensitivity (dpm/100 cm^2)	Scan Speed (cm/s)	Probe Width (cm)	Scan Interval(s)	Surveyor Efficiency (%)	Bkg Counts Per Scan Interval	Results [c]
Surface alpha scans	Count detection probability for α scans; Equations 7-2, 7-3, or 7-4 (depends on detector area)	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.120	N/A			10.0	100	1.3	14.0	10.8	N/A		90%
			Gas-proportional, Ludlum Model 43-68	126	0.120				1.0	100	0.7	8.8	12.6			92%
			Scintillation, Ludlum Model 43-89	126	0.130				0.4	100	0.7	7.6	10.9			90%
Surface beta scans	MDC for β scans; Equations 7-5 and 7-6	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.250	0.25	N/A		800	N/A	1.7	14.0	8.2	0.50	110	974 dpm/100 cm^2
			Gas-proportional, Ludlum Model 43-68	126	0.250	0.25			200		0.2	8.8	44.0	0.50	147	973 dpm/100 cm^2
			Scintillation, Ludlum Model 43-89	126	0.250	0.25			180		0.2	7.6	38.0	0.50	114	993 dpm/100 cm^2
Direct measurement static alpha	MDC for static α counts; Equations 7-7 and 7-8	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.250	0.25	5	0.3	15.0	N/A						93 dpm/100 cm^2
			Gas-proportional, Ludlum Model 43-68	126	0.250	0.25	5	1.2	2.0							92 dpm/100 cm^2
			Scintillation, Ludlum Model 43-89	126	0.250	0.25	5	0.7	0.4							88 dpm/100 cm^2
Direct measurement static beta	MDC for static β counts; Equations 7-7 and 7-8	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.250	0.25	5	0.1	1,000	N/A						996 dpm/100 cm^2
			Gas-proportional, Ludlum Model 43-68	126	0.250	0.25	5	0.5	200							953 dpm/100 cm^2
			Scintillation, Ludlum Model 43-89	126	0.250	0.25	5	0.5	180							908 dpm/100 cm^2
Surface gamma scans	MDC for γ scans; Equation 7-9	Ludlum Model Number(s) 2360 or 2350-1 data logger, or 2221 scaler/rate meter	NaI 2-inch × 2-inch scintillation, Ludlum Model 44-10	N/A			1	0.017	5,000	N/A						4.8 μR/hr
Direct measurement static gamma	MDCR for static γ counts; Equation 7-10	Ludlum Model Number(s) 2360 or 2350-1 data logger, or 2221 scaler/rate meter	NaI 2-inch × 2-inch scintillation, Ludlum Model 44-10	N/A			1	1.0	5,000	N/A						332 cpm (net)
Direct measurement beta/gamma	N/A	Ludlum Model Number 3	Geiger-Mueller, Ludlum Model 44-9	N/A					50	N/A						~1,000 dpm/probe area
Exposure rates	N/A	Ludlum Model Number(s) 19 MicroR Meter	Integral NaI 1-inch × 1-inch scintillation	N/A					6 μR/hr	N/A						~2 μR/hr
Truck Portal Monitor	N/A	Ludlum Model Number(s) 3500-1000RWM Radiation Monitor System	Plastic scintillator, ~480 cubic inches (48 inches long × 5 inches wide × 2 inches thick)	N/A						N/A						

TABLE 10-2

EXAMPLES OF FIELD RADIOLOGICAL SURVEY INSTRUMENT CALCULATIONS

Notes:

[a] or equivalent.

[b] 0.25 will be assumed surface efficiencies.

[c] Results for alpha scans reflect the probability of detecting 1 or more counts during the scan interval, as appropriate. Results for other activities reflect the instrument sensitivities calculated using the provided equations, or as provided by the manufacturer where equations in this plan are not applicable.

Abbreviations and Acronyms:

μR/hr – microroentgens per hour
cm^2 – square centimeter
cm/s – centimeters per second
cpm – counts per minute
dpm – disintegrations per minute
MDC – minimum detectable concentration
MDCR – minimum detectable count rate
min – minute
N/A – not applicable
NaI – sodium iodide

ATTACHMENT 3

RADIATION PROTECTION PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 3

FINAL
RADIATION PROTECTION PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

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APPENDICES

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ABBREVIATIONS AND ACRONYMS

ALARA	as low as reasonably achievable
APP	Accident Prevention Plan
CDPH	California Department of Public Health
CFR	*Code of Federal Regulations*
CHPM	Corporate Health Physics Manager
DAC	derived air concentration
DOT	U.S. Department of Transportation
EHS	environmental health and safety
HRA	Historical Radiological Assessment
MOU	Memorandum of Understanding
NRC	U.S. Nuclear Regulatory Commission
PjM	Project Manager
PPE	personal protective equipment
QC	quality control
Ra-226	radium-226
RASO	Radiological Affairs Support Office
RCA	Radiologically Controlled Area
RCT	Radiological Control Technician
RMA	Radioactive Materials Area
RML	Radioactive Material License
RPG	Radiation Protection Guidance
RPP	Radiological Protection Plan
RSO	Radiation Safety Officer
RSOR	Radiation Safety Officer Representative
RTS	Radiological Task Supervisor
RWP	Radiation Work Permit
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
TEDE	total effective dose equivalent
TIP	Task Initiation Procedure
TtEC	Tetra Tech EC, Inc.
VPESQ	Vice President for Environmental Safety and Quality Services

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1.0 PURPOSE/INTRODUCTION

The purpose of this Radiation Protection Plan (RPP) is to detail Tetra Tech EC, Inc's. (TtEC's) requirements for activities conducted under Radioactive Material License (RML) No. 29-31396-01, issued and subject to regulatory enforcement by the United States Nuclear Regulatory Commission (NRC) and activities conducted under a State of California Agreement State license, once issued, if activities are conducted in areas not under exclusive federal jurisdiction. The following activities are subject to this RPP: project activities that involve the use and/or handling of licensed by-product, source, and/or special nuclear material (hereafter referred to as radioactive material); tasks with the potential for radioactive material to be present based on available data and historical records; and work in locations posted and controlled because of radioactive material. Project activities will incorporate the requirements within to maintain compliance in parallel with the current version of corporate procedure RP1-1, Radiological Protection Program.

Project activity performance steps are detailed in site-specific Work Plans, e.g., Standard Operating Procedures (SOPs), Work Instructions, and Task-specific Plans. (Agencies that may have jurisdiction or an interest in project activities are also identified in such documents.) Project staff tasked to perform assignments involving the presence of radioactive material (i.e., those identified in the applicable portions of Section 2.0) will complete a review of this document and indicate an understanding of all requirements by completing a Radiation Protection Plan Acknowledgement Form (Appendix A).

1.1 POLICY

It is TtEC's policy that work with radioactive material be purposeful and performed in a manner that protects project staff, members of the general public, and the environment. Radiologically oriented work may not begin unless it can be performed in a safe and reliable manner that is compliant with the exposure reduction rules, regulations, and principles described in Section 1.3.

1.2 PROJECT-SPECIFIC RADIATION PROTECTION PLAN

Corporate procedure RP1-1, Radiological Protection Program, provides the foundation for the RPP and its use for any project or activity that involves the possession or use of radioactive materials, including the subsequent potential for exposure to ionizing radiation. Content provided within this RPP reflects corporate policy and provides the guidance needed for project management to execute the scope of work in a safe manner. Site-specific guidance for radiological safety and control is further detailed in SOPs. SOPs are subject to approval by the Radiation Safety Officer (RSO) or designee and authorized for use as indicated on a Radiation Protection Program SOP Crossover Document. This document may be revised separately from the RPP. A current copy for each viable project is available upon request. The RSO is also the company's Corporate Health Physics Manager (CHPM).

1.3 AS LOW AS REASONABLY ACHIEVABLE

Work involving radioactive material and any corresponding exposure to ionizing radiation must be purposeful and performed in a manner sufficient to ensure the protection of staff, members of the public, and the environment. TtEC applies industry recognized principles to radiological work so that exposure to ionizing radiation is maintained in accordance with corporate procedure NLP-01, As Low As Reasonably Achievable (ALARA) Program.

1.4 AUTHORIZATION TO STOP WORK

In accordance with corporate procedure RP1-1, Radiological Protection Program, and as detailed in Section 2.9, employees are authorized to stop work if an unsafe condition exists or safety protocol is being violated, and immediately report the condition to project management.

Work performed under a Radiation Work Permit (RWP) will stop, and the Navy Radiological Affairs Support Office (RASO) will be notified if any of the following atypical work site conditions are encountered:

- An individual total effective dose equivalent (TEDE) exceeding 500 millirems
- The collective TEDE for the job exceeding 1 rem
- Individual airborne exposures exceeding 10 derived air concentration (DAC) hours in a 7-day period
- General area exposure rates exceeding limits of current radiological posting
- Contamination levels exceeding 100 times the limits requiring classification of an area as a Contaminated Area

In cases where the Navy must be notified, the license RSO, with concurrence from the Navy's Radiological Environmental Protection Manager, RASO, must approve the RWP prior to restarting work.

1.5 SCOPE OF WORK

The scope of work involves the following activities:

- Task-specific training of personnel
- Site controls and establishment of work zones at sites with, or having the potential for, radioactive commodities or contaminants

- Handling and management of collected radioactive commodities, radiologically contaminated soil, construction and building materials, or other associated radiologically contaminated material
- Site investigation and remediation including characterization surveys and sampling; excavation; demolition; screening for and removal of commodities, and building and construction materials; and surveys and sampling to document final conditions

1.6 QUALITY CONTROL AND AUDITING

To maintain continued compliance and evaluate overall RPP effectiveness, quality control (QC) measures including self-assessment and management reviews will be used. Formal audits, including those conducted at field projects, will be coordinated and tracked to completion by the RSO as will any need for adjustments to audit frequencies.

1.6.1 Self-Assessment, Management Reviews, and Audits

A self-assessment and management review of RPP use, as detailed in corporate procedure NLP-08, Radiation Protection Program Audits, will be conducted. Project personnel including the Project Manager (PjM), project Radiation Safety Officer Representative (RSOR), and on-site personnel will support and cooperate with any audit conducted.

1.6.2 Responses and Corrective Actions

Radiological deficiencies must be responded to in a timely fashion. Deficiencies that represent an imminent threat to radiological control or safety (e.g., compromise of procedural protocol) will be immediately reported to the RSOR, RSO, and PjM or designee(s). Subsequent corrective actions will be tracked to completion by the RSO or designee. Radiological deficiencies, including corrective actions, will be promptly reported by the RSO to the Navy. (For the purposes of this RPP, the Navy means U.S. Department of the Navy, Naval Facilities Engineering Command Southwest; U.S. Department of the Navy, Base Realignment and Closure, Program Management Office; and Naval Sea Systems Command Detachment, [RASO]). Responses to findings will be submitted to the RSO or designee for review, approval, and final disposition.

1.6.3 Daily Instrumentation Check

As addressed in Section 3.16, survey instruments procured for field use will have proof of current calibrations in accordance with the manufacturers' procedures, employing applicable standards and sources traceable to the National Institute of Standards and Technology. Copies of instrument calibration certificates will be maintained on-site for reference. Instruments will be response-checked daily in accordance with applicable SOPs. (In addition to the manufacturers' instruction manuals, typical project instruments and their performance characteristics are identified in site-specific controlling documents such as a Site-specific Radiological Work Plan.)

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2.0 RADIATION PROTECTION PERSONNEL

This section details the radiological safety responsibilities vested with key personnel within the project. (Nonradiological safety responsibilities will be detailed in a separate project-specific Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP). Reporting relationships between TtEC support personnel and the Navy will be referenced in a site-specific controlling document as well (e.g., Site-specific Radiological Work Plan).

2.1 VICE PRESIDENT FOR ENVIRONMENTAL SAFETY AND QUALITY SERVICES

The Vice President for Environmental Safety and Quality Services (VPESQ) has overall responsibility for TtEC's safety operations. The VPESQ is responsible for:

- Ensuring proper maintenance of the RPP consistent with applicable regulatory mandates, TtEC corporate policy, and recognized industry practice
- Establishing and maintaining all necessary management oversight specific to the RPP
- Implementing a management review process to ensure applicable use of RPP requirements

2.2 LICENSE RADIATION SAFETY OFFICER (CORPORATE HEALTH PHYSICS MANAGER)

The CHPM (also referred to as the RSO) is appointed by the VPESQ as the senior health physicist and the Health Physics Resource Manager for TtEC. The CHPM is responsible for:

- Reviewing and making recommended revisions to:
  - The RPP, RML procedures, radiation protection guidelines, and supporting documents
  - Project plans involving the use or handling of radioactive materials, or access to areas of radiological concern to ensure compliance with RPP requirements and supporting guidelines
- Acting as the Health Physics Resource Manager, also referred to as the corporate-level or license RSO
- Designating a Project Health Physicist, also referred to as the project-level RSOR, to provide day-to-day guidance on radiological protection issues
- Compliance as the license RSO, with RML No. 29-31396-01, or California Agreement State license, as applicable, including:

- Primary point of contact for all communications to the NRC and California Department of Public Health (CDPH)
- Identification and training of RML authorized users
- Assignment of project RSORs
- Coordination of investigations involving radiological occurrences to include review and approval of a resulting Corrective Action Plan
- Advance NRC or CDPH (as applicable) notification in writing at least 14 days before initiating at a temporary job site under TtEC RML jurisdiction any activity, or change to scope involving new activities, in areas of radiological concern (excluding routine packaging or repackaging for purposes of transporting and not requiring a job- or site-specific work package, and characterization and/or final surveys where radioactive materials and/or radiation are not likely to be detected)
- Refrain from taking ownership of licensed materials in excess of possession limits without prior notification and written NRC or CDPH approval (as applicable)
- Advance NRC or CDPH (as applicable) notification in writing within 30 days of the temporary job site completion status involving decontamination and decommissioning activities, and disposition of any licensed material as related to RML jurisdiction
- Placement of reciprocity request with applicable Agreement States when necessary
- Maintenance of radiological exposure records
- Development and/or approval of radiation safety training materials and/or courses
- Performance of program audits as detailed in corporate procedure NLP-08, Radiation Protection Program Audits
- Providing guidance on radiological protection issues
- Identification of appropriate project staffing needs to implement RPP requirements
- Assistance with the development of site Environmental Health and Safety (EHS) plans and approval of EHS plans for projects that involve the use or handling of radioactive materials or access to areas of radiological concern
- Resource Specialist review for Task Initiation Procedures (TIPs) for proposed projects involving exposure to radiation or radioactive materials

• Delegating project responsibilities to other company health physicists (also referred to as RSORs), as necessary

2.3 PROJECT RADIATION SAFETY OFFICER REPRESENTATIVE (PROJECT HEALTH PHYSICIST)

The project RSOR, also referred to as the Project Health Physicist, is assigned by the RSO and vested with corporate-level authority to implement the RPP and the TtEC RML at a project site.

Whenever radiological work is actively ongoing under the TtEC RML, the RSOR or designee identified as an authorized user will be present at the project site. The RSOR is vested with the following responsibilities at projects subject to jurisdiction involving the TtEC RML:

- Providing health physics guidance on an as-needed basis
- Conducting required radiological safety training
- Reviewing and approving project field procedures that involve the handling of radioactive materials or access to areas of radiological concern
- Conducting radiation incident investigations and project inspections
- Maintaining a project site file that details radiological protection training provided, dosimetry records generated, radiological surveys performed, and other documentation pertinent to the RPP, RML procedures, radiation protection guidelines, and supporting documents; copies of these will be provided to the CHPM at the conclusion of the project
- Arranging for and assisting in program radiation protection audits as detailed in the most current version of corporate procedure NLP-08, Radiation Protection Program Audits
- Assisting in the development and approval of the site EHS plan
- Helping in the identification of project radiological analysis needs and selection of analytical support contractors
- Coordinating required ALARA reviews
- Ensuring appropriate staff work practices are employed to maintain occupational radiation exposures ALARA
- Ensuring items needed to perform work in accordance with the RPP, RML, and supporting documents are available, such as appropriate instrumentation, protective devices, dosimetry, etc.
- Directing the preparation of, and performing the review and approval of, RWPs
- Stopping work if necessary to ensure radiological safety
- Communicating with the PjM and RSO as needed to ensure the RPP is implemented correctly
- Ensuring proper operation of radiation-measuring equipment, including the performance of daily function and QC tests, and removing out-of-compliance instruments from service
- Maintaining radiation-measuring equipment in accordance with manufacturers' recommendations
- Directing and supervising the performance of radiological surveys and sampling in accordance with the most current version of this RPP and supporting TtEC SOPs

- Reviewing survey reports and instrument performance data for accuracy, completeness, and compliance with project, procedural, and regulatory requirements
- Ensuring work is performed in accordance with current versions of project plans, procedures, and the RPP

The project RSOR reports to and receives technical direction from the RSO, advises the PjM on radiation protection and radiological operation matters, coordinates with the PjM on day-to-day project activities, and communicates and coordinates radiation protection and radiological operation activities with the RSO and the client. Company Health Physicists (also referred to as RSORs) may delegate project responsibilities to other staff members deemed qualified for the task assigned.

2.4 PROJECT MANAGER

The PjM is responsible for:

- Ensuring implementation of and compliance with the RPP requirements and current versions of the following support documents applicable to the project:
  - TtEC RML procedures (i.e., applicable NRC License Procedures)
  - TtEC Radiation Protection Guidance (RPG) documents
- Forwarding any TIP or modified TIP involving exposure to ionizing radiation or radioactive material to the RSO or designee for input and review (involvement includes the use of subcontractors who may use radioactive materials or radiation-generating devices in the course of corresponding work such as field radiography, soil density gauges, well logging, etc.)
- Determining with the assistance of the RSO or designee if the project is required to use the TtEC RML or if activities will fall under a Department of Energy, NRC, Agreement State, or other license
- Working with the license RSO in accordance with corporate procedure RP1-1, Radiological Protection Program, to identify applicable NRC and Agreement State requirements for projects that will not use the TtEC RML
- The safe conduct of work in compliance with all permits, client contracts, and other controlling documents that apply
- Exposure to radiation ALARA by project staff
- Adequate resources and staffing to develop and implement this RPP in compliance with applicable regulations and requirements

The PjM reports to the TtEC Program Manager.

2.5 CONSTRUCTION MANAGER/PROJECT SUPERINTENDENT

Responsibilities for the Construction Manager/Project Superintendent include:

- Ensuring assigned personnel comply with radiological requirements
- Supplying relevant information to the RSOR regarding planned work activities and proposed applications necessary to maintain occupational radiation exposures ALARA
- Timely RSOR and PjM notification of radiological problems or issues encountered
- Verifying staff is sufficiently prepared for assigned tasks (e.g., appropriate tools and equipment needed to minimize the time spent in areas of radiological concern)
- Confirming that escorted visitors accessing areas of radiological concern are properly supervised and exhibiting safe work practices in accordance with RPP protocol

The Project Superintendent/Construction Manager reports to the PjM.

2.6 RADIOLOGICAL TASK SUPERVISOR

The Radiological Task Supervisor (RTS) is the TtEC representative responsible for Radiological Control Technician (RCT) oversight and corresponding field operations conducted in areas of radiological concern. Designated as an authorized user at projects subject to jurisdiction under the TtEC RML, the RTS is vested with the following responsibilities:

- Supporting required ALARA reviews
- Coordinating plans for field activities with the Construction Manager/Project Superintendent to ensure exposure to radiation is maintained ALARA and in accordance with corresponding RWPs
- Supervising the preparation of, and performing review of, RWPs
- Stopping work if necessary to ensure radiation safety
- Maintaining communication with the RSO, RSOR, PjM, Construction Manager, and Project Superintendent as needed to ensure the RPP is fully implemented
- Confirming proper operation of radiation survey instruments, including the validation of daily function and QC checks, and removing noncompliant instruments from service
- Ensuring radiation survey instruments are maintained in a way that complies with manufacturer instructions and recommendations
- Directing and supervising the performance of radiological survey and sampling practices in accordance with the RPP, current versions of applicable SOPs, and corresponding RWPs
- Validating field survey reports and instrument performance data for accuracy, completeness, and compliance with the RPP, applicable SOPs, and corresponding RWPs
- Participating in periodic internal and external reviews of RPP content and implementation

- Supporting self-assessments and management reviews as needed and correcting identified deficiencies within the allotted time frame

The RTS reports to and receives technical direction from the RSOR.

2.7 RADIOLOGICAL CONTROL TECHNICIANS

The RCTs are responsible for:

- Ensuring occupational exposure to radiation is maintained ALARA
- RWP preparation, use, and adherence
- Stopping work if necessary to ensure radiological safety
- Performing radiation surveys and other radiological safety tasks in accordance with the RPP, applicable SOPs, and corresponding RWPs
- Confirming proper operation of assigned radiation survey instruments prior to field use to include verification of daily function and QC performance checks, and removing noncompliant instruments from service
- Using radiation survey instruments in accordance with the RPP, applicable SOPs, and corresponding RWPs and maintaining the instruments in a way that complies with manufacturers' instructions and recommendations

The RCTs report to and receive technical direction from the RTS.

2.8 RADIATION WORKERS (FIELD PERSONNEL)

Project staff (including the general labor force associated with the TtEC and subcontractors) who have the potential to receive occupational exposure to radiation while on the job site, and who are expected to work under the requirements of this RPP as radiation workers, will:

- Receive sufficient training, prior to beginning work, in accordance with the most current version of corporate document RPG 2-5, Radiation Safety Training.
- Report to the RTS or RCT non-occupational radiation exposures that result from the use of medical or dental applications more aggressive than a standard X-ray.
- Comply with requirements of all procedures and guidelines applicable to the project.
- As required, exercise stop work authority and report radiological safety issues or concerns, including incidents and unplanned events, immediately to project management and Environmental Safety and Quality staff in writing, verbally, or with a Zero Incident Performance® slip; respond promptly to any stop-work and/or evacuate orders.
- Display use of industry recognized radiological work practices when inside areas of radiological concern, and conform promptly to instructions when provided by RCTs.

- Strictly adhere to radiological control procedures, guidelines, and postings including information provided in RWPs.
- Immediately report lost dosimetry devices to the RCT.
- Report planned medical radiation treatments in advance to supervision and the project RSOR and prior to entering areas of radiological concern or wearing dosimetry.
- Periodically confirm personal radiation exposure status and ensure that administrative dose guidelines are not exceeded.
- Notify the RCT of faulty or alarming radiological protection equipment.

When in areas of radiological concern, workers report to the RTS.

2.9 STOP WORK AUTHORITY

Company and subcontractor personnel will have the responsibility and authority to stop work when controls are inadequate or imminent danger exists.

In any situation in which stop work authority is used, the following requirements will apply:

- Exercise stop work authority in a justifiable and responsible manner.
- Once work is stopped, do NOT resume until proper controls have been established.
- Resumption of work will require concurrence by the PjM or designee.

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3.0 TASK-SPECIFIC HAZARD ANALYSIS/CONTROLS

A task-specific hazard analysis is performed on a daily basis to allow for risk identification associated with site work, including physical, chemical, and radiological components. (Radiation exposures that result from naturally occurring background sources and medical applications conducted under the care of a physician are examples of dose that is independent of occupational monitoring requirements but considered when planning task assignments. In instances of verifiable therapeutic applications, employee-furnished notifications will be used as an informational reference and included as part of a corresponding radiation exposure file.) Risk-based hazards and controls are defined in a site-specific Activity Hazard Analysis. Anticipated physical and chemical risks are described in detail in the project-specific APP/SSHP. Radiological risk controls are categorized in the sections to follow, and protective measures apply as defined in task-specific RWPs and corresponding SOPs.

3.1 IDENTIFICATION OF RADIATION RISKS

Project tasks subject to RPP protocol indicate a known or suspected likelihood of activities occurring in radiologically impacted areas (e.g., locations with sources of radium-226 [Ra-226], areas with similar radionuclides of concern as identified in a site-specific Historical Radiological Assessment [HRA]).

3.2 CONTROLLING DOCUMENTS

Unless indicated otherwise in Section 1.0, work conducted under the RPP will be subject to requirements detailed in TtEC RML No. 29-31396-01 or California Agreement State license (as applicable) and in accordance with any project-specific Memorandum of Understanding (MOU) criteria and applicable radiological control work documents (e.g., site-specific Base-wide Radiological Work Plan, SOPs). TtEC will incorporate site-specific versions of SOPs as needed to implement and satisfy license commitments. Title 10 of the *Code of Federal Regulations* (CFR) Section 20 applies to the RPP standards used. In parallel, industrial safety requirements and U.S. Environmental Protection Agency regulations detailed in 29 and 40 CFR also have applicability for a variety of regulatory subjects including Comprehensive Environmental Response, Compensation, and Liability Act; the Resource Conservation and Recovery Act; and the National Emission Standards for Hazardous Air Pollutants.

3.3 EVALUATION OF POTENTIAL EXPOSURE TO WORKERS

RPP dose limits for the control of occupational exposure to ionizing radiation are listed in 10 CFR 20.1201–1208. Dose limits for individual members of the pubic are detailed in 10 CFR 20.1301–1302. In accordance with company policy, all exposures will be minimized to the extent practical. Administrative guidelines, established below the federal limits, will be used as detailed in the current version of corporate procedure NLP-01, As Low As Reasonably

Achievable Program. Occupational exposures for project personnel will be maintained below TtEC administrative values for annual TEDE.

Occupational dose, if any, is expected to originate from external sources (e.g., Ra-226, cesium-137, or strontium-90 or similar known radionuclides of concern as listed in a site-specific reference document [e.g., HRA]). Dose resulting from internal exposures are not anticipated. External exposure controls are addressed in Section 3.8, and controls to prevent or limit internal exposures are detailed in Section 3.9. Dose rates for general area work sites are expected to reflect naturally occurring background values.

3.4 EVALUATION OF PUBLIC DOSE

Based on the scope of planned work, the limited activity of radionuclides expected, and low concentration of naturally occurring radioactive material anticipated, public dose associated with tasks performed under this RPP is not projected. To validate the maintenance of public dose goals, TtEC will implement necessary survey and sampling protocol in areas of intrusive work, conspicuously post and restrict access to intrusive work locations that require monitoring (e.g., areas where soil excavations and/or handling, etc., may disturb sources of radioactive material), and validate survey and sampling results and frequencies with the RASO, RSO, RSOR, and RTS representatives to ensure established controls are effective.

3.5 TRAINING PROGRAM

Site personnel tasked to conduct project-oriented activities must satisfy corresponding APP/SSHP training requirements. Persons subject to assignments involving a known or suspected potential for occupational radiation dose will receive additional training commensurate with radiological awareness requirements as defined in 10 CFR 19.12, Instructions to Workers. Visitors and escorted persons must receive a site briefing and will be assigned to a qualified radiation worker aide when in an area of radiological concern.

3.5.1 Site Briefing

An RPP site briefing is designed for an escorted person and is presented when access is needed to radiologically impacted locations. Specific to the area(s) of concern where access is needed, the RPP brief will cover at a minimum:

- Applicable portions of 10 CFR 19, 10 CFR 20, the RPP, RWPs, site-specific reference documents (e.g., HRA), and supporting SOPs
- A description of radiation exposure risks and monitoring requirements
- Access and egress protocol specific to the radiologically impacted location(s) requiring entry
- Radiation exposure reduction techniques for an embryo/fetus

- Completion of applicable briefing/exposure monitoring documentation
- Notification of contacts as needed to complete training requirements

3.5.2 Radiation Worker Training

RPP training for the radiation worker is provided when unescorted access is needed to impacted site locations subject to radiological control. Inclusive of material that may be required by project-specific Work Plans and documents (e.g., APP/SSHP, Task-specific Plans), training may be presented in the form of a group overview, video presentation, etc., with use of printed handouts approved by the RSOR. Training will address at a minimum:

- Applicable portions of 10 CFR 19, 10 CFR 20, the RPP, site-specific reference documents (e.g., HRA), and supporting SOPs specific to task performance
- A description of radiation exposure risks, monitoring requirements, and techniques
- Access and egress protocol specific to radiologically impacted locations
- Required contacts and expected actions in the event of an emergency (in accordance with the current version of corporate procedure NLP-06, Managing Radiological Emergencies)
- Expected actions and contacts if radioactive material is discovered in an area where it is not expected
- Understanding “hands and feet” and “whole body” monitoring requirements
- Risks with radioactive material and radiation-producing devices unique to the site
- ALARA work principles and techniques
- Understanding the requirements for and compliance with RWPs including protocol for dosimetry and personal protective equipment (PPE)
- Radiation exposure reduction techniques for the embryo/fetus
- Completion of applicable training and exposure monitoring documentation
- Notification of contacts as needed to complete training requirements

3.5.3 Radiological Control Technician Training Qualification

As coordinated between the RSO and RSOR, TtEC will evaluate and ensure acceptable qualification of RCTs. When selected for project assignment, RCT qualifications are evaluated between the RSO and RSOR in accordance with the requirements detailed in NRC License No. 29-31396-01 or California Agreement State license (as applicable). Project-specific training is provided to RCTs commensurate with anticipated duties and assignments.

3.6 DECLARED PREGNANT FEMALE WORKER

To maintain embryo/fetus radiation exposure ALARA, female employees who are pregnant or attempting to become pregnant are encouraged to declare this information to project management in writing to allow for criteria to be exercised as detailed in:

- 10 CFR 20.1208, Dose Equivalent to an Embryo/Fetus
- NRC Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure, Revision 3, Washington, DC (NRC 1999)
- NRC Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, Revision 1, Washington, DC (NRC 1996)

Because of the small anticipated annual dose for workers associated with project activities (i.e., less than 10 millirems/year) it is unlikely in instances of pregnancy that separate dose tracking for the embryo/fetus will be necessary. Managing occupational exposures for all staff within annual TtEC administrative TEDE guidelines is expected to satisfy parallel maintenance of less than 500 millirems total dose for any pregnant female worker over the course of an entire gestation period.

3.7 AS LOW AS REASONABLY ACHIEVABLE PROGRAM

TtEC is committed to maintaining radiation exposure to workers and the public as far below company guidelines and regulatory limits as practical. RPP requirements are established for field operations in an effort to meet that commitment in accordance with the current version of corporate procedure NLP-01, As Low As Reasonably Achievable Program.

3.8 EXTERNAL EXPOSURE CONTROL

The following steps will be taken to control external radiation exposure to levels that are ALARA:

- Employ basic dose reduction strategies as detailed in corporate procedures and site-specific SOPs using the ALARA concepts of time, distance, and shielding.
- Use instruments at frequencies sufficient to accurately determine the level and extent of radiation fields.
- Present adequate staff training to ensure the ability to recognize situations involving objects that might be radioactive, to be wary of objects that are unfamiliar, and to rely on valid instrument readings to limit and safely manage external exposure.

3.9 INTERNAL EXPOSURE CONTROL

Internal exposure is expected to be below all the recognized DAC values as specified in 10 CFR 20. Should the potential for internal dose be confirmed during fieldwork (e.g., due to the nature of the planned activity such as remediation efforts), the activity will be temporarily suspended and the work area secured pending determination and use of corrective protocol as decided among the RSO, RSOR, and PjM.

3.10 MONITORING AND MEASURING EXTERNAL EXPOSURE

A vendor accredited by the National Voluntary Laboratory Accreditation Program will be used to provide project-related dosimetry services. Dosimetry applications and considerations will apply to field staff designated as radiation workers (i.e., personnel needing unescorted access to impacted site locations subject to radiological control). Prior to dosimetry issue, a radiation worker will have satisfactorily completed requirements as detailed in Section 3.5.2.

3.11 MONITORING AND MEASURING INTERNAL EXPOSURE

The monitoring of work practices conducted in areas of radiological concern will be coordinated among the RCTs, RTSs, and members of project management designated as radiation workers using frequencies necessary to confirm the application of correct techniques and PPE to minimize potential transfer of external contaminants inside the body.

Air sampling will be performed during intrusive activities conducted in areas of radiological concern. Air sample results will be reviewed and tracked among the RSO, RSOR, RTS, and designated RCTs to determine whether trends (e.g., concentrations greater than 10 percent of DAC) exist that require work stoppage and/or re-engineering of task-specific contamination controls.

3.12 SURVEYS AND MONITORING

A project-based summary of historic survey and monitoring information is typically available in site-specific documentation (e.g., an HRA or Base-wide Radiological Work Plan). Protection of workers, the public, and the environment depends on accurate assessment and interpretation of past historic information as compared to present-day survey data collected in accordance with prescribed procedures and project support documents.

In situations subject to this RPP, guidance for determining survey frequency and technique is detailed in applicable portions of corporate procedures NLP-04, Radiological Entry Control Program, NLP-05, Radioactive Contamination Control, and RPG 2-9, Radiological Surveys and Operational Checks. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.12.1 Surveys of Equipment and Materials

Equipment and material passing through areas controlled for radiological concern will be subject to survey criteria and techniques detailed in applicable portions of corporate procedure NLP-05, Radioactive Contamination Control. In parallel, supplemental site-specific documentation may be authorized for use by the RSO if indicated on a Radiation Protection Program SOP Crossover Document.

3.13 ACTION LEVELS

Action levels represent transition points at which concentrations of radioactivity require additional response and/or investigation (e.g., PPE upgrades or increased work technique controls). Action levels for radiological controls are detailed in corporate procedure NLP-01, As Low As Reasonably Achievable Program, and NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document. Modification to project-specific action levels requires Navy concurrence.

3.14 RADIOLOGICALLY CONTROLLED AREAS AND POSTING

Site structures, outdoor locations, and/or perimeter boundaries posted with yellow and magenta markings are established to identify areas designated for radiological control, prevent (to the extent practical) access by unauthorized persons, and protect members of the public from exposure to radiation. A description of scenarios and postings employed for control purposes are detailed in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.14.1 Controlled Area

A Controlled Area may be established where access to impacted portions of a work site requires specialized qualification and approval. A Controlled Area (which may also be called a Restricted Area) is intended to serve as the outermost boundary around planned and established work zones.

Controlled Area access requires prior authorization and use of PPE as defined in a project specific APP/SSHP. Visitors must have requisite training as specified in an SSHP. Personnel who enter a Controlled Area may not cross into more restrictive areas posted within unless prior authorization is obtained.

Where the perimeter to a Controlled Area is first encountered for radiological purposes, posting applications will have the wording "Caution Controlled Area" (or Restricted Area) and provide a contact phone number. (Supplemental information as specified by the RSOR or designee may also be included as magenta [preferred], purple, or black markings on a yellow [preferred] or white background). A minimum of one sign will be posted on each straight run of the Controlled Area (or Restricted Area) boundary. Note that areas not typically accessed by pedestrians (e.g., windows) need not be posted. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.2 Access Control Point

When used, an Access Control Point is part of a Controlled Area (or Restricted Area) boundary. Intended to serve as a transition corridor, an Access Control Point allows for the accountability of personnel, tools, and equipment that pass through. When established as a radiological control mechanism, an Access Control Point RCT will be present any time activities within are ongoing. During periods of inactivity, control point gates (part of the contiguous area boundary) are closed and locked.

3.14.3 Radiologically Controlled Area

A Radiologically Controlled Area (RCA) represents an area in which a person who works for 1 year might receive a whole body dose in excess of 100 millirems from all pathways (excluding natural background and medical exposures). For external sources, the RCA is typically posted when the dose rate of 30 centimeters exceeds 50 microrems per hour, although this may be modified at the discretion of the license RSO based on accurately assessed occupancy factors. Intended to include (for posting purposes) the nearest boundary or perimeter associated with the affected area, RCA restrictions and corresponding access protocol can be located in supplemental site-specific documentation and authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the RCA boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary. For waterfront areas, signs should be posted at areas accessible by watercraft.

3.14.3.1 Radioactive Materials Area

A Radioactive Materials Area (RMA) identifies any area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in Appendix C, Title 10 Part 20 of the CFR. Intended to warn of the potential for occupational dose, a description of RMA scenarios and postings employed for control purposes can be located in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the RMA boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.4 Contaminated Area

A Contaminated Area is any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed the removable surface contamination values specified in Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors

(AEC 1974), but do not exceed 100 times those values. Contamination is radioactive material that is deposited on a surface where it is unwanted. Subject to license control, a description of Contaminated Area scenarios and postings employed for control purposes can be located in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the RCA boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.5 High Contamination Area

A High Contamination Area is any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed 100 times the removable surface contamination values specified in Regulatory Guide 1.86 (AEC 1974). High Contamination Area scenarios and postings employed for control purposes are detailed in applicable portions of supplemental site-specific documentation (e.g., Department of Energy Procedures for Radiologically Restricted Areas – Posting and Access Control per 10 CFR 835) and may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the High Contamination Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.6 Radiation Area

A Radiation Area means any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates. A description of Radiation Area scenarios and postings employed for control purposes can be located in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the Radiation Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.7 High Radiation Area

A High Radiation Area means any area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. A description of High Radiation Area scenarios and postings employed for control purposes can be located in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the High Radiation Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.8 Airborne Radioactivity Area

An Airborne Radioactivity Area is a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:

- In excess of the DACs specified in Appendix B to 10 CFR 20.1001–20.2401, or
- To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake or 12 DAC hours.

As an example, for Ra-226, the most likely airborne contaminant at Navy radiological remediation projects, the applicable DAC value is 3.0E-10 microcuries/milliliter. A description of Airborne Radioactivity Area scenarios and postings employed for control purposes can be located in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized for use by the RSO if indicated on a Radiation Protection Program SOP Crossover Document.

When used, a minimum of one sign will be posted on each straight run of the Airborne Radioactivity Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.15 CONTAMINATION CONTROL

Contamination control practices are established to preclude the spread of contaminants into uncontrolled areas. Recognized applications are detailed in corporate procedure NLP-05, Radioactive Contamination Control.

In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.15.1 Physical Boundary

A physical boundary will be established using criteria referenced in Section 3.14.4 to fully enclose a location established as a Contaminated Area.

3.15.2 Entry

Entry into a Contaminated Area will be compliant with pre-established requirements as detailed on a job-specific RWP. In such instances, an RCT will be present to assist in radiological control and support. (See Section 3.17.1 for details related to RWP use.)

3.15.3 Exit

Exit from a Contaminated Area will be compliant with pre-established requirements as detailed on a job-specific RWP. In such instances, an RCT will be present to assist in radiological control and support. (See Section 3.17.1 for details related to RWP use.)

3.15.4 Limitations on Entry

Personnel with open wounds or sores are not generally granted access into a Contaminated Area. Entry may be authorized by the RSOR or designee, on a case-by-case basis, if appropriate protection of the wound or sore is verified, planned work activities are unlikely to compromise the protection, and there is no other medical reason to restrict entry.

Jewelry and personal items are not allowed in Contaminated Areas; only project furnished tools, materials, and equipment necessary to accomplish the planned task are acceptable. Container wrappings, packing, and similar materials must be segregated from essential items prior to entry.

3.15.5 Control of Items

Items such as equipment and tools to be removed from a Contaminated Area must meet unconditional release criteria as detailed in applicable portions of corporate procedure NLP-05, Radioactive Contamination Control. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.16 INSTRUMENTATION

As detailed in applicable portions of corporate procedure RPG 2-9, Radiological Surveys and Operational Checks, field survey instruments will be calibrated annually at a minimum in accordance with the manufacturers' specifications. Instruments will be removed from service on or before calibration due dates and returned to the supplier for recalibration. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.17 CONTROL OF RADIOLOGICAL WORK

All radiological work activities will be planned in consultation with the RSOR, the PjM, and other project personnel tasked with oversight responsibilities. Work performed in areas of radiological concern require establishment of an RWP, which details radiologically based requirements and protective measures.

3.17.1 Radiation Work Permits

RWPs detail the protective measures and controls needed to perform tasks in areas of radiological concern. Information considered during RWP development is detailed in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.17.2 Task-specific Work Instructions

Task-specific work instructions are used to supplement RWP requirements and address in greater detail corresponding activities planned while personnel are inside areas of radiological concern. These instructions are required for tasks scheduled to occur in locations as determined by the PjM, RSO, RSOR, or the Construction Manager. The RSO or designee will finalize, control, and issue radiologically based work instructions.

3.18 CREDENTIALING OF STAFF

Qualification and training requirements for RCTs are provided in NRC License No. 29-31396-01 and as detailed in applicable portions of corporate procedure RPG 2-5, Radiation Safety Training. The RSO verifies qualifications and conducts required license-specific training with any RSOR designated on the license as an authorized user.

To supplement and validate the correct use and implementation of this RPP and NRC License No. 29-31396-01 or California Agreement State license (as applicable), a Health Physicist certified by the American Board of Health Physicists provides support to active field projects.

3.19 PROCUREMENT, RECEIPT, AND INVENTORY OF SEALED RADIOACTIVE SOURCES

It is not anticipated that field projects will receive radioactive material shipments other than exempt-quantity radioactive check sources. As detailed in corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control, check sources are controlled, stored, posted, and managed as radioactive material.

3.19.1 Leak Testing

Radioactive sealed sources with quantities exceeding the licensable threshold will be leak-tested as detailed in applicable portions of corporate procedures NLP-02, Radioactive Material

Accountability and NLP-03, Sealed Radioactive Source Control. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.19.2 Transport of Sources

Check sources will be used on field projects only for the period of time necessary to execute planned work, will not be introduced onto a project location prior to project initiation, and will be returned to the provider immediately following the completion of planned field activities.

Check sources will be maintained as detailed in applicable portions of corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control. In parallel, supplemental site-specific documentation may be authorized for use by the RSO if indicated on a Radiation Protection Program SOP Crossover Document.

3.19.3 Reporting Lost, Damaged, or Stolen Sources

As detailed in applicable portions of corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control, if a check source is lost, damaged, or stolen, the event will be reported immediately to the RSOR or designee. The RSOR will immediately notify the RSO, the PjM, and the Navy and initiate appropriate recovery actions. In consultation with the Navy, a report will be filed by the RSO or designee with the appropriate law enforcement agency if it is determined that radioactive material was stolen. The RSO will make any necessary notifications to the NRC.

Supplemental site-specific documentation may be authorized for use by the RSO if indicated on a Radiation Protection Program SOP Crossover Document.

3.20 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIALS

Off-site shipment of radioactive materials other than exempt-quantity radioactive check sources by TtEC is not anticipated. Information pertinent to an authorized shipper for a field project is provided in Section 6.0.

3.21 CONTROL OF RADIOACTIVE WASTE

Radioactive waste will be minimized by compliance with contamination control practices (Section 3.15) combined with segregation and survey practices. A waste shipment provider contracted to the Navy through the Army Joint Munitions Command will provide brokerage services including waste characterization sampling, waste containers, and transportation of radioactive materials/waste generated from a field project. Soil and used PPE will typically be processed for final disposition in disposal bins. When filled, bins will be transferred to the custody and control of the authorized shipper. As detailed in corporate procedure NLP-02, Radioactive Material Accountability, commodities are stored in a locked radioactive materials storage area, controlled by the RSOR or designee, and will periodically be packaged and transferred to the authorized shipper for disposal. Radioactive material will be packaged, stored, shipped, and disposed of as required by U.S. Department of Transportation (DOT) regulations.

In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

3.22 RADIATION PROTECTION RECORDS

As detailed in the applicable portions of corporate procedure NLP-07, Radiological Protection Records, the RSO or designee is responsible for ensuring that airborne monitoring, contamination surveys, and exposure/dose rate surveys are reviewed for accuracy and completeness as an ongoing process. Individual exposure records including dosimetry and bioassay reports for personnel are reviewed for results as generated.

3.23 REPORTS AND NOTIFICATIONS

Workers who have previous occupational work history with radiological environments will supply the RSO or designee with prior estimated or reported dose histories on an NRC Form 4 or equivalent as defined in 10 CFR 20.2104.

Records of radiation exposures to workers who have been issued external dosimetry monitoring devices will be maintained. Dosimetry monitoring results for workers will be reported to the RSO annually at a minimum. Annual occupational exposure greater than or equal to 100 millirems for the previous calendar year, or otherwise when requested, requires a summary of individual exposure to be reported to the employee monitored.

3.24 LICENSES

Entities subject to the use of this RPP will conduct radiological-based tasks with use of TtEC NRC License No. 29-31396-01 or California Agreement State license (as applicable). TtEC will ensure that the Radiological Control Program and work practices are implemented and performed in accordance with the NRC or California Agreement State license requirements (as applicable) and the RPP. (Any client-designated waste shipment provider may implement their NRC-issued license to conduct waste characterization sampling of waste material in support of low-level radioactive waste shipment and disposal. An MOU between TtEC and a waste shipment provider will be developed, identifying interfaces and commitments for the transfer of radioactive materials. Active MOUs will be maintained by the RSO or designee.)

3.25 REVIEW AND APPROVALS OF RADIATION PROTECTION PLANS

The RSO or designee will prepare the RPP, which will then be reviewed for approval with subject matter experts (e.g., the PjM, RSOR). In addition, the Navy will have an opportunity to review the draft content, provide input, and indicate acceptance of the plan. Changes to the RPP will be reviewed and accepted following the same process.

3.26 PLANNED SPECIAL EXPOSURES

No anticipated event within work scopes subject to this RPP will require use of a planned special exposure. In the event it is necessary to initiate such a need, an activity-specific work instruction including a formal ALARA review and an RWP will be prepared and submitted for acceptance following the same process as the RPP submittal in Section 3.25.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Minimum PPE requirements based on chemical contaminants are established by the Health and Safety Manager (in a project-/task-specific APP/SSHP). This primary level of PPE, Modified Level D, is historically sufficient for radiological work activities and is supplemented by activity-specific RWPs based on the radiological conditions and field tasks required to perform planned activities. Information considered for PPE during RWP development is detailed in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document.

4.1 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

Personnel must wear PPE commensurate with contamination hazards associated with both the work area and the planned activity. Activities that require heavy physical effort or that have an increased potential for damage to PPE may require additional layers or different PPE materials, even in areas of low contamination. Site- or task-specific PPE requirements beyond the minimum traditionally used will be detailed in a corresponding RWP.

In parallel, supplemental site-specific documentation may be authorized for use by the RSO if indicated on a Radiation Protection Program SOP Crossover Document.

4.2 DONNING AND DOFFING PPE

To prevent contamination of personnel or the spread of contamination, PPE must be donned and doffed in a specific manner. Directions for donning and doffing standard PPE ensembles are provided in the applicable sections of corporate procedure NLP-05, Radioactive Contamination Control. In parallel, supplemental site-specific documentation may be authorized by the RSO for use if indicated on a Radiation Protection Program SOP Crossover Document. Additional instructions for non-standard site- or task-specific PPE requirements will be provided in the applicable RWP.

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5.0 DECONTAMINATION PROCEDURES

Contamination control when handling radioactively contaminated materials will be conducted in accordance with corporate procedure NLP-05, Radioactive Contamination Control. Decontamination of materials and equipment will be performed at a dedicated location (e.g., decontamination pad, room) in accordance with site-specific procedure SOP 7, Decontamination of Equipment and Tools.

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6.0 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIALS

Field projects subject to the use of this RPP will conduct radiological-based activities with use of TtEC NRC License No. 29-31396-01 or California Agreement State license, as applicable. The client-designated waste shipment provider associated with a field project may implement their NRC-issued or California Agreement State license to conduct waste characterization sampling of waste material in support of low-level radioactive waste shipment and disposal. An MOU between TtEC and a waste shipment provider will be used, identifying interfaces and commitments for the transfer of radioactive materials. In such instances, a current MOU will be maintained by the project RSOR for projects subject to the requirements of the RPP.

Environmental samples shipped for off-site analysis and exempt-quantity radioactive check sources are packaged and shipped in accordance with DOT regulations via commercial carriers.

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7.0 REFERENCES

AEC (Atomic Energy Commission). 1974. Regulatory Guide 1.86. Termination of Operating Licenses for Nuclear Reactors. June.

NRC (U.S. Nuclear Regulatory Commission). 1996. Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, Revision 1, Washington, DC. February.

—————. 1999. Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure, Revision 3, Washington, DC. June.

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APPENDIX A

RADIATION PROTECTION PLAN ACKNOWLEDGEMENT FORM

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Radiation Protection Plan Acknowledgment Form

I have reviewed, understand, and agree to follow the Radiation Protection Plan for this project. Additionally, I understand that there are additional nonradiological health and safety requirements, which are presented in the Site Safety and Health Plan. I agree to abide by the requirements of the Radiation Protection Plan for the work that I will perform.

Printed Name	Signature	Representing	Date

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ATTACHMENT 4

SAMPLING AND ANALYSIS PLAN

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SAP Worksheet #1 – Title and Approval Page

ATTACHMENT 4

FINAL
SAMPLING AND ANALYSIS PLAN

APRIL 2013

**REMEDIAL ACTION IR SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

**Prepared for:
Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310**

**Prepared by:
Tetra Tech EC, Inc.
1230 Columbia Street, Suite 750
San Diego, California 92101
(619) 234-8696**

**Prepared under:
Contract No. N62473-10-D-0809
DCN: RMAC-0809-0009-0004
CTO No. 0009**

Review Signature: Gregory D Joyce 04/24/13
Greg Joyce — Date
TtEC Quality Control Program Manager

Approval Signature: Joseph Michalowski April 24, 2013
Joseph Michalowski — Date
NAVFAC SW Quality Assurance Officer

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EXECUTIVE SUMMARY

The Department of the Navy (DON) contracted with Tetra Tech EC, Inc. (TtEC) to provide support for the remedial action at Installation Restoration (IR) Site 2 at Alameda Point, Alameda, California, which includes radiological surveys and sampling prior to and after installation of a multilayer soil cover. The radiological work will be performed under TtEC's United States Nuclear Regulatory Commission Service Provider Radioactive Materials License. This project will be conducted under Contract No. N62473-10-D-0809, Contract Task Order (CTO) No. 0009. This Sampling and Analysis Plan (SAP) has been prepared by TtEC to provide guidance on sampling, analysis, and quality control (QC) in support of the remedial action at IR Site 2.

BACKGROUND

IR Site 2 is located at the southwestern edge of Alameda Point and encompasses approximately 110 acres bordered by San Francisco Bay to the south and west. IR Site 2 consists of a former landfill, wetlands area, the interior margin, and the coastal margin. The landfill covers approximately 60 acres and is bounded to the north by the interior margin and the east by runways and tarmacs. The wetland covers approximately 33 acres and is bounded by the landfill to the north and east and by the coastal margin adjacent to the San Francisco Bay on the south and west. The remaining 17 acres within the IR Site 2 boundary is known as the interior margin and the coastal margin.

As part of the environmental investigations being performed to facilitate transfer of Alameda Point, Weston Solutions, Inc., prepared a Historical Radiological Assessment (HRA) that documents the history of radiological materials at Alameda Point. The HRA states that IR Site 2 is also called the West Beach Landfill. This landfill received essentially all wastes generated by the former Naval Air Station (now called Alameda Point) from 1956 to 1978. As early as 1973, the radioactive wastes generated were being disposed of by licensed radioactive waste disposal firms at approved disposal facilities. IR Site 2 was used for general disposal purposes. Wastes known to have been disposed of include solvents, metal cleaning compounds, electroplating solutions, paint, paint removers and thinners, sludges, oil, sand blast grit, PCB-contaminated oils, TAC rags, infectious wastes, laboratory wastes, asbestos, tear gas, mercury wastes, inert ordnance, and pesticides. Radioactive items potentially disposed of in the IR Site 2 (West Beach) landfill could have included but are not limited to wastes from radium painting operations, damaged instruments, and other radioluminescent devices including both radium and strontium deck or bridge markers, thoriated glass optical devices, depleted uranium counterweights, and residue from washdown of aircraft participating in nuclear weapons testing. An earthen berm surrounds most of the IR Site 2 site. The HRA and the ROD list radium-226 (^{226}Ra), cesium-137 (^{137}Cs), strontium-90 (^{90}Sr), cobalt-60 (^{60}Co), thorium-232 (^{232}Th), and uranium-238 (^{238}U) as radionuclides of concern (ROCs).

The DON conducted a feasibility study (Battelle and BBL 2008) to evaluate potential remedial alternatives for IR Site 2 and prepared a record of decision (ROD) (DON 2010) to document the selected remedy for the site. The selected remedy for soil, as outlined in the ROD, is Alternative

2, a multilayer soil cover, engineering and institutional controls (ICs), and monitoring. This alternative consists of installation of an engineered soil cover over the former landfill to isolate buried waste and soil contaminants and prevent animal burrowing; implementation of engineering and land use controls to protect human health and soil cover integrity; provide for any necessary wetlands mitigation if impacts to wetlands occurs; monitor the soil cleanup action and wetlands mitigation to ensure their proper construction and long-term effectiveness; and conduct methane gas monitoring as necessary.

The selected remedy for groundwater, as outlined in the ROD, is Alternative 2 – Monitored Natural Attenuation. This alternative consists of regularly monitoring groundwater quality using shoreline groundwater monitoring wells to ensure that there are continued stable to decreasing trends in contaminant concentrations, and protection of the beneficial uses of surface water in San Francisco Bay; and implementation of engineering controls and ICs to protect human health and the groundwater remedy. A Post-closure Operations, Maintenance, and Monitoring Plan is provided in Attachment 11. Monitoring activities for groundwater which include groundwater sampling are not discussed in this SAP since these activities are not part of the TtEC scope for this project. A separate SAP will be prepared by the contractor who receives that scope of work.

OBJECTIVES

The objectives of the project as related to the sampling activities associated with the installation of a multilayer soil cover are as follows:

- Clearing vegetation and subgrading at IR Site 2
- Performing an initial radiological survey of the subgrade prior to installation of the cover to establish baseline risk and dose estimates
- Removing identified radioactive contamination at twice background radiation levels based on the initial survey
- Collecting soil samples from the subgrade surface for radiological dose and risk modeling
- Providing modeling, based on analysis of soil samples collected from the subgrade surface, to demonstrate that with the 2-foot cover installed, the maximum annual dose to an individual of 15 mrem, and the excess lifetime cancer risk (ELCR) at 3×10^{-4} for the critical group, are not exceeded
- Disposing of soil exceeding the criteria for the ROCs as low-level radioactive waste (LLRW)
- Performing a final radiological survey of the cover to document effectiveness of the remedy

Where applicable, radiological survey activities will be conducted in accordance with the guidelines in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Nuclear Regulatory Commission (NRC) NUREG-1575 (DoD et al. 2000), as discussed in the Radiological Work Plan (Attachment 2 to the Remedial Action Work Plan).

SAP Worksheets

Page

APPENDICES (on CD only)

ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
%D	percent difference
%R	percent recovery
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AA	atomic absorption
AEC	Atomic Energy Commission
AES	atomic emission spectrometer
AM	Action Memorandum
^{241}Am	americium-241
ASCII	American Standard Code for Information Interchange
Ba	barium
BHC	benzene hexachloride
^{214}Bi	bismuth-214
BRAC	Base Realignment and Closure
Cal/EPA	California Environmental Protection Agency
CAS	Chemical Abstracts Service
CCB	continuing calibration blank
CCR	*California Code of Regulations*
CCV	continuing calibration verification
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm^2	square centimeter
CN	cyanide
^{60}Co	cobalt-60
COC	chain of custody
COD	chemical oxygen demand
CPM	counts per minute
^{137}Cs	cesium-137
CSO	Caretaker Site Office
CTO	Contract Task Order
CV	calibration verification

ABBREVIATIONS AND ACRONYMS
(Continued)

CVAA	cold vapor atomic absorption
2,4-D	2,4-dichlorophenoxyacetic acid
2,4-DB	(2,4-dichlorophenoxy)butyric acid
DCC	daily calibration check
DCGL	derived concentration guideline level
DCN	Document Control Number
4,4′-DDD	4,4′-dichlorodiphenyldichloroethane
4,4′-DDE	4,4′-dichlorodiphenyldichloroethene
4,4′-DDT	4,4′-dichlorodiphenyltrichloroethane
DoD	Department of Defense
DOE	Department of Energy
DON	Department of the Navy
dpm	disintegrations per minute
DQA	data quality assessment
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
ELCR	Excess Lifetime Cancer Risk
EPA	U.S. Environmental Protection Agency
EWI	Environmental Work Instruction
FCR	Field Change Request
FD	field duplicate
FID	flame ionization detector
FSS	Final Status Survey
g	gram
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
^3H	tritium
HCl	hydrochloric acid
HNO_3	nitric acid
HPGe	high-purity germanium

ABBREVIATIONS AND ACRONYMS
(Continued)

HRA	Historical Radiological Assessment
H_2SO_4	sulfuric acid
ICAL	initial calibration
ICB	initial calibration blank
ICP-MS	inductively coupled plasma mass spectroscopy
ICS	interference check sample
ICV	initial calibration verification
IR	Installation Restoration (Program)
IRCDQM	Installation Restoration Chemical Data Quality Manual
keV	kiloelectron volt
L	liter
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LDC	Laboratory Data Consultants
LLRW	low-level radioactive waste
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCPA	2-methyl-4-chlorophenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy)-propionic acid
MDA	minimum detectable activity
MDL	method detection limit
MEK	methyl ethyl ketone
MeV	megaelecton volt
mg	milligram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
MS	matrix spike
MSA	Method of Standard Addition
MSD	matrix spike duplicate
N_2	nitrogen gas
N/A	not applicable

ABBREVIATIONS AND ACRONYMS
(Continued)

NaI	sodium iodide
NaOH	sodium hydroxide
NAVFAC SW	Naval Facilities Engineering Command Southwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEDD	Navy Electronic Data Deliverable
NIRIS	Naval Installation Restoration Information Solution
NIST	National Institute of Standards and Technology
NORM	naturally occurring radioactive material
OSHA	Occupational Safety and Health Administration
oz	ounce
PAL	project action limit
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PDF	portable document format
PID	photoionization detector
PjM	Project Manager
PMO	Program Management Office
PQCM	Project Quality Control Manager
PRG	preliminary remediation goal
PT	proficiency testing
^{238}Pu	plutonium-238
^{239}Pu	plutonium-239
^{240}Pu	plutonium-240
^{242}Pu	plutonium-242
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QCPM	Quality Control Program Manager
QL	quantitation limit

ABBREVIATIONS AND ACRONYMS
(Continued)

QSM	Quality Systems Manual
^{226}Ra	radium-226
RASO	Radiological Affairs Support Office
RCRA	Resource Conservation and Recovery Act
RER	relative error ratio
RESRAD	residual radioactivity (computer code)
RL	reporting limit
ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RSL	Regional Screening Level
RSO	Radiation Safety Officer
RSOR	Radiation Safety Officer Representative
RTC	response to comments
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOP	Standard Operating Procedure
Sr	strontium
^{90}Sr	strontium-90
STLC	soluble threshold limit concentration
SVOC	semivolatile organic compound
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
^{229}Th	thorium-229
^{230}Th	thorium-230
^{232}Th	thorium-232
TOG	total oil and grease
2,4,5-TP	2-(2,4,5-trichlorophenoxy)propionic acid
TPH	total petroleum hydrocarbons

ABBREVIATIONS AND ACRONYMS
(Continued)

TPH-d	total petroleum hydrocarbons quantified as diesel
TPH-diesel	total petroleum hydrocarbons quantified as diesel
TPH-e	TPH-extractable
TPH-extractable	total extractable petroleum hydrocarbons
TPH-g	total petroleum hydrocarbons quantified as gasoline
TPH-mo	total petroleum hydrocarbons quantified as motor oil
TPH-p	TPH-purgeable
TPH-purgeable	total purgeable petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
TSP	Task-specific Plan
TSS	total suspended solids
TtEC	Tetra Tech EC, Inc.
^{238}U	uranium-238
UFP	Uniform Federal Policy
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound
VSP	Visual Sample Plan
VTA	vehicle towed array
Water Board	Regional Water Quality Control Board
Yt	yttrium
ZnAC	zinc acetate

SAP Worksheet #2 – SAP Identifying Information

Site Name/Number: **Installation Restoration (IR) Site 2 Remedial Action at Alameda Point**
Contractor Name: **Tetra Tech EC, Inc. (TtEC)**
Contract Number: **N62473-10-D-0809**
Contract Title: **Radiological Environmental Multiple Award Contract**

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005) and U.S. Environmental Protection Agency (EPA) Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS (EPA 2002).

2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held.

Scoping Session	Date
Kick-off meeting to discuss scope of project with DON.	September 8, 2011

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
Not applicable	

6. List organizational partners (stakeholders) and connection with lead organization: The EPA, California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC), California Department of Public Health (CDPH), Regional Water Quality Control Board (Water Board) San Francisco Region, Radiological Affairs Support Office (RASO), and United States Fish and Wildlife Service (USFWS) (for sensitive species) will provide regulatory oversight and guidance.

7. Lead organization: Department of the Navy (DON)

8. If any required SAP elements or required information is not applicable to the project or is provided elsewhere, then note the omitted SAP elements and provide an explanation for its exclusion below:

    - Worksheet #12 (Measurement Performance Criteria Table) is not applicable for this project as field QC samples are not required.
    - Worksheet #21 (Project Sampling SOPs Reference Table) is not included in this SAP since the sampling procedures are described in detail in Worksheet #14.

SAP Worksheet #2 – SAP Identifying Information (Continued)

SAP elements and required information that are not applicable to the project are noted below. An explanation is provided above and in the appropriate SAP worksheet(s), as necessary.

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	
Project Planning/Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	
10	Problem Definition, Site History, and Background Site Maps (historical and present)	
11	Site-Specific Project Quality Objectives	
12	Measurement Performance Criteria Table	Not applicable
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/ SOP Requirements Table Sampling Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field Quality Control Sample Summary Table	
21	Project Sampling SOP References Table	Not applicable
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
Analytical Tasks		

SAP Worksheet #2 – SAP Identifying Information (Continued)

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	
32	Assessment Findings and Corrective Action Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

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SAP Worksheet #3 – Distribution List

The following distribution list represents the recipients of the final version of this SAP.

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing and E-mail Address
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SAP Worksheet #3 – Distribution List (Continued)

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Mr. Doug DeLong	Caretaker Site Office (CSO) / Environmental Compliance Manager (ECM)	BRAC PMO West	(415) 743-4713	410 Palm Ave; B-1 Suite 161 (Treasure Island) San Francisco, CA 94130-1806 douglas.delong@navy.mil
Mr. Hedy Abedi	PjM	TtEC	(949) 809-5053	17885 Von Karman Avenue, Suite 500 Irvine, CA 92614-6213 hedy.abedi@tetratech.com
Mr. Pete Everds	Technical Lead	TtEC	(619) 471-3504	1230 Columbia St., Suite 750 San Diego, CA 92101 pete.everds@tetratech.com
Mr. Erik Abkemeier	Radiation Safety Officer (RSO)	TtEC	(757) 944-0921	Twin Oaks, Suite 309 5700 Lake Wright Drive Norfolk, VA 23502 erik.abkemeier@tetratech.com

SAP Worksheet #3 – Distribution List (Continued)

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing and E-mail Address
Mr. Nathan Smith	Radiation Safety Officer Representative (RSOR)	TtEC	(614) 332-5838	1090 ½ West Tower Avenue Alameda, CA 94501 nathan.smith@tetratech.com
Mr. Greg Joyce	Quality Control Program Manager (QCPM)	TtEC	(360) 780-0371	1230 Columbia St., Suite 750 San Diego, CA 92101 greg.joyce@tetratech.com
Ms. Lisa Bienkowski	Program Chemist	TtEC	(949) 809-5028	17885 Von Karman Ave., Suite 500 Irvine, CA 92614 lisa.bienkowski@tetratech.com
Ms. Sabina Sudoko	Project Chemist	TtEC	(949) 809-5022	17885 Von Karman Ave., Suite 500 Irvine, CA 92614 sabina.sudoko@tetratech.com
Mr. Vincent Richards *	Project Quality Control Manager (PQCM)	TtEC	(949) 283-0589	1090 ½ West Tower Avenue Alameda, CA 94501 vincent.richards@tetratech.com
Mr. Ray Seamons	Alternate PQCM	TtEC	(510) 523-1582	1090 ½ West Tower Avenue Alameda, CA 94501 ray.seamons@tetratech.com
Mr. Phil Smith	Laboratory Supervisor	Curtis and Tompkins	(415) 216-2768	201A & 201B Fisher Avenue San Francisco, CA 94124 phil.smith@ctberk.com
Ms. Erika Starman	Laboratory Project Manager	TestAmerica-St. Louis	(314) 298-8566	13715 Rider Trail North Earth City, MO 63045 erika.starman@testamericainc.com
Ms. Linda Rauto	Data Validator Project Manager	Laboratory Data Consultants (LDC)	(760) 634-0437	7750 EL Camino Real, Suite 2L Carlsbad, CA 92009 lrauto@lab-data.com

** The PQCM, Vincent Richards, will have multiple copies of the final SAP on-site for field crews to reference while sampling.*

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SAP Worksheet #4 – Project Personnel Sign-Off Sheet

The key personnel listed below will read the final version of this SAP. Their signature and date will be filled in below and included in the project file.

Name	Organization/Title/Role	Signature/Email Receipt	SAP Section Reviewed	Date SAP Read
Mr. Hedy Abedi	TtEC/PjM		Entire document	
Mr. Nathan Smith	TtEC/RSOR		Entire document	
Mr. Vincent Richards	TtEC/PQCM		Entire document	
Mr. Michael O'Hare	TtEC/Alternate PQCM		Entire document	
Ms. Sabina Sudoko	TtEC/Project Chemist		Entire document	
Mr. Phil Smith	Curtis and Tompkins/Laboratory Supervisor		Entire document	
Ms. Erika Starman	TestAmerica-St. Louis /Laboratory Project Manager		Entire document	
Ms. Linda Rauto	LDC/Data Validator Project Manager		Entire document	
TBD [a]	TtEC/Field Crews		Entire document	

Notes:

[a] Field crews include multiple persons and vary from project to project. Therefore, persons identified by the PQCM will read the SAP and sign this worksheet as required.

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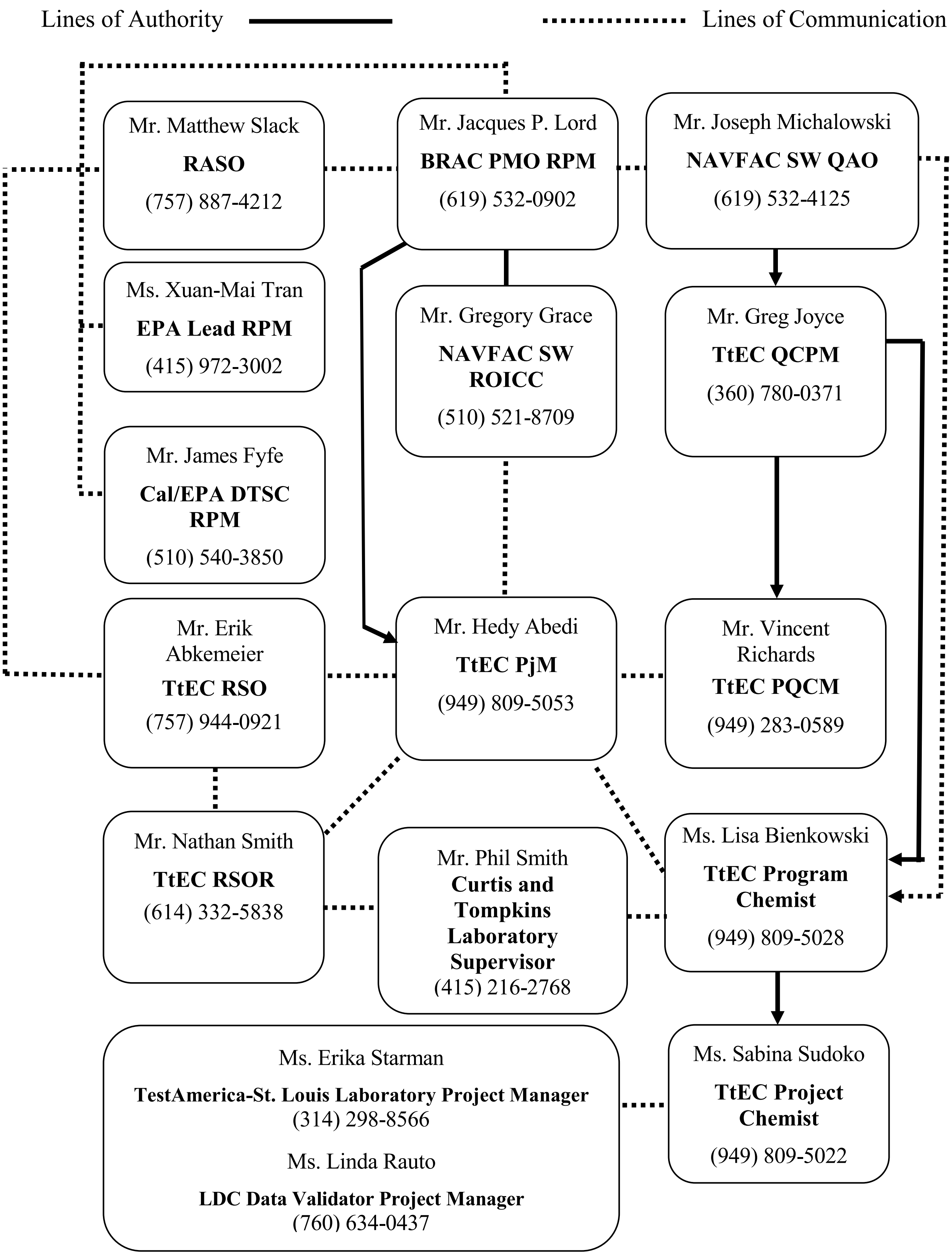
SAP Worksheet #5 – Project Organizational Chart



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SAP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Point of contact for DON quality issues	NAVFAC SW QAO	Mr. Joseph Michalowski	(619) 532-4125	SAP and its addendum (if applicable) will be approved by the QAO prior to start of sampling. If during sampling, a major change in sampling procedures or strategy is required, the QAO will be notified via email and give concurrence to issue a field change request or SAP Addendum. In addition, the QAO has the authority to suspend project execution if quality assurance requirements are not adequately followed.
Point of contact for contractor quality issues	TtEC QCPM	Mr. Greg Joyce	(360) 780-0371	The QCPM is responsible for overseeing program quality control (QC), including construction and analytical data acquisition. The QCPM has the authority to suspend project activities if quality standards are not maintained.
Project management	TtEC PjM	Mr. Hedy Abedi	(949) 809-5053	If changes are necessary, the PjM is responsible for communicating the changes via phone and/or e-mail to the project staff and is authorized to stop work, if necessary.
Point of contact for significant changes or corrective actions	BRAC PMO RPM	Mr. Jacques P. Lord	(619) 532-0902	If significant changes or corrective actions occur during the project, the RPM will notify the EPA and other regulators involved in this project.
SAP review and radiological concurrence	RASO	Mr. Matthew Slack	(757) 887-4212	The RASO will review and concur with the SAP as related to the radiological aspects.
SAP review	QCPM	Mr. Greg Joyce	(360) 780-0371	The SAP will be written by the Program Chemist and reviewed by the QCPM prior to submittal to the NAVFAC SW QAO.
Notification of nonusable analytical data	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	If significant problems are identified by the laboratory or the project team that impact the usability of the data (i.e., the data is rejected or data quality objectives are not met), the Program Chemist will notify the NAVFAC SW RPM and QAO within 24 hours.

SAP Worksheet #6 – Communication Pathways (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Coordination of laboratory supplies for field sampling activities	TtEC Project Chemist	Ms. Sabina Sudoko	(949) 809-5022	The Project Chemist will contact the laboratory to provide all necessary sample containers and appropriate shipping materials (such as coolers and bubble wrap) to be delivered on-site prior to commencement of field sampling activities and throughout the course of the project.
Reporting laboratory data quality issues or analytical corrective actions	Curtis and Tompkins Laboratory Supervisor TestAmerica-St. Louis Laboratory Project Manager	Mr. Phil Smith Ms. Erika Starman	(415) 216-2768 (314) 298-8566	All Curtis and Tompkins data quality issues will be reported in writing by the Laboratory Supervisor to the RSO and Program Chemist within 24 hours. All TestAmerica-St. Louis data quality issues will be reported in writing by the Laboratory Project Manager to the Project Chemist and Program Chemist within 24 hours. Any corrective actions will be documented and verified by the Program Chemist who will notify in writing the QCPM, RSO, and PjM. The PjM will notify the BRAC PMO RPM and RASO.
Field corrective actions	TtEC PQCM	Mr. Vincent Richards	(949) 283-0589	All field corrective actions will be documented in writing by the PQCM who will notify in writing the QCPM, RSO, and PjM. The PjM will notify the BRAC PMO RPM and RASO.
Release of analytical data	TtEC RSO TtEC Project Chemist	Mr. Erik Abkemeier Ms. Sabina Sudoko	(757) 944-0921 (949) 809-5022	The RSO (or designee) will review Curtis and Tompkins analytical results to verify that the requirements in this SAP have been met prior to releasing the data to the project team for evaluation. The Project Chemist will review TestAmerica-St. Louis analytical results to verify that the requirements in this SAP have been met prior to releasing the data to the project team for evaluation.

SAP Worksheet #6 – Communication Pathways (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Review of radiological data and concurrence on radiological actions	RASO	Mr. Matthew Slack	(757) 887-4212	The RASO will review all appropriate radiological data provided by the RSO (or designee) and will provide concurrence with actions proposed.
SAP procedure revision during field activities	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	The Program Chemist (or designee) will prepare a Field Change Request (FCR) for any changes in sampling procedures that occur due to conditions in the field.
SAP amendments	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	Significant changes to the SAP such as additional scope of work that is not covered in this SAP will require that the Program Chemist prepare an addendum, which will be reviewed and approved by the NAVFAC SW QAO prior to initiating the affected field activities.

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SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Joseph Michalowski	QAO	NAVFAC SW	• Reviewing and approving this SAP • Providing DON oversight of TtEC's Quality Assurance (QA) Program • Providing technical and administrative oversight of TtEC's surveillance audit activities • Acting as point of contact for matters concerning QA and the Department of Defense's (DoD) Laboratory QA Program • Coordinating training on matters pertaining to generation and maintenance of quality of data • Authorizing the suspension of project execution if QA requirements are not adequately followed
Mr. Jacques P. Lord	RPM	BRAC PMO	• Performing project management for the DON • Ensuring that the project scope of work requirements are fulfilled • Overseeing the project cost and schedule • Providing formal technical direction to the TtEC project team, as needed • Acting as lead interface with agencies
Mr. Hedy Abedi	PjM	TtEC	• Coordinating work activities of subcontractors and TtEC personnel, and ensuring that all personnel adhere to the administrative and technical requirements of the project • Monitoring and reporting the progress of work, and ensuring that the project deliverables are completed on time and within project budget • Monitoring the budget and schedule, and notifying the client and the RPM of any changes that may require administrative actions • Ensuring adherence to the quality requirements of the contract, project scope of work, and the QC plans • Ensuring that all work meets the requirements of the technical specifications and complies with applicable codes and regulations

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Hedy Abedi (Continued)	PjM	TtEC	• Ensuring that all work activities are conducted in a safe manner in accordance with the Site-Specific Safety and Health Plan, United States Army Corps of Engineers' Safety and Health Requirements (Engineer Manual 385-1-1), and all applicable Occupational Safety and Health Administration (OSHA) regulations • Serving as the primary contact between the DON and TtEC for actions and information related to the work and including appropriate TtEC technical personnel in the decision-making • Coordinating satisfactory resolution and completion of evaluation and acceptance report for nonconformance reports • Suspending project activities if standards are not maintained
Mr. Matthew Slack	Radiological Environmental Protection Manager	RASO	• Reviewing radiological laboratory data on a routine basis • Performing on-site reviews of all radiological site operations • Reviewing and approving all radiological work plans and final reports • Providing review and concurrence on data for proposed radiological actions • Ensuring that all necessary sample results are provided and are consistent with proposed radiological actions • Comparing radiological data with the requirements of the Work Plan, Design Plans, Task-specific Plans, and SAP to ensure that all proper conditions have been met to implement the action requested

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Matthew Slack (Continued)	Radiological Environmental Protection Manager	RASO	• Ensuring that the radiological data reported are consistent with the intent for which the data were provided • Comparing the sample number matrix with the intent of the data package to ensure that the sample number is consistent with the intent of the data package • Reviewing sample acquisition information to ensure that the sample analytical duration meets the minimum required time necessary to meet the minimum detectable activity (MDA) • Comparing each radionuclide's specific activity with the release criteria to ensure that the decision made is consistent with the specific activity reported • Comparing the MDA with the release criteria to ensure that it is sufficiently below the release levels • Evaluating the qualifiers provided with the sample results to ensure that the information provided is consistent with the results provided • Reviewing uncertainty counting and the 2-sigma total uncertainty data along with the laboratory qualifiers to determine if the data are of sufficient quality
Mr. Erik Abkemeier	RSO	TtEC	• Overseeing overall radiological operations and documentation for the project • Supporting projects as the technical lead for radiological data collection and analysis • Ensuring that RSOR and field sampling personnel have adequate training in radiological sample collection • Receiving and reviewing data from the laboratory to ensure the data quality objectives have been met • Reviewing and evaluating scan survey data and requiring additional scan data, as necessary

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Nathan Smith	RSOR	TtEC	• Supervising day-to-day radiological operations • Overseeing performance of radiological static surveys • Identifying and assessing radiological contamination • Concurring on the identification of elevated areas for collection of biased samples and the locations of systematic samples • Overseeing the preparation of a remediation plan and the performance of remedial activities when sampling activities indicate the presence of radioactive materials at levels above the release criteria • Directing any additional biased sampling activities to ensure the isolation and removal of radioactive material • Reviewing and evaluating biased sampling data and identifying any additional radiological activities • Recommending radiological activities to the RASO for concurrence including additional sampling, backfilling of trenches, identification of material that can be used as backfill, etc. • Overseeing the plotting of systematic sample locations and collection of the appropriate number of samples • Reviewing and evaluating static survey readings used to verify scan surveys or to get a reading of a sampling point

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Greg Joyce	QCPM	TtEC	• Establishing and maintaining the Quality Program • Overseeing program QC, including construction and analytical data acquisition • Working directly with the PjM and the DON to ensure implementation of the program QC Plans • Acting as a focal point for coordination for quality matters across all projects and resolving quality issues • Suspending project activities if quality standards are not maintained • Interfacing with the DON, including NAVFAC SW QAO, on quality-related items • Conducting field QC audits to ensure project plans are being followed • Performing reviews of audit and surveillance reports conducted by others • Implementing the DON technical direction letters related to quality topics • Approving any FCRs and reviewing addendums to the SAP
Ms. Lisa Bienkowski	Program Chemist	TtEC	• Developing the SAP and any addendums to the SAP • Implementing contract requirements for data collection • Supporting projects as the technical lead for data collection and analysis • Evaluating and selecting a qualified laboratory and third-party data validation subcontractor • Providing oversight of the laboratory with regards to deliverable requirements • Monitoring performance of laboratory and data validator • Overseeing preparation of the Navy Electronic Data Deliverable (NEDD) deliverable to the Naval Installation Restoration Information Solution (NIRIS) website of the analytical data • Coordinating submittal of hard-copy analytical data packages with DON Administrative Record

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Ms. Sabina Suduko	Project Chemist	TtEC	• Tracking samples sent to laboratory to ensure laboratory receipt of samples and proper login of samples for analysis • Tracking receipt of analytical data from the laboratory • Reviewing laboratory data prior to use against requirements in this SAP • Coordinating third-party data validation of the laboratory data • Reviewing data validation reports • Coordinating upload of electronic data to database

SAP Worksheet #8 – Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates
Sampling	General employee radiological awareness training	RSO or designee	Prior to field work	Sampling personnel	Sampler/TtEC	TtEC Project File

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SAP Worksheet #9 – Project Scoping Session Participants Sheet

Project Name: IR Site 2 Remedial Action **Projected Date(s) of Sampling:** 2013 **Project Manager:** Mr. Hedy Abedi	**Site Name:** Alameda Point **Site Location:** Alameda, CA

Date of Session: September 8, 2011
Scoping Session Purpose: Kick-off meeting to discuss scope of project with DON. The purpose of this meeting was to develop a mutual understanding of the work to be performed and the planning documents to be developed and submitted.

Name	Title	Affiliation	Phone #	E-mail Address
Mr. Jacques P. Lord	RPM	BRAC PMO West	(619) 532-0902	jacques.lord.ctr@navy.mil
Ms. Joyce Howell-Payne	Contract Specialist	NAVFAC SW	(619) 532-0923	joyce.howell-payne@navy.mil
Mr. Matthew Slack	Radiological EPM	RASO	(757) 887-4212	matthew.slack@navy.mil
Mr. Robert Perricone	ROICC	NAVFAC SW	(510) 521-8600	robert.perricone@navy.mil
Mr. Doug DeLong	CSO/ECM	BRAC PMO West	(510) 743-4713	douglas.delong@navy.mil
Mr. Hedy Abedi	PjM	TtEC	(949) 809-5053	hedy.abedi@tetratech.com
Mr. Pete Everds	Technical Lead	TtEC	(619) 471-3504	pete.everds@tetratech.com
Mr. Caleb Moore	Design Engineer	BAS	(909) 860-7777	caleb.morre@tetratech.com
Mr. Nathan Smith	RSOR	TtEC	(614) 332-5838	nathan.smith@tetratech.com
Mr. Vincent Richards	PQCM	TtEC	(949) 283-0589	vincent.richards@tetratech.com
Mr. Bob Wells	Construction Superintendent	TtEC	(510) 523-1582	bob.wells@tetratech.com
Mr. Ray Seamons	Project Engineer	TtEC	(510) 523-1582	ray.seamons@tetratech.com

Meeting minutes:

Project Technical Information

Jacques wanted to discuss several broad aspects of the project and wanted to point out key points regarding the work.

SAP Worksheet #9 – Project Scoping Session Participants Sheet (Continued)

1. The IR Site 2 project is not a Title 27 closure but a ROD based cover to interrupt receptor pathways. Although the team may be developing plans and performing work similar and in conformance to a Title 27 closure, the Navy is not required to close the landfill to comply with that law.
2. The Navy must deal with the radiological issues of the site and to obtain as much information as possible from all the past work at IR Site 2 to fully understand the data Jacques wants to be able to identify gaps in the data and be able to determine if it is possible to deal with radiological concerns by use of cover materials or other controls to minimize radiological impacts. Jacques feels the radiological issues are one of the most important aspects of the work and difficult since there is not a clear indication on where all the radiological contamination specifically is located and the current design may not identify all the subgrade cut areas that would be required to make grade.
3. The seismic engineering mitigations are another important aspect to the job. Jacques feels that the detailed evaluation of the seismic aspects for the site will dictate how TtEC plans to mitigate their affects. Jacques mentioned dynamic compactions, possible set-backs slope grades and thickness as all potentially key issues that need evaluation before the design plan can be completed.
4. The most important political issue at the site with the regulators and community is the wetlands. Jacques feels this is not a difficult challenge since the Navy has delineated the main wetland area within the site. Regarding the 9 acres of seasonal wetlands in the north, northeast bunker area of the site, Jacques feels that any disruption of those areas during construction can be mitigated. Jacques envisions those disturbances as temporal and easily repaired without having to consider creating new wetland areas.
5. Institutional controls that had been considered in the ROD, although not specific, are important to the Navy. Jacques felt if the project could be designed to include public access, even with a path around the area, that effort will go a long way with the community buying into the project.
6. Regarding drainage Jacques was not specific in addressing any one issue except to say that controls need to mitigate erosion of the cover.
7. Material sources are important to the Navy in a way to control cost. Jacques is aware that TtEC plans to barge in off-site soils; however, the Navy has identified on-site sources of concrete and asphalt that he envisions can be used in the bio-barrier. In addition Jacques stated that IR Site 17 nonhazardous soils are expected to be stockpiled at the site. Hedy indicated that the task is already in progress and those soils are already being stockpiled. Jacques indicated that others had proposed mining soils at the site. Jacques does not feel that there is much potential in that but wants to pursue it by reviewing the site information in case an argument could be made for it.

Everyone appreciated the summary that Jacques provided. Jacques felt the above items were critical to the project and wanted them identified at this time so the team can be focused with their work throughout the entire period of performance. Doug raised a question regarding drainage and asked if the wetland culvert was part of the contract. Jacques indicated that the

SAP Worksheet #9 – Project Scoping Session Participants Sheet (Continued)

culvert is covered but he was considering other issues above regarding the drainage. The final cover surface could have many facets and those need to be evaluated to address erosion control and settlement issues that will impact the operation and maintenance (O&M) of the cover over the long term.

Task Summary

Hedy reviewed the current contract award and read the items in the Task Summary

1. **Project Plans (initial award)**

   - Prepare Work Plan including QA/QC Plan, Post-Closure Monitoring plan, Sampling and Analysis Plan, Dust Control Plan, Traffic Control Plan, Data Management Plan, Waste Management Plan, Storm Water Pollution Prevention Plan, Radiological Work Plan/ Protection Plan (four versions).
   - Prepare the 90% Design (including RTCs to the 60% Design) and Final Design including Design Drawings, Specifications, Engineering Calculations, Land Use Controls Remedial Design, Pre-Design Field Investigation, and Geotechnical Report. Design submittals will accompany the Work Plan.

     Hedy indicated that TtEC was expecting the agencies comments on the 60% design mid-October. Jacques confirmed this but he envisioned that by the time the comments come back he expects the majority of the comments can be answered by referring to the 90% design. Jacques expects that TtEC will be modifying the design significantly and some of the comments by the agencies may not be relevant to the new concepts. Pete stated that TtEC has been discussing this issue extensively and will be preparing a technical summary of the new design concepts based on early review of the 60% design and adherence to the key issues addressed above. Pete asked Jacques if it would be advantageous to meet with the Water Board at this time to review those ideas. Jacques indicated that the Water Board is aware of the back story for the project and he feels that the team should take a close look at the comments the board submits and then considering a one-on-one meeting with them. The meeting could focus on the synergistic effect the proposals could have on the project and discuss a path forward.
   - Prepare separate SOPs and Project Specific Work Instructions for radiological work to be submitted for Navy review including RASO.

     Matt asked Nathan if TtEC was planning to work under TtEC's federal NRC radiological license or the State's. Nathan indicated that TtEC always works under the federal license but the Navy scope had mentioned the contractor having a State license. However, at this time Nathan is not sure if they will envoke the State license. Matt suggested that Jacques confer with the Navy's legal department to determine if the IR Site 2 work falls under the federal exclusive jurisdiction or concurrent jurisdiction. Matt indicated that most of Alameda is under concurrent jurisdiction but he understands that IR Site 2 is a federal to

SAP Worksheet #9 – Project Scoping Session Participants Sheet (Continued)

federal transfer and therefore may not require concurrent jurisdiction. Using the federal NRC license eliminates the oversight that the State would provide. Jacques asked Nathan if a concurrent jurisdiction is required does TtEC have or are they in the process of obtaining a state license. Nathan indicated that TtEC is in the process of obtaining one. Doug added that working with the state license opens up other issues that make the work more challenging. Doug feels that Site 2 will be considered an exclusive federal jurisdiction. Jacques agreed but will wait for final word from his legal department.

- Prepare separate document for the Accident Prevention Plan/Health & Safety Plan (two versions).

  Hedy mentioned that Keith Rademacher in Alameda and Roger Margotto in San Diego will take the lead on this document.

- Prepare Fact Sheet for presentation at Public Meeting (three versions).

Jacques mentioned to the ROICCs and RASO that when TtEC presents internal drafts of all the documents he is satisfied with receiving an electronic copy of the document for his review. Jacques envision that the document would be reviewed with track changes and those changes documented by TtEC. Jacques asked the Navy personnel if they would also be amenable to this method. Matt mentioned that he is used to getting a CD of the document and for large documents he prefers to have a hard copy handy to refer to. Nathan mentioned that to create the hard copy takes a few extra days. Matt indicated that TtEC can send a CD with word and pdf files and his review could officially start at this time with TtEC following up with a hard copy. Matt is fine with being able to place comments directly into the document with track changes. Jacques mentioned that TtEC does not need to do formal RTCs for the internal draft as indicated in the schedule. Nathan indicated that the way TtEC is used to doing this is by inserting the RTC directly under the changes made by the Navy and include the changes in the document using "tracked changes" format. Matt mentioned that he has reviewed numerous documents with TtEC and feels everyone is on the same page on how this will work. Matt saw no issues with what Jacque was proposing. Jacques indicated the reason for this request was to help save on paper and to expedite the document schedule.

Hedy mentioned that Matt would be on-site September 15, 2011, with Jacques and this could be discussed further. Hedy resumed the task summary.

2. **Field Work**

   Initial Award

   - Site preparation including demolition of features per Work Plan, and establishing subgrade elevations to the extent practicable without import soil (soil import is optional work)
   - Radiological surface scan and removal of radiologically impacted soil

SAP Worksheet #9 – Project Scoping Session Participants Sheet (Continued)

Hedy mentioned that Nathan has been preparing information in preparation for the meeting on September 15, 2011.

- Procurement of general fill for subgrade

  Hedy mentioned that the procurement process is already underway to secure pricing and schedule.

Options

- Place fill to establish subgrade elevation
- Procurement and placement of animal intrusion barrier
- Procurement and placement of 1-foot thick general soil layer and 0.5-foot thick vegetative topsoil layer.

  Pete asked Jacques if the Navy would be interested in discussing a geosynthetic liner as a bio-barrier. Jacques indicated that the current design uses available on site concrete and asphalt material but if TtEC has a cost effective alternative he would be willing to consider it. Jacques added that burrowing animals are one of the biggest problems with these types of projects. Jacques also mentioned that if the geosynthetic barrier is used it could reduce that amount of material IR Site 2 needed and those could be made available to the Site 1 project.
- Install drainage, monitoring wells, fencing, other IC features
- Final radiological surface scan

3. **Reports and Data Submission (Option)**
   - Data submittals including NIRIS
   - Remedial Action Completion Report

Project Schedule

Hedy mentioned the project schedule was attached and asked if Jacques had any questions on it. Jacques mentioned he had looked at it and he felt it was very optimistic like most projects are at the beginning. He did not want to review the schedule now but wanted TtEC to concentrate on meeting the 90% design submittal to the regulators. Pete indicated that TtEC is committed to that schedule and that is the reason he is already working on an initial technical memorandum identifying key design concerns while the 60% design is in agency review.

Additional Items

1. Hedy asked Jacques when he would be at the Alameda site on September 15, 2011. Jacques indicated that he is meeting with the team for the Building 5 and 400 remediation at 0930 hrs. They plan to discuss with Matt the decontamination proposal. Matt asked Jacques if he was aware that Robert Wilson of the CDPH may join the meeting. Jacques thought that he was not interested because work was EPA driven and not by him. Matt

SAP Worksheet #9 – Project Scoping Session Participants Sheet (Continued)

indicated he may come out just to see what was going on but not in an official capacity. Jacques had no issue with this and felt it may be beneficial.

2. Hedy asked Jacques if he was able to provide any documentation from Site 1 as requested. Jacques had not remembered that request but he instructed Hedy that he can contact Cecily Sabedra (Navy RPM IR Site 1) whenever he wants to provide this information. Jacques has already spoken with Cecily and she is aware of our schedule and will make any information she has available. Jacques will provide her contact information to Hedy after the meeting.

3. Pete asked Jacques if any more information from pre-design site investigations would be coming from the previous contractors. Jacques indicated that the Navy was very unhappy with the recommendations from the contractors because they had done modeling to show that at the maximum credible earthquake it all turned to "soup" from liquefaction at the site and wanted to pursue a waiver and do more research to find out what the minimum earthquake would be to minimize the mitigation measures. Jacques felt the lesson learned from Site 1 is that the contractors have proposed dynamic compaction and a deep driven pile wall to militate against liquefaction. Jacques feels that there is already enough information about the seismic hazards and it is time to design something rather than study it further. Based on that data the Navy denied the additional research work.

   Caleb mentioned that the 60% design report had indicated that ongoing geotechnical work was in progress at the site and wanted to be sure that more data was not forthcoming. Jacques reiterated that the Navy stopped the KCH funding and felt that the statement in the report was probably there in anticipation of them receiving more money for research.

4. Pete also requested if TtEC could get a hold of the CAD files for the 60% design to help alleviate cost in reproducing them. Jacques indicated that he has instructed Anne Estabrook at KCH to provide that data to TtEC and TtEC can contact her directly.

5. Pete and Caleb indicated that they are anxious to have the technical meeting with Jacques to discuss the geotechnical issues of the project in detail.

SAP Worksheet #10 – Problem Definition

The main problem defined for this project is: The DON has determined (based on site-specific investigative data) that low-level radioactive contamination potentially present at IR Site 2 requires a response action prior to installation of a multilayer soil cover. Therefore, the DON initiated removal actions for the screening, characterization, and remediation of radiologically impacted materials at IR Site 2 up to a maximum depth of 1 foot to protect the public health and welfare, and the environment, from actual or potential releases of radiological contaminants during installation of the cover. Installation of the cover is intended to isolate buried waste and soil contamination, and prevent contact with any contamination that may be present at the existing ground surface.

BACKGROUND

Alameda Point was an active military installation from the 1930s to the 1990s, which primarily provided facilities and support for fleet aviation activities. The area of present day IR Site 2 was originally open water until 1956 when a sea wall was constructed along the southern and western shorelines to confine and protect the area. Dredged fill was hydraulically placed within the seawall creating the area encompassed by IR Site 2.

IR Site 2, also called the West Beach Landfill, was used as the main disposal area for the Alameda Point from approximately 1952 through 1978. An estimated 1.6 million tons of waste was deposited (E&E 1983). Historical waste disposal methods at the site generally consisted of trench-and-fill operations. Wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB)-containing liquids, batteries, low-level radiological waste from radium dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E 1983). Ordnance and explosives waste (OEW) may have also been deposited in the 2.5-acre (approximate) OEW burial site located in the southern part of the landfill.

The former landfill is defined as extending into wetland areas. The wetland area contains two surface perennial ponds. The northern pond (North Pond), which is connected to San Francisco Bay via a culvert, contains water year-round. The southern pond (South Pond) was created by excavating soil for landfill cover and subsequently was filled in with fresh water via precipitation. The presence of water in the South Pond is seasonally variable and is directly related to precipitation and run-off.

In 1978, the DON developed plans to close the landfill in accordance with the requirements of the Water Board's *Minimum Criteria for Proper Closure of Class II Solid Waste Disposal Sites* (Resolution No. 77-7). In 1983, the San Francisco Bay Regional Water Quality Control Board (Water Board) issued Order No. 83-35 to implement a final cover, leachate cutoff barrier, methane gas control, earthquake damage control, drainage control, and erosion control, and to generate compliance reports for the former landfill. Between 1983 and 1995, the DON responded by placing a partial clay-soil cover, installing an 820 foot-long, 2-foot-wide and 20- to 30-foot-deep slurry wall to restrict potential contaminant migration to San Francisco Bay. A gas

SAP Worksheet #10 – Problem Definition (Continued)

venting system was installed for methane gas control and repairs were made to the seawall also during this time period. In 1986, 20,000 cubic yards of imported fill soil was spread on the former landfill, which was insufficient in achieving a uniform cover layer of appropriate thickness over the landfill area. Also in 1986 the landfill was graded to prevent ponding, and an earthen perimeter berm was constructed around the landfill. In August 1999, IR Site 2 was officially added to the EPA's National Priority List of Superfund sites.

Most recently, the DON conducted a feasibility study (Battelle and BBL 2008) to evaluate potential remedial alternatives for IR Site 2 and prepared a ROD (DON 2010) to document the selected remedy for the site. The DON, the EPA, California EPA, Department of Toxic Substances Control (DTSC), and the Water Board concurred on the selected remedy for the site. The decision presented in the ROD is based on information contained in the administrative record file as well as on extensive field investigations, laboratory analyses, interpretation of the data, review of current and future conditions, and assessment of the potential human health and ecological risks, and an evaluation of potential remedial alternatives.

The selected remedy for soil, as outlined in the ROD, is Alternative 2, a multilayer soil cover, engineering and institutional controls (ICs), and monitoring. This alternative consists of installation of an engineered soil cover over the former landfill to isolate buried waste and soil contaminants and prevent animal burrowing; implementation of engineering and land use controls to protect human health and soil cover integrity; provision for any necessary wetlands mitigation if impacts to wetlands occurs; monitoring of the soil cleanup action and wetlands mitigation to ensure their proper construction and long-term effectiveness; and conducting of methane gas monitoring as necessary. This SAP includes any sampling activities associated with installation of the soil cover.

The selected remedy for groundwater, as outlined in the ROD, is Alternative 2 – Monitored Natural Attenuation. This alternative consists of regularly monitoring groundwater quality using shoreline groundwater monitoring wells to ensure that there are continued stable to decreasing trends in contaminant concentrations, and to protect the beneficial uses of surface water in San Francisco Bay; and implementation of engineering controls and ICs to protect human health and the groundwater remedy. A Post-closure Operations, Maintenance, and Monitoring Plan is provided in Attachment 11. Monitoring activities for groundwater, which include groundwater sampling, are not discussed in this SAP since these activities are not part of the TtEC scope for this project. A separate SAP will be prepared by the contractor who receives that scope of work.

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

The Data Quality Objectives (DQOs) specify project objectives, data collection boundaries and limitations, the most appropriate type of data to collect, and the level of acceptable decision error. The quality and quantity of data required to implement environmental removal actions are also defined.

The DQOs, as defined through the seven-step process (EPA 2006a), are as follows:

1. State the problem

The main problem defined for this project is: The DON has determined (based on site-specific investigative data) that low-level radioactive contamination potentially present at IR Site 2 requires a response action prior to installation of a multilayer soil cover. Therefore, the DON initiated removal actions for the screening, characterization, and remediation of radiologically impacted materials at IR Site 2 up to a maximum depth of 1 foot to protect the public health and welfare, and the environment, from actual or potential releases of radiological contaminants during installation of the cover. Installation of the cover is intended to isolate buried waste and soil contamination, and prevent contact with any contamination that may be present at the existing ground surface.

Any chemical analysis discussed hereafter in this SAP is for the purpose of classification (non-hazardous or hazardous) of any soil prior to its use as fill material. If the soil is classified as non-hazardous (i.e., meets criteria listed in footnotes d, f, and g of Worksheet #15.1), then the material will be used as fill. Otherwise, the material will be disposed of accordingly.

2. Identify the goal of the study

a) Does the initial gamma survey (conducted after installation of the subgrade and prior to the installation of the cover) identify areas greater than twice background?

b) Does the final gamma survey (conducted after the installation of the cover) identify areas greater than the reference area mean + 3σ?

c) Do the risk and dose assessments, calculated from the soil data generated by the MARSSIM [DoD et al. 2000] guidelines used for the final survey conducted after the installation of the cover, exceed the maximum annual dose to an individual of 15 mrem and/or the excess lifetime cancer risk (ELCR) of 3×10^{-4} for the critical group?

d) Are the radiological analytical results of the soil generated from excavation of any areas prior to installation of the cover above the criteria listed in Worksheet #15.1?

e) Do the analytical results for material to be used as fill meet the criteria described in footnotes d, f, and g of Worksheet #15.1?

3. Identify information inputs

Radiological field technicians will gather the following types of data for this project for subsequent use/evaluation by the RSO (or designee):

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

- Reference (background) area readings
- Gamma scan survey readings
- Systematic gamma static measurements
- Analytical results of samples collected during this project
- Risk and dose modeling

The above data will be gathered using field instruments and analytical techniques described in Step 6 and 7 below. The data will be used to make decisions described in Step 5 below.

4. Define the boundaries of the study

Spatial boundaries: IR Site 2 is located at the southwestern edge of Alameda Point and encompasses approximately 110 acres bordered by San Francisco Bay to the south and west. IR Site 2 consists of a former landfill, wetlands area, the interior margin, and the coastal margin. The landfill covers approximately 60 acres and is bounded to the north by the interior margin and the east by runways and tarmacs. The cover will be installed over approximately 70 acres ensuring that the entire landfill is covered.

Temporal boundaries: There are no temporal boundaries for this project.

5. Develop the analytic approach

a) If the initial gamma survey (conducted after installation of the subgrade and prior to the installation of the cover) identifies areas greater than twice background, then each area determined to be above twice background will be excavated to a depth of 1 foot. Samples will be collected in the excavated area, and then the area will be filled in to bring the surface back up to subgrade. If the initial gamma survey does not identify areas greater than twice background, then no further action is required and installation of the cover will commence. Since a soil cover is being installed as the final remedy for the site, the limit of the excavation will be one foot.

b) If the final gamma survey (conducted after the installation of the cover) identifies areas greater than the reference area mean + 3σ, then the area will be further investigated with concurrence from the project team to ensure that remediation is warranted taking into consideration the risk and dose assessment performed based upon analytical results for the soil to be used for the cover. If remediation is warranted, then the area will be excavated as directed by the project team, then filled in to bring the surface back up to grade, and another gamma survey will be conducted. If the final gamma survey does not identify areas greater than the reference area mean + 3σ, then no further action is required.

c) If the risk and dose assessments, calculated from the soil data generated by the MARSSIM (DoD et al. 2000) guidelines used for the final survey conducted after the

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

installation of the cover, exceed the maximum annual dose to an individual of 15 mrem and/or the ELCR of 3×10^{-4} for the critical group, then the data will be presented to the project team for further direction. If the data indicate doses and risk levels are below acceptable criteria, then no further action is required for the subgrade of the landfill.

d) If the radiological analytical results of the soil generated from excavation of areas prior to installation of the cover are above the criteria listed in Worksheet #15.1, then the material will be disposed of as low-level radioactive waste (LLRW). Otherwise, the material may be used as fill for the cover.

e) If the analytical results for the material to be used as fill meet the criteria described in footnotes d, f, and g of Worksheet #15.1, then the soil may be used as fill material for subgrade or the cover depending on criteria met according to footnotes d, f, and g of Worksheet #15.1. Otherwise, the soil may not be used and additional sources of soil will be identified and sampled.

6. Specify performance or acceptance criteria

Actions to minimize decision errors will be instituted during the data collection phase of the radiological survey. Qualified radiation survey personnel will perform the surveys and record the data. Automated recording of survey data will be used where possible to minimize errors. Data transcribing is the second phase where errors may arise. To avoid data errors for manual surveys, experienced personnel will record and transcribe data.

A knowledgeable individual who is not involved in the direct data collection process (RSO, RSOR, or designee) will review the survey data on a daily basis. This will ensure an ongoing independent review for consistency of all survey data collected.

Field crews will review this SAP prior to collection of samples and sign off on Worksheet #4. An equivalent form to Worksheet #4 may be used.

7. Develop the plan for obtaining data

Radioactive source readings will be used to check instruments for consistency prior to use in each daily shift. The instrument will only be used after readings are compared and agree within +/- 20 percent of predetermined responses. The on-site RSOR will review the information to verify that equipment is operating satisfactorily. In addition, background levels will be determined by conducting gamma scan surveys of a reference area of approximately 1,000 square meters, as agreed upon by the project team. The mean of all readings for the respective survey instrument (Vehicle Towed Array or Ludlum 2350-1 survey meter with 44-10 2-inch by 2-inch sodium iodide [NaI] detector) will be used to calculate the mean reference area gamma background rate.

The MARSSIM (DoD et al. 2000) guidelines will be used for the intial gamma surveys. A 95 percent confidence level for detecting radioactivity above the levels corresponding to a maximum annual dose to an individual of 15 mrem, and the ELCR of 3×10^{-4} for the critical

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

group in soil samples will be assumed with Type I and II errors limited to 5 percent. Survey units will be limited in size to 2000 square meters (m^2) based on the survey unit sizes recommended in MARSSIM (DoD et al. 2000). A triangular grid reference coordinate system will be laid out for each of the initial survey units prior to cover installation to identify survey locations. Combined with the use of qualified and experienced personnel, this design is considered both efficient and resource effective. The theoretical assumptions of the survey design are based on guidelines contained in MARSSIM (DoD et al. 2000).

Details on collection and analysis of samples are in Worksheet #14.

SAP Worksheet #12 – Measurement Performance Criteria Table for Samples

Field QC samples are not required for this project since any samples collected are for modeling dose/risk, waste characterization purposes, or for evaluation of fill material. Therefore, measurement performance criteria for field QC sample collection are not applicable.

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SAP Worksheet #13 – Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical Radiological Assessment	Weston Solutions, Inc.; Historical Radiological Assessment, Alameda Naval Air Station, Use of General Radioactive Materials 1941–2005; 2007.	Assess the likelihood of potential radioactive contamination and migration pathways. Designate sites as impacted or non-impacted.	Data were used to perform the Time-Critical Removal Action by TtEC.	None
Time-Critical Removal Action	TtEC; Final Time-Critical Removal Action Post-Construction Report for Installation Restoration Sites 1, 2, and 32, Alameda Point, Alameda, California; 2009	Mitigate the potential risk posed by material potentially presenting an explosive hazard and radiological contamination at IR Sites 1, 2, and 32.	Data were part of the Record of Decision document prepared by the Navy in 2010.	None
ROD	DON; Final Record of Decision (ROD) for IR Site 2, Former Naval Air Station Alameda, California; 2010	The selected remedy for soil, as outlined in the ROD, is Alternative 2, a multilayer soil cover, engineering controls and ICs, and monitoring. This alternative consists of installation of an engineered soil cover over the former landfill to isolate buried waste and soil contaminants and prevent animal burrowing; implementation of engineering controls and LUCs to protect human health and soil cover integrity; provision for any necessary wetlands mitigation if impacts to wetlands occurs; monitoring of the soil cleanup action and wetlands mitigation to ensure their proper construction and long-term effectiveness; and conducting of methane gas monitoring as necessary.	ROCs identified in the ROD for soil at IR Site 2 include cesium-137 (^{137}Cs), cobalt-60 (^{60}Co), ^{226}Ra, strontium-90 (^{90}Sr), thorium-232 (^{232}Th), and uranium-238 (^{238}U).	None

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SAP Worksheet #14 – Summary of Project Tasks

The following is a list of summary of project tasks as related to sampling activities.

BUILDING UP TO SUBGRADE

The first phase of the project is to build up to subgrade. This will involve grubbing plants, cutting into some of the current land surfaces, and building up the grade of some of the land surfaces with import material and materials that are cut from other areas. In order to minimize the hazards of disturbing the wastes found within the berm, efforts will be made to avoid any cuts within the berm. All planned cuts will be of the berm itself and areas outside the berm.

IR Site 2 is currently posted as a radiologically controlled area (RCA) and will continue to be controlled as such. Radiological controls while performing cuts of the berms and areas outside of the berms will be minimal due to the unlikelihood of waste materials being found within the berm. Radiological control technicians (RCTs) will periodically scan the cut areas on a frequency based on the professional judgment of the RSOR taking into consideration the previous survey results, accessibility of the affected areas, and soil movement in the area. At a minimum, the affected area will be surveyed each time a lift is excavated, a new surface area is exposed, or when personnel entry is required into the affected area. These radiological scans will be performed for health and safety reasons during soil moving operations to ensure that radiological contaminants are not disturbed. The radiological scans will be documented in the field and in the remedial action completion report if a radiological scan identifies an area with levels greater than twice background using a Ludlum 2350 meter with a Ludlum 44-10 NaI detector or equivalent. If levels are encountered that are greater than twice background within the berm, then the work in the area will stop and the RSOR will be immediately notified to assess the levels, and determine a new course of action for these cuts. Soils from these cuts will be used to help bring other portions of the site up to subgrade.

All efforts will be taken to avoid making cuts within the berms to help keep dose to workers ALARA. However, if for some reason it becomes necessary to perform cuts within this area, the area to be cut will be posted as a Contaminated Area and controlled in accordance with TtEC's NRC Radioactive Materials License and SOP 12, Radiologically Controlled Areas Posting and Access Control. Specific radiological controls will be determined by the RSOR based upon the nature of the cut and documented in a Radiation Work Permit prior to performing any cuts within the berm. Cut materials will be scanned in place with the Vehicle Towed Array (VTA) and removed in 6 inch lifts to ensure that no material greater than twice the background level was disturbed. If levels are found greater than twice background, then these areas will be remediated. Materials that do not indicate radiation levels greater than twice background may be used to bring other portions of the site up to subgrade. Note that these materials have not been radiologically released and must either be used to bring depressions up to subgrade or ultimately disposed of as LLRW. VTA surveys of the cut areas will be performed to verify radiation levels prior to down posting the Contaminated Area. If levels are found greater than twice background, remediations will be performed in these areas up to a depth of one foot. Remediated areas will be filled in to bring the surface back up to subgrade.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

INITIAL MARSSIM SURVEY OF SUBGRADE PRIOR TO INSTALLATION OF COVER

The initial MARSSIM survey will be performed once the subgrade is complete and prior to installation of the cover. The entire footprint of the subgrade will be subdivided into survey units no larger than 2,000 square meters in surface area. Each survey unit will be 100% gamma surveyed with the VTA or a Ludlum 2350 meter coupled to a Ludlum 44-10 NaI scintillation detector, in cases where the VTA is physically incapable of surveying. Areas that indicate levels greater than twice background during the gamma survey will be excavated to a depth of 1 foot, sampled (the number of samples will be determined by the RSOR based on the size of the area) and analyzed for gamma isotopes. Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. The area will then be filled in to bring the surface back up to subgrade.

In addition, ten samples will be collected from each survey unit and analyzed for gamma isotopes and one of those samples will be randomly chosen for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) analyses. Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. These sample results will be used to perform dose and risk assessments for the final MARSSIM survey of the cover.

Any soil that is excavated (due to the intial gamma surveys) will be placed in 6-inch lifts. The soil will be surveyed again and soil samples will be collected at a rate of two samples per 40 cubic yards. All samples will be analyzed for gamma isotopes. Ten percent of the samples will also be randomly chosen for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) analyses. Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. These results will be used to determine if the material is LLRW or non-LLRW. LLRW material will be transported to the waste broker for disposal. Non-LLRW will be sampled at a minimum of one sample per 500 cubic yards for chemical analyses as listed in Worksheet #18. These chemical results will determine if any of the material can be reused as fill material for IR Site 2 or if off-site disposal of the material is required.

INSTALLATION OF THE COVER

During installation of the cover, the site will continue to be controlled as an RCA. Periodic coverage by the RCTs is required due to the reduced risk of encountering gross contamination.

FINAL MARSSIM SURVEY OF THE COVER

The final MARSSIM survey of the cover will again entail subdividing the entire footprint of the cover into survey units no larger than 2,000 square meters in surface area. Each survey unit will be 100% gamma surveyed with the VTA or a Ludlum 2350 meter coupled to a Ludlum 44-10 NaI scintillation detector, in cases where the VTA is physically incapable of surveying. Areas indicating levels exceeding the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area, will be further investigated with concurrence from the project team to ensure that remediation is warranted taking into consideration the risk and dose assessment performed based upon analytical results for the soil to be used for the cover. If remediation is warranted, then the area will be excavated as directed by the project team, then

SAP Worksheet #14 – Summary of Project Tasks (Continued)

filled in to bring the surface back up to grade, and another gamma survey will be conducted. If the final gamma survey does not identify areas greater than the reference area mean + 3σ, then no further action is required.

Any soil that is excavated during this time will be placed in 6-inch lifts. The soil will be surveyed again and soil samples will be collected at a rate of two samples per 40 cubic yards. All samples will be analyzed for gamma isotopes. Ten percent of the samples will also be randomly chosen for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) analyses. Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. These results will be used to determine if the material is LLRW or non-LLRW. LLRW material will be transported to the waste broker for subsequent disposal. Non-LLRW will be sampled at a minimum of one sample per 500 cubic yards for chemical analyses as listed in Worksheet #18. These chemical results will determine if any of the material can be reused as fill material for IR Site 2 or if off-site disposal of the material is required.

SOIL SAMPLING PROCEDURES

Soil samples for any of the above activities described will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.
2. Soil will placed into containers specified in Worksheet #19 in conjunction with analyses identified in Worksheet #18. Containers will be filled with no headspace. A disposable scoop or equivalent may be used to fill the containers.
3. Sample numbering, labeling, documentation, and packaging procedures will be followed as described below and in Worksheets #27 and #29.

FILL MATERIAL SAMPLING PROCEDURES

The DON is currently stockpiling soil (and rock) material generated by other projects in the runway areas north and east of IR Site 2. Only materials that have been characterized as non-hazardous have been placed in this area and are envisioned to be placed as part of the subgrade layer at IR Site 2. Previous chemical and radiological analytical results of these soil stockpiles will be reviewed against the criteria in Worksheet #15.1, as applicable, prior to use of the material as subgrade. The material may not have been analyzed for all analytes listed in Worksheet #15.1 because the material may have been sampled based on the contaminants of concern at the site where the material was generated. However, for evaluation of the material to be used as subgrade, at a minimum a) 10 samples of the material will have been collected and analyzed for chemical analyses (even though the analyte lists may not exactly match Worksheet #15.1); b) those 10 samples will also have been analyzed for gamma isotopes as listed in Worksheet #15.1, which includes meeting the minimum detectable activity (MDA) criteria; and c) 1 of those 10 samples will also have been analyzed for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) as listed in Worksheet #15.1, which includes meeting the MDA criteria. If the evaluation of the data indicates that the material is non-hazardous (i.e., meets criteria in Worksheet #15.1), then the material may be used as fill material for the subgrade at IR Site 2.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

If other sources of material are identified (Navy or off-site sources) that are not currently stockpiled near IR Site 2 but have analytical results, those results will also be evaluated as described in the paragraph above prior to use of this material for the subgrade at IR Site 2.

In the event that additional soil material sources are needed for the subgrade that do not have analytical results or for the import sand material that is needed for the cover at IR Site 2, a minimum of 10 soil samples will be collected per source and analyzed for gamma isotopes and all chemical analytes listed in Worksheet #15.1. One of those 10 samples will also be analyzed for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) as listed in Worksheet #15.1. Analytical results for the subgrade or cover material will be evaluated as described in Worksheet #15.1. These samples will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.
2. Only soil/sand material will be sampled. (Gravel/rock is not required to be sampled for the cover material.) The source material pile sample locations will be determined by generating random x, y, and z coordinates.
3. A disposable scoop or equivalent will be used to access each x, y, and z coordinate. (Due to limitations in accessing deep depths in a large stockpile of soil, z coordinates will be limited to 10 feet.) In the event the source material cannot be sampled at the source site, then the source will provide four bags of material, and one sample will be collected from each bag.
4. Soil samples will be collected in containers in Worksheet #19 in conjunction with chemical and radiological analyses identified in Worksheet #18 for fill material samples (subgrade or cover). Containers will be filled to ensure no headspace.
5. Sample numbering, labeling, documentation, and packaging procedures will be followed as described in Worksheets #27 and #29.

WASTEWATER SAMPLING PROCEDURES

In the event wastewater is generated during this project, a minimum of one wastewater sample per container will be collected as follows:

- Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting wastewater samples.
- Wastewater samples will be collected using a disposable bailer or similar device. Samples will be transferred from the bailers to pre-preserved, pre-cleaned sample containers listed in Worksheet #19 in conjunction with analyses identified in Worksheet #18.
- If vials for volatile organic compound (VOC) analysis are required to be collected, the vials will be filled as follows:
    a. The water samples will be carefully collected into 40-milliliter volatile organic analysis (VOA) vials using techniques to minimize aeration.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

b. The vial will be filled up to the lid until a positive meniscus is formed.

c. The vial will be capped immediately, but slowly.

d. The sample will be checked for the presence of air bubbles.

e. If an air bubble is present, the collected sample will be discarded and resampled using a new vial.

f. The previous steps will be repeated until an air bubble-free sample vial is collected.

- Sample numbering, labeling, documentation, and packaging procedures will be followed as described in Worksheets #27 and #29.

DECONTAMINATION PROCEDURES

In the event any non-disposable equipment is used for sampling purposes, the equipment will be decontaminated as follows:

1. **Pre-screening using a hand-held alpha/beta survey meter** — If radioactive contamination exceeds the equipment release limits (identified in the Radiological Work Plan), the equipment and local area will be secured and the RSOR will be notified for further action.
2. **Washing with detergent and water solution** — This step will reduce the amount of gross contamination from the equipment. Use of a container, approximately 75 percent full of solution, is suggested for this step. This detergent solution will be prepared as directed by the manufacturer.
3. **Rinsing with potable water** — This step will rinse all the detergent solution away from equipment. Use of a container, approximately 75 percent full of potable water, is suggested for this step. Periodic changing of this water is required.
4. **Screening of equipment** — When dry, survey the post-decontaminated equipment using a hand-held alpha/beta survey meter. If radioactive contamination exceeds the equipment release limits (identified in the Radiological Work Plan), the equipment and local area will be secured and the RSOR will be notified for further action.
5. **Drumming of wastewater** — Drummed decontamination fluids will be sampled to characterize the waste for disposal as described in the wastewater characterization sampling procedure section above. Drums will be stored in a designated storage area pending receipt of the analytical data.

DATA MANAGEMENT TASKS

Field sampling data, including field logbooks and field forms, will be maintained. The logbooks will be numbered sequentially on the cover by the PQCM and that number will be entered into a logsheet maintained by the PQCM. A copy of all field forms will be maintained in the project file.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

A copy of the laboratory COCs will be faxed/emailed to the Project Chemist on a daily basis for review and communication with the laboratory. The Project Chemist will maintain a copy of the COC form until submitted to the DON Administrative Record along with the hard-copy packages as described in Worksheet #29.

The laboratory will submit data at the turnaround time to TtEC via email. This submittal will include results and basic QC results (method blanks, laboratory control sample [LCS], surrogates, and matrix spike/matrix spike duplicates [MS/MSDs]). Following this submittal, the laboratory will be required to submit an EPA Level III- or IV-equivalent data package within 30 business days of the sample collection date. For this project, 80 percent of the data will be submitted in an EPA Level III-equivalent data package, and 20 percent will be submitted in an EPA Level IV-equivalent data package as listed on the COC and described in Worksheet #29. Each sample will have an EPA Level III or IV designation on the COC. In order to meet the 20 percent requirement for EPA Level IV samples, EPA Level IV will be chosen for every fifth sample collected.

Field data from the laboratory COCs (date and time collected, sample identification, etc.) will be entered into the TtEC database by the Project Chemist. Survey data will be recorded and also entered into the database. All radiological survey locations will be surveyed in accordance with EWI EVR.6, Environmental Data Management and Required Electronic Delivery Standards (SWDIV 2005). Horizontal control information will be captured in the State Plane Coordinate System (North American Datum 83) in feet, and vertical control standards will be in mean sea level (North American Vertical Datum 88) in feet. Any manual entries into the TtEC database will be 100 percent verified by the Project Chemist by checking the manual entry against the hard-copy information.

The laboratory will provide an electronic data deliverable (EDD) that will be compatible with TtEC requirements, and the EDD will be uploaded into the TtEC database. The data will be checked for required values and project-specific requirements by the database. Any discrepancies in the EDD will be corrected by TtEC or the laboratory will be notified to make corrections.

Analytical data generated by the laboratory will be validated by an independent data validation company as required by EWI #1, 3EN2.1, Chemical Data Validation (SWDIV 2001). The validation report will include the data validation findings worksheets as described in Worksheet #29, and the validation qualifiers will be entered electronically in the laboratory EDD.

After receipt of the validated data, the validation qualifiers will be uploaded into the TtEC database and will be checked against the hard-copy validation report for accuracy. Validated analytical data will be submitted to the NIRIS website in NEDD format in accordance with EWI EVR.6, Environmental Data Management and Required Electronic Delivery Standards (SWDIV 2005) as required.

Hard-copy data will be stored until subsequent submittal to the DON Administrative Record as described in Worksheet #29. The TtEC database will be electronically backed up on data storage tapes, and the backup will be stored as an archive file.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples

Matrix: Soil

Analytical Group: Gamma Isotopes (Curtis and Tompkins)

Analyte	CAS Number	Project Action Limit (pCi/g)	Project Action Limit Reference	Project MDA (pCi/g)	Laboratory-specific	
					MDAs (pCi/g)	MDLs (pCi/g)
Americium-241	86954-36-1	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Bismuth-212	14913-49-6	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Bismuth-214	14733-03-0	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Cesium-137	10045-97-3	0.113	ROD (DON 2010)	0.07 [a]	0.07 [a]	Not applicable [b]
Cobalt-60	10198-40-0	0.0361	ROD (DON 2010)	0.03 [a]	0.03 [a]	Not applicable [b]
Europium-152	14683-23-9	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Europium-154	15585-10-1	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Lead-212	15092-94-1	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Lead-214	15067-28-4	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Potassium-40	13966-00-2	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Protactinium-234	15100-28-4	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Radium-226	13982-63-3	1.0 above background	ROD (DON 2010)	0.2 [a]	0.2 [a]	Not applicable [b]
Thallium-208	14913-50-9	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Thorium-232	7440-29-1	1.69	ROD (DON 2010)	0.9 [a]	0.9 [a]	Not applicable [b]
Thorium-234	15065-10-8	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Uranium-235	15117-96-1	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]

Note: Curtis and Tompkins will prepare the sample on-site into a sealed tuna can geometry, which allows for the in-growth of Ra-226 daughter products to approach secular equilibrium leading to analysis of the 609 keV Bi-214 gamma energy peak after in-growth is complete, typically 21 calendar days.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: Strontium (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/g)	Project Action Limit Reference	Project MDA (pCi/g)	Laboratory-specific MDAs (pCi/g)	Laboratory-specific MDLs (pCi/g)
Total Strontium [c]	7440-24-6	0.331	ROD (DON 2010)	0.32 [a]	0.32 [a]	Not applicable [b]
^{90}Sr	10098-97-2	0.331	ROD (DON 2010)	0.32 [a]	0.32 [a]	Not applicable [b]

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil

Analytical Group: Alpha Isotopes (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/g)	Project Action Limit Reference	Project MDA (pCi/g)	Laboratory-specific	
					MDAs (pCi/g)	MDLs (pCi/g)
Uranium-238	7440-61-1	0.742	ROD (DON 2010)	0.3 [a]	0.3 [a]	Not applicable [b]

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: VOCs (TestAmerica-St. Louis)

(Chemical analyses listed hereafter pertain to fill material and/or waste characterization samples only.)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific QLs (µg/kg)	Laboratory-specific MDLs (µg/kg)
1,1,1-Trichloroethane	71-55-6	Not established *	Not established *	5	5	0.431
1,1,2,2-Tetrachloroethane	79-34-5	Not established *	Not established *	5	5	0.401
1,1,2-Trichloroethane	79-00-5	Not established *	Not established *	5	5	0.573
1,1-Dichloroethane	75-34-3	Not established *	Not established *	5	5	0.392
1,1-Dichloroethene	75-35-4	14,000	[d]	5	5	1.61
1,2-Dichloroethane	107-06-2	10,000	[d]	5	5	0.867
1,2-Dichloropropane	78-87-5	Not established *	Not established *	5	5	0.383
2-Butanone	78-93-3	4,000,000	[d]	20	20	1.92
2-Hexanone	591-78-6	Not established *	Not established *	20	20	1.77
4-methyl-2-pentanone	108-10-1	Not established *	Not established *	20	20	0.732
Acetone	67-64-1	Not established *	Not established *	20	20	6.47
Benzene	71-43-2	10,000	[d]	5	5	0.253
Bromodichloromethane	75-27-4	Not established *	Not established *	5	5	0.254
Bromoform	75-25-2	Not established *	Not established *	5	5	0.366
Bromomethane	74-83-9	Not established *	Not established *	10	10	1.1
Carbon tetrachloride	56-23-5	10,000	[d]	5	5	0.513
Chlorobenzene	108-90-7	2,000,000	[d]	5	5	0.382
Chloroethane	75-00-3	Not established *	Not established *	10	10	0.516

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
Chloroform	67-66-3	120,000	d	5	5	0.376
Chloromethane	74-87-3	Not established *	Not established *	10	10	0.65
cis-1,2-Dichloroethene	156-59-2	Not established *	Not established *	5	5	0.597
cis-1,3-Dichloropropene	10061-01-5	Not established *	Not established *	5	5	0.595
Dibromochloromethane	124-48-1	Not established *	Not established *	5	5	0.406
Ethylbenzene	100-41-4	Not established *	Not established *	5	5	0.299
Methyl tert-butyl ether	1634-04-4	Not established *	Not established *	5	5	0.476
Methylene chloride	75-09-2	Not established *	Not established *	10	10	1.58
Styrene	100-42-5	Not established *	Not established *	5	5	0.347
Tetrachloroethene	127-18-4	14,000	d	5	5	0.322
Toluene	108-88-3	Not established *	Not established *	5	5	0.7
trans-1,2-Dichloroethene	156-60-5	Not established *	Not established *	5	5	0.943
trans-1,3-Dichloropropene	10061-02-6	Not established *	Not established *	5	5	0.349
Trichloroethene	79-01-6	2,040,000	g	5	5	0.385
Vinyl chloride	75-01-4	4,000	d	10	10	0.428
Xylenes (Total)	1330-20-7	Not established *	Not established *	10	10	0.854

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: SVOCs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	Not established *	Not established *	330	330	33.3
1,2-Dichlorobenzene	95-50-1	Not established *	Not established *	330	330	33.3
1,3-Dichlorobenzene	541-73-1	Not established *	Not established *	330	330	33.3
1,4-Dichlorobenzene	106-46-7	150,000	[d]	330	330	33.3
2,4,5-Trichlorophenol	95-95-4	8,000,000	[d]	330	330	33.3
2,4,6-Trichlorophenol	88-06-2	40,000	[d]	330	330	33.3
2,4-Dichlorophenol	120-83-2	Not established *	Not established *	330	330	33.3
2,4-Dimethylphenol	105-67-9	Not established *	Not established *	330	330	33.3
2,4-Dinitrophenol	51-28-5	Not established *	Not established *	1,600	1,600	330
2,4-Dinitrotoluene	121-14-2	2,600	[d]	330	330	33.3
2,6-Dinitrotoluene	606-20-2	Not established *	Not established *	330	330	33.3
2-Chloronaphthalene	91-58-7	Not established *	Not established *	330	330	33.3
2-Chlorophenol	95-57-8	Not established *	Not established *	330	330	33.3
2-Methylphenol (o-cresol)	95-48-7	4,000,000	[d]	330	330	33.3
2-Nitroaniline	88-74-4	Not established *	Not established *	1,600	1,600	33.3
2-Nitrophenol	88-75-5	Not established *	Not established *	330	330	33.3
3,3′-Dichlorobenzidine	91-94-1	Not established *	Not established *	1,600	1,600	33.3
3-Nitroaniline	99-09-2	Not established *	Not established *	1,600	1,600	33.3
¾-Methylphenol (m/p-cresol)	-3495 [e]	4,000,000	[d]	660	660	66.6

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
4,6-Dinitro-2-methylphenol	534-52-1	Not established *	Not established *	1,600	1,600	330
4-Bromophenyl-phenylether	101-55-3	Not established *	Not established *	330	330	33.3
4-Chloro-3-methylphenol	59-50-7	Not established *	Not established *	330	330	33.3
4-Chloroaniline	106-47-8	Not established *	Not established *	330	330	33.3
4-Chlorophenyl-phenylether	7005-72-3	Not established *	Not established *	330	330	33.3
4-Nitroaniline	100-01-6	Not established *	Not established *	1,600	1,600	330
4-Nitrophenol	100-02-7	Not established *	Not established *	1,600	1,600	330
bis(2-Chloroethoxy)methane	111-91-1	Not established *	Not established *	330	330	33.3
bis(2-Chloroethyl)ether	111-44-4	Not established *	Not established *	330	330	33.4
bis(2-Chloroisopropyl)ether	108-60-1	Not established *	Not established *	330	330	33.3
bis(2-Ethylhexyl)phthalate	117-81-7	Not established *	Not established *	330	330	45.3
Butylbenzyl phthalate	85-68-7	Not established *	Not established *	330	330	33.3
Dibenzofuran	132-64-9	Not established *	Not established *	330	330	33.3
Diethyl phthalate	84-66-2	Not established *	Not established *	330	330	33.3
Dimethyl phthalate	131-11-3	Not established *	Not established *	330	330	33.3
Di-n-butyl phthalate	84-74-2	Not established *	Not established *	330	330	33.3
Di-n-octyl phthalate	117-84-0	Not established *	Not established *	330	330	33.3
Hexachlorobenzene	118-74-1	2,600	[d]	330	330	33.3
Hexachlorobutadiene	87-68-3	10,000	[d]	330	330	33.3
Hexachlorocyclopentadiene	77-47-4	Not established *	Not established *	1,600	1,600	330
Hexachloroethane	67-72-1	60,000	[d]	330	330	33.3
Nitrobenzene	98-95-3	40,000	[d]	330	330	33.3

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
n-Nitrosodiphenylamine	86-30-6	Not established *	Not established *	330	330	33.3
n-Nitroso-di-n-propylamine	621-64-7	Not established *	Not established *	330	330	33.3
Pentachlorophenol	87-86-5	17,000	[g]	1,600	1,600	330
Phenol	108-95-2	Not established *	Not established *	330	330	33.3
Pyridine	110-86-1	100,000	[d]	660	660	66.6
Acenaphthene	83-32-9	Not established *	Not established *	330	330	33.3
Acenaphthylene	208-96-8	Not established *	Not established *	330	330	33.3
Anthracene	120-12-7	Not established *	Not established *	330	330	33.3
Benzo(a)anthracene	56-55-3	Not established *	Not established *	330	330	33.3
Benzo(a)pyrene	50-32-8	Not established * / 240	Not established * / ROD (DON 2010) [f]	330	330	33.3
Benzo(b)fluoranthene	205-99-2	Not established *	Not established *	330	330	33.3
Benzo(g,h,i)perylene	191-24-2	Not established *	Not established *	330	330	33.3
Benzo(k)fluoranthene	207-08-9	Not established *	Not established *	330	330	33.3
Chrysene	218-01-9	Not established *	Not established *	330	330	33.3
Dibenzo(a,h)anthracene	53-70-3	Not established *	Not established *	330	330	33.3
Fluoranthene	206-44-0	Not established *	Not established *	330	330	33.3
Fluorene	86-73-7	Not established *	Not established *	330	330	33.3
Indeno(1,2,3-cd)pyrene	193-39-5	Not established *	Not established *	330	330	33.3
Naphthalene	91-20-3	Not established *	Not established *	330	330	33.3
Phenanthrene	85-01-8	Not established *	Not established *	330	330	33.3
Pyrene	129-00-0	Not established *	Not established *	330	330	33.3

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: Pesticides (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
4,4′-DDD	72-54-8	1,000 / 27 (total DDx)	[g] / ROD (DON 2010) [f]	1.7	1.7	0.221
4,4′-DDE	72-55-9	1,000 / 27 (total DDx)	[g] / ROD (DON 2010) [f]	1.7	1.7	0.39
4,4′-DDT	50-29-3	1,000 / 27 (total DDx)	[g] / ROD (DON 2010) [f]	1.7	1.7	0.628
alpha-BHC	319-84-6	Not established *	Not established *	1.7	1.7	0.185
Aldrin	309-00-2	1,400	[g]	1.7	1.7	0.306
beta-BHC	319-85-7	Not established *	Not established *	1.7	1.7	0.3
delta-BHC	319-86-8	Not established *	Not established *	1.7	1.7	0.242
Chlordane (technical)	12789-03-6	2,500	[g]	17	17	3.73
Dieldrin	60-57-1	8,000	[g]	1.7	1.7	0.215
Endosulfan sulfate	1031-07-8	Not established *	Not established *	1.7	1.7	0.34
Endosulfan I	959-98-8	Not established *	Not established *	1.7	1.7	0.57
Endosulfan II	33213-65-9	Not established *	Not established *	1.7	1.7	0.235
Endrin	72-20-8	200	[g]	1.7	1.7	0.158
Endrin aldehyde	7421-93-4	Not established *	Not established *	1.7	1.7	0.389
Endrin ketone	53494-70-5	Not established *	Not established *	1.7	1.7	0.417
gamma-BHC (Lindane)	58-89-9	4,000	[g]	1.7	1.7	0.168
Heptachlor	76-44-8	4,700	[g]	1.7	1.7	0.204
Heptachlor epoxide	1024-57-3	4,700	[g]	1.7	1.7	0.429

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
Methoxychlor	72-43-5	100,000	[g]	3.3	3.3	0.719
Toxaphene	8001-35-2	5,000	[g]	67	67	15.16

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: PCBs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
Aroclor 1016	12674-11-2	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	8.72
Aroclor 1221	11104-28-2	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	8.72
Aroclor 1232	11141-16-5	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	8.72
Aroclor 1242	53469-21-9	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	8.72
Aroclor 1248	12672-29-6	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	8.72
Aroclor 1254	11097-69-1	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	5.5
Aroclor 1260	11096-82-5	50,000 / 870 (total PCBs)	[g] / ROD (DON 2010) [f]	33	33	5.5

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: TPH-purgeable (gasoline) and TPH-extractable (diesel and motor oil) (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific	
					QLs (mg/kg)	MDLs (mg/kg)
TPH-gasoline (C_6-C_{10})	-3534 [e]	Not established *	Not established *	0.1	0.1	0.01
TPH-diesel (C_{10}-C_{24})	-3527 [e]	Not established *	Not established *	25	25	0.333
TPH-motor oil (C_{24}-C_{36})	-3528 [e]	Not established *	Not established *	25	25	0.333

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: Metals (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific QLs (mg/kg)	Laboratory-specific MDLs (mg/kg)
Antimony	7440-36-0	500	[g]	0.50	0.50	0.164
Arsenic	7440-38-2	500	[g]	1.0	1.0	0.26
Barium	7440-39-3	10,000	[g]	2.0	2.0	0.094
Beryllium	7440-41-7	75	[g]	0.10	0.10	0.026
Cadmium	7440-43-9	100 / 6.5	[g] / ROD (DON 2010) [f]	0.06	0.06	0.016
Chromium	7440-47-3	2,500 / 48.5	[g] / ROD (DON 2010) [f]	1.9	1.9	0.45
Cobalt	7440-48-4	8,000	[g]	0.20	0.20	0.043
Copper	7440-50-8	2,500	[g]	1.0	1.0	0.101
Lead	7439-92-1	1,000	[g]	0.30	0.30	0.10
Mercury	7439-97-6	20	[g]	0.04	0.04	0.011
Molybdenum	7439-98-7	3,500 / 1.9	[g] / ROD (DON 2010) [f]	0.50	0.50	0.124
Nickel	7440-02-0	2,000	[g]	0.50	0.50	0.107
Selenium	7782-49-2	100	[g]	0.50	0.50	0.158
Silver	7440-22-4	500	[g]	0.20	0.20	0.024
Thallium	7440-28-0	700	[g]	0.45	0.45	0.152
Vanadium	7440-62-2	2,400	[g]	1.0	1.0	0.735
Zinc	7440-66-6	5,000 / 263	[g] / ROD (DON 2010) [f]	5.0	5.0	1.33

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil
Analytical Group: Asbestos (AmeriSci)

Analyte	CAS Number	Project Action Limit (percent)	Project Action Limit Reference	Project Quantitation Limit Goal (percent)	Laboratory-specific	
					QLs (percent)	MDLs (percent)
Asbestos	132207-33-1	1	[g]	0.25	0.25	Not applicable [b]

Notes:

* The criteria in this Worksheet #15.1 are applicable to fill material and waste characterization samples. For analytes that have no project action limit (PAL) established, the data will be evaluated to determine if additional screening is warranted in regards to fill material samples. In the event material cannot be used for fill at IR Site 2, it will need to be sent off-site for disposal. Disposal facilities require a standard list of analytes for each analytical method even though each analyte does not have a PAL because the facility may have its own criteria for those analytes. Therefore, fill material samples and waste characterization samples are being analyzed for the same full list of analytes. In addition, the gamma spectroscopy analytes in this Worksheet #15.1 without PALs established are predominantly naturally occurring radioactive materials (NORM). Information collected from these analytes may be used qualitatively to assess a correlation between high gamma scan survey readings with corresponding samples containing no radionuclides above the PALs for the radionuclides of concern.

[a] Project quantitation limits and minimum detectable activities for radiological analyses are calculated per samples per analysis. Therefore, these values are listed as to be determined (TBD) until a project action limit is applicable since these are determined based on instrument background, sample size, and count time. Values listed indicate a minimum MDA that will be achieved for isotopes that have project action limits specified in the ROD (DON 2010). For the laboratory, the MDAs listed are based on a 30-45 minute count time. To achieve lower MDAs, the sample count time would have to increase. The DON or RASO may direct an increase in sample count times to lower MDAs based on a sample-specific basis.

[b] MDLs are not applicable to radiological and asbestos analyses.

[c] Total strontium may be analyzed first due to a quicker turnaround time by the laboratory. If the total strontium result exceeds the project action limit listed, then the sample will be analyzed for ^{90}Sr.

[d] Limit listed is the value at which if exceeded then TCLP analysis must be performed. TCLP results will then be evaluated against CCR Title 22 criteria. If the TCLP results are below the CCR Title 22 criteria, then the material may be suitable as fill material pending evaluation of the rest of the analytical data against criteria in footnote f and/or g below. Otherwise, the material will be disposed of off-site.

[e] CAS number listed is from the NEDD valid value list since a CAS number is not available for this analyte.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

[f] ROD (DON 2010) criteria for chemical analytes are applicable only to the soil cover material. Subgrade material to be used as fill material is only required to pass the non-hazardous waste criteria for chemical analytes described in footnotes d) and g) herein. (Note that ROD criteria for radioisotopes listed herein are applicable to subgrade and the cover material.)

[g] Limit listed is the Total Threshold Limit Concentration value at which if exceeded the material is automatically considered non-RCRA hazardous and will be evaluated for TCLP analysis. If the value is not exceeded, results will then be evaluated to determine if STLC/TCLP analysis is required in accordance with CCR Title 22. If STLC/TCLP analysis is required, those results will be evaluated against criteria in CCR Title 22. If the STLC/TCLP results are below the CCR Title 22 criteria, then the material may be suitable for use as fill material pending evaluation of the rest of the analytical data against criteria in footnote d and/or f above. Otherwise, the material will be disposed of off-site.

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SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples

Matrix: Water
Analytical Group: Gamma Isotopes (TestAmerica-St. Louis)

(Analyses listed hereafter pertain to waste characterization samples only.)

Analyte	CAS Number	Project Action Limit (pCi/L)	Project Action Limit Reference	Project MDA (pCi/L)	Laboratory-specific	
					MDAs (pCi/L)	MDLs (pCi/L)
Americium-241	86954-36-1	15	(EPA 2000)	7.5 [a]	7.5 [a]	Not applicable [b]
Bismuth-212	14913-49-6	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Bismuth-214	14733-03-0	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Cesium-137	10045-97-3	119	(EPA 2000)	60 [a]	60 [a]	Not applicable [b]
Cobalt-60	10198-40-0	100	(EPA 2000)	50 [a]	50 [a]	Not applicable [b]
Europium-152	14683-23-9	60	(EPA 2000)	30 [a]	30 [a]	Not applicable [b]
Europium-154	15585-10-1	200	(EPA 2000)	100 [a]	100 [a]	Not applicable [b]
Lead-212	15092-94-1	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Lead-214	15067-28-4	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Potassium-40	13966-00-2	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Protactinium-234	15100-28-4	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Thallium-208	14913-50-9	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Thorium-232	7440-29-1	15	(EPA 2000)	8 [a]	8 [a]	Not applicable [b]
Thorium-234	15065-10-8	Not established *	Not established *	TBD [a]	TBD [a]	Not applicable [b]
Uranium-235	15117-96-1	30	(EPA 2000)	15 [a]	15 [a]	Not applicable [b]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Radium-226 (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/L)	Project Action Limit Reference	Project MDA (pCi/L)	Laboratory-specific	
					MDAs (pCi/L)	MDLs (pCi/L)
Radium-226	13982-63-3	5	(EPA 2000)	2.5 [a]	2.5 [a]	Not applicable [b]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Strontium (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/L)	Project Action Limit Reference	Project MDA (pCi/L)	Laboratory-specific	
					MDAs (pCi/L)	MDLs (pCi/L)
Total Strontium [c]	7440-24-6	8	(EPA 2000)	4 [a]	4 [a]	Not applicable [b]
^{90}Sr	10098-97-2	8	(EPA 2000)	4 [a]	4 [a]	Not applicable [b]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water

Analytical Group: Alpha Isotopes (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/L)	Project Action Limit Reference	Project MDA (pCi/L)	Laboratory-specific	
					MDAs (pCi/L)	MDLs (pCi/L)
Uranium-238	7440-61-1	30	(EPA 2000)	0.10 [a]	0.10 [a]	Not applicable [b]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water

Analytical Group: Tritium (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/L)	Project Action Limit Reference	Project MDA (pCi/L)	Laboratory-specific	
					MDAs (pCi/L)	MDLs (pCi/L)
Tritium	10028-17-8	20,000	(EPA 2000)	500 [a]	500 [a]	Not applicable [b]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: VOCs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
1,1-Dichloroethene	75-35-4	700	TCLP Limit	5	5	0.365
1,2-Dichloroethane	107-06-2	500	TCLP Limit	5	5	0.372
2-Butanone (MEK)	78-93-3	200,000	TCLP Limit	20	20	0.389
Benzene	71-43-2	500	TCLP Limit	5	5	0.253
Carbon tetrachloride	56-23-5	500	TCLP Limit	5	5	0.36
Chlorobenzene	108-90-7	100,000	TCLP Limit	5	5	0.382
Chloroform	67-66-3	6,000	TCLP Limit	5	5	0.147
Tetrachloroethene	127-18-4	700	TCLP Limit	5	5	0.28
Trichloroethene	79-01-6	204,000 / 500	STLC Limit / TCLP Limit	5	5	0.29
Vinyl chloride	75-01-4	200	TCLP Limit	5	5	0.428

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: SVOCs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
1,4-Dichlorobenzene	106-46-7	7,500	TCLP Limit	10	10	1
2,4,5-Trichlorophenol	95-95-4	400,000	TCLP Limit	10	10	1
2,4,6-Trichlorophenol	88-06-2	2,000	TCLP Limit	10	10	1
2,4-Dinitrotoluene	121-14-2	130	TCLP Limit	10	10	1
2-Methylphenol (o-cresol)	95-48-7	200,000	TCLP Limit	10	10	1
3/4-Methylphenol (m/p-cresol)	-3495 [d]	200,000	TCLP Limit	10	10	2
Hexachlorobenzene	118-74-1	130	TCLP Limit	10	10	1
Hexachlorobutadiene	87-68-3	500	TCLP Limit	10	10	1
Hexachloroethane	67-72-1	3,000	TCLP Limit	10	10	1
Nitrobenzene	98-95-3	2,000	TCLP Limit	10	10	1.09
Pentachlorophenol	87-86-5	1,700 / 100,000	STLC Limit / TCLP Limit	50	50	1.27
Pyridine	110-86-2	5,000	TCLP Limit	20	20	2

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Pesticides (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
4,4′-DDD	72-54-8	100 (total DDx)	STLC Limit	0.05	0.05	0.01
4,4′-DDE	72-55-9	100 (total DDx)	STLC Limit	0.05	0.05	0.01
4,4′-DDT	50-29-3	100 (total DDx)	STLC Limit	0.05	0.05	0.01
Aldrin	309-00-2	140	STLC Limit	0.05	0.05	0.01
Chlordane (technical)	57-74-9	250 / 30	STLC Limit / TCLP Limit	0.5	0.5	0.231
Dieldrin	60-57-1	800	STLC Limit	0.05	0.05	0.01
Endrin	72-20-8	20	STLC Limit	0.05	0.05	0.017
gamma-BHC (Lindane)	58-89-9	400	STLC Limit	0.05	0.05	0.01
Heptachlor	76-44-8	470 / 8	STLC Limit / TCLP Limit	0.100	0.100	0.01
Heptachlor epoxide	1024-57-3	470 / 8	STLC Limit / TCLP Limit	0.05	0.05	0.017
Methoxychlor	72-43-5	10,000	STLC Limit	0.100	0.100	0.01
Toxaphene	8001-35-2	500	STLC Limit	2	2	0.66

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: PCBs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Aroclor 1016	12674-11-2	5,000 (total PCBs)	STLC Limit	1	1	0.241
Aroclor 1221	11104-28-2	5,000 (total PCBs)	STLC Limit	1	1	0.241
Aroclor 1232	11141-16-5	5,000 (total PCBs)	STLC Limit	1	1	0.241
Aroclor 1242	53469-21-9	5,000 (total PCBs)	STLC Limit	1	1	0.241
Aroclor 1248	12672-29-6	5,000 (total PCBs)	STLC Limit	1	1	0.241
Aroclor 1254	11097-69-1	5,000 (total PCBs)	STLC Limit	1	1	0.166
Aroclor 1260	11096-82-5	5,000 (total PCBs)	STLC Limit	1	1	0.166

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Metals (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit [a] (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific QLs (µg/L)	Laboratory-specific MDLs (µg/L)
Antimony	7440-36-0	15,000	STLC Limit	5.0	5.0	1.67
Arsenic	7440-38-2	5,000	STLC Limit	10.0	10.0	1.18
Barium	7440-39-3	100,000	STLC Limit	2.0	2.0	0.223
Beryllium	7440-41-7	750	STLC Limit	0.50	0.50	0.35
Cadmium	7440-43-9	1,000	STLC Limit	0.50	0.50	0.10
Chromium	7440-47-3	5,000	STLC Limit	10.0	10.0	3.26
Cobalt	7440-48-4	80,000	STLC Limit	2.0	2.0	0.217
Copper	7440-50-8	25,000	STLC Limit	3.0	3.0	0.451
Lead	7439-92-1	5,000	STLC Limit	3.0	3.0	0.173
Mercury	7439-97-6	200	STLC Limit	0.18	0.18	0.06
Molybdenum	7439-98-7	350,000	STLC Limit	5.0	5.0	1.0
Nickel	7440-02-0	20,000	STLC Limit	5.0	5.0	0.40
Selenium	7782-49-2	1,000	STLC Limit	5.0	5.0	1.0
Silver	7440-22-4	5,000	STLC Limit	2.0	2.0	1.59
Thallium	7440-28-0	7,000	STLC Limit	2.0	2.0	0.55
Vanadium	7440-62-2	24,000	STLC Limit	10.0	10.0	2.37
Zinc	7440-66-6	250,000	STLC Limit	12.0	12.0	8.29

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Herbicides (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
2,4-D	94-75-7	10,000	STLC Limit	5	5	1.8
2,4,5-TP (Silvex)	93-72-1	1,000	STLC Limit	1	1	0.148

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Notes:

* The criteria in this Worksheet #15.2 are applicable to waste characterization samples for water sent off-site for disposal. Only analytes that have a STLC or TCLP criteria are listed in this worksheet. In addition, the gamma spectroscopy analytes in this Worksheet #15.2 without PALs established are predominantly NORM. Information collected from these analytes may be used qualitatively to assess a correlation between high gamma scan survey readings with corresponding samples containing no radionuclides above the PALs for the radionuclides of concern.

[a] Project quantitation limits and minimum detectable activities for radiological analyses are calculated per samples per analysis. Therefore, these values are listed as to be determined (TBD) until a project action limit is applicable since these are determined based on instrument background, sample size, and count time. Values listed indicate a minimum MDA that will be achieved for isotopes that have project action limits defined in the ROD (DON 2010). For the laboratory, the MDAs listed are based on a 30-45 minute count time. To achieve lower MDAs, the sample count time would have to increase. The DON or RASO may direct an increase in sample count times to lower MDAs based on a sample-specific basis.

[b] MDLs are not applicable to listed analyses.

[c] Total strontium is analyzed first due to a quicker turnaround time by the laboratory. If the total strontium result exceeds the waste criteria, then the sample will be analyzed for ^{90}Sr.

[d] CAS number listed is from the NEDD valid value list since a CAS number is not available for this analyte.

SAP Worksheet #16 – Project Schedule / Timeline Table

The project schedule is provided as Figure 1-3 of the Remedial Action Work Plan.

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SAP Worksheet #17 – Sampling Design and Rationale

RADIOLOGICAL SURVEYS AND SAMPLING

Sections 7.0 through 11.0 of the Radiological Work Plan (Attachment 2 to the Remedial Action Work Plan) describe the formulas and general procedural requirements of the MARSSIM surveys planned as part of the remedial action at IR Site 2. Equipment parameters have not been calculated as site-specific reference background areas have not been sampled and analyzed. As stated in Section 8.3.3, Final Status Surveys: "Although the FSS of IR Site 2 is not intended to provide for radiological release of IR Site 2, the sample density is designed to ensure data commensurate with a Class 1 survey are collected. Derived concentration guideline levels (DCGLs) for each ROC are based on the exposure pathways and parameters presented in the Final Remedial Investigation Report IR Site 2, West Beach Landfill and Wetlands (Battelle and BBL 2006), and limit the maximum annual dose to an individual to 15 mrem and the ELCR to 3×10^{-4} for the critical group." These DCGLs used in conjunction with conservative assumptions of approximate background concentrations of the ROCs result in a minimum of nine samples from the reference area and nine from the survey unit area. In the interest of conservatism, these sample number values are increased to 10 in each respective area.

Ten soil samples will be collected from each survey unit and analyzed for gamma isotopes and one of those samples will be randomly chosen for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) analysis. (The only analyte of interest to be analyzed by alpha spectroscopy is ^{238}U, because all other radionuclides of concern are easily quantified through gamma spectroscopy.) Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. These sample results will be used to perform dose and risk assessments for the final MARSSIM survey of the cover.

Any soil that is excavated during this time will be placed in 6-inch lifts. The soil will be surveyed again, and soil samples will be collected at a rate of two samples per 40 cubic yards. All samples will be analyzed for gamma isotopes. Ten percent of the samples will be analyzed for total strontium and/or ^{90}Sr, and alpha isotopes (^{238}U). Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. These results will be used to determine if the material is LLRW or non-LLRW. LLRW material will be transported to the waste broker for subsequent disposal. Non-LLRW will be sampled at a minimum of one sample per 500 cubic yards for chemical analyses as listed in Worksheet #18. These chemical results will determine if any of the material can be reused as fill material for IR Site 2 or if off-site disposal of the material is required.

IMPORT FILL MATERIAL SAMPLING

The DON is currently stockpiling soil (and rock) material generated by other projects in the runway areas north and east of IR Site 2. Only materials that have been characterized as non-hazardous have been placed in this area and are envisioned to be placed as part of the subgrade layer at IR Site 2. Previous chemical and radiological analytical results of these soil stockpiles will be reviewed against the criteria in Worksheet #15.1, as applicable, prior to use of the material as subgrade. The material may not have been analyzed for all analytes listed in Worksheet #15.1 because the material may have been sampled based on the contaminants of

SAP Worksheet #17 – Sampling Design and Rationale (Continued)

concern at the site where the material was generated. However, for evaluation of the material to be used as subgrade, at a minimum a) 10 samples of the material will have been collected and analyzed for chemical analyses (even though the analyte lists may not exactly match Worksheet #15.1); b) those 10 samples will also have been analyzed for gamma isotopes as listed in Worksheet #15.1, which includes meeting the MDA criteria; and c) 1 of those 10 samples will also have been analyzed for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) as listed in Worksheet #15.1, which includes meeting the MDA criteria. If the evaluation of the data indicates that the material is non-hazardous (i.e., meets criteria in Worksheet #15.1), then the material may be used as fill material for the subgrade at IR Site 2.

If other sources of material are identified (Navy or off-site sources) that are not currently stockpiled near IR Site 2 but have analytical results, those results will also be evaluated as described in the paragraph above prior to use of this material for the subgrade at IR Site 2.

In the event that additional soil material sources are needed for the subgrade that do not have analytical results or for the import sand material that is needed for the cover at IR Site 2, a minimum of 10 soil samples will be collected per source and analyzed for gamma isotopes and all chemical analytes listed in Worksheet #15.1. One of those 10 samples will also be analyzed for total strontium and/or ^{90}Sr, and alpha isotope (^{238}U) as listed in Worksheet #15.1. Analytical results for the subgrade or cover material will be evaluated as described in Worksheet #15.1.

WASTEWATER CHARACTERIZATION SAMPLING

Water from decontamination activities will be collected and stored in approved storage containers. A minimum of one wastewater sample per container will be collected and analyzed as described in Worksheet #18.

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
Excavated area samples	Soil	1 foot	Gamma isotopes [b] (and strontium or alpha isotope analyses as required)	TBD [c]	Worksheet #14
Initial gamma survey samples	Soil	Surface	• Gamma isotopes [b] • Strontium and alpha isotope analyses	• 10 samples per survey unit • 1 random sample per survey unit	Worksheet #14
Excavated soil samples (initial or final gamma screenings)	Soil	Not applicable since soil is laid out in 6-inch lifts	• Gamma isotopes [b] • Strontium and alpha isotope analyses	• 2 samples per 40 cubic yards • Ten percent of samples randomly chosen	Worksheet #14
Fill material samples (subgrade or cover)	Soil	Random	• VOCs, SVOCs, pesticides, PCBs, TPH-purgeable, TPH-extractable, metals including mercury, asbestos, gamma isotopes • Strontium and alpha isotope analyses	• 10 samples per source • 1 random sample per source	Worksheet #14
Excavated soil samples (not radioactive)	Soil	Random	VOCs, SVOCs, pesticides, PCBs, TPH-purgeable, TPH-extractable, metals including mercury, asbestos	Minimum of 1 sample per 500 cubic yards	Worksheet #14
Wastewater samples	Water	Not applicable	VOCs, SVOCs, pesticides, PCBs, herbicides, metals including mercury, gamma isotopes, radium-226, strontium, tritium, and alpha isotope analyses as required	Minimum of 1 sample per container	Worksheet #14

Notes:

[a] The sample IDs will be determined in the field using a sequential numbering system explained in Worksheet #27.

[b] Any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr.

[c] The number of excavated area samples is listed as TBD (to be determined) since it is unknown if and how many excavations may be conducted based on initial survey results above twice background.

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SAP Worksheet #19 – Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) [a]
Soil	Gamma Isotopes (Curtis and Tompkins)	EPA 901.1 MOD HPS SOPs Section 3.3	Gallon ziplock bag then 250-mL tuna can	~ 1000 g (bag) ~ 300 g (can)	None	Not applicable
Soil	Strontium (TestAmerica-St. Louis)	EPA 905 MOD or DOE SR-03-RC MOD SOP ST-RD-0403	One 250-mL, poly/glass	5 g	None	Not applicable
Soil	Alpha Isotopes (TestAmerica-St. Louis)	DOE A-01-R MOD SOP ST-RD-0210	One 250-mL, poly/glass	5 g	None	Not applicable
Soil	VOCs (TestAmerica-St. Louis)	EPA 5035A/8260C SOP ST-MS-0002	Three 5-g En Core samplers [b]	15 g	4±2°C	48 hours/14 days
Soil	SVOCs (TestAmerica-St. Louis)	EPA 3550C/8270D SOP ST-MS-0001	One 8-oz glass jar [c]	8 oz	4±2°C	14 days/40 days
Soil	Pesticides (TestAmerica-St. Louis)	EPA 3550C/8081B SOP ST-GC-0016	One 8-oz glass jar [c]	8 oz	4±2°C	14 days/40 days
Soil	PCBs (TestAmerica-St. Louis)	EPA 3550C/8082A SOP ST-GC-0015	One 8-oz glass jar [c]	8 oz	4±2°C	14 days/40 days
Soil	TPH-purgeable (TestAmerica-St. Louis)	EPA 5035A/8015B SOP ST-GC-0014	Three 5-g En Core samplers b	15 g	4±2°C	48 hours/14 days
Soil	TPH-extractable (TestAmerica-St. Louis)	EPA 3550C/8015B SOP ST-GC-0005	One 8-oz glass jar [c]	8 oz	4±2°C	14 days/40 days

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) [a]
Soil	Metals (TestAmerica-St. Louis)	EPA 3050B/6020A SOP ST-MT-0001	One 8-oz glass jar [c]	8 oz	4±2°C	180 days
Soil	Mercury (TestAmerica-St. Louis)	EPA 7471B SOP ST-MT-0007	One 8-oz glass jar [c]	8 oz	4±2°C	28 days
Soil	Asbestos (AmeriSci)	CARB 435 or equivalent SOP Section III-A	One 8-oz glass jar [c]	8 oz	4±2°C	Not applicable

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) [a]
Water	Gamma Isotopes and Radium-226 (TestAmerica-St. Louis)	EPA 901.1 MOD and 903.0 MOD SOP ST-RD-0102 or SOP ST-RD-0403	One 1 L, poly/glass	1 L	HNO_3 pH < 2	180 days
Water	Strontium (TestAmerica-St. Louis)	EPA 905 MOD or DOE SR-03-RC MOD SOP ST-RD-0403	One 1 L, poly/glass	1 L	HNO3 pH < 2	180 days
Water	Alpha Isotopes (TestAmerica-St. Louis)	DOE A-01-R MOD SOP ST-RD-0210	One 1 L, poly/glass	1 L	HNO_3 pH < 2	180 days
Water	Tritium (TestAmerica-St. Louis)	EPA 906.0 MOD SOP ST-RD-0302	One 250-mL amber glass	120 mL	None	180 days
Water	VOCs (TestAmerica-St. Louis)	EPA 5030B/8260C SOP ST-MS-0002	Three 40-mL VOA vials	120 mL	pH ≤ 2 w/HCl, 4±2°C	14 days
Water	SVOCs (TestAmerica-St. Louis)	EPA 3510C/8270D SOP ST-MS-0001	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days
Water	Pesticides (TestAmerica-St. Louis)	EPA 3510C/8081B SOP ST-GC-0016	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days
Water	PCBs (TestAmerica-St. Louis)	EPA 3510C/8082A SOP ST-GC-0015	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days
Water	Metals (TestAmerica-St. Louis)	EPA 3010A/6020A SOP ST-MT-0001	One 500-mL poly bottle	500 mL	pH ≤ 2 w/HNO_3	180 days
Water	Mercury (TestAmerica-St. Louis)	EPA 7470A SOP ST-MT-0005	One 500-mL poly bottle	500 mL	pH ≤ 2 w/HNO_3	28 days

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) [a]
Water	Herbicides (TestAmerica-St. Louis)	EPA 3510C/8151A SOP ST-GC-0017	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days

Notes:

The laboratory will meet the analytical requirements in the EPA methods listed above or the requirements in this SAP, whichever is more stringent.

[a] If one time is listed, that is the maximum holding time for the analysis. (Preparation time is included in the analytical method holding time.) If two times are listed, they are listed as the maximum holding time for the preparation/analysis.

[b] If En Core samplers cannot be used due to saturated soil, then only the 8-ounce jar will be used, and VOC analysis will be conducted from the jar sample.

[c] Multiple analyses may be performed from one 8-ounce jar. The laboratory will be contacted to determine the appropriate number of jars based on analyses required.

SAP Worksheet #20 – Field Quality Control Sample Summary Table

Field QC samples are not required for this project since any samples collected are for modeling dose/risk, waste characterization purposes, or for evaluation of fill material. Therefore, measurement performance criteria for field QC sample collection are not applicable. However, MS/MSD samples will be collected for fill material.

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOA Trip Blanks	No. of PT Samples	Total No. of Samples to Lab
Fill Material Soil Samples									
Soil	Gamma Isotopes	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Strontium	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Alpha isotopes	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	VOCs	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	SVOCs	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Pesticides	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	PCBs	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	TPH-purgeable	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	TPH-extractable	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Metals/Mercury	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Asbestos	TBD [a]	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]

Notes:

[a] The number of fill material soil samples are listed as TBD (to be determined) since it is unknown if and how many sources may be sampled.

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SAP Worksheet #21 – Project Sampling SOP References Table

Sampling SOPs are not used for this project. Instead, the details of the sampling procedures associated with this SAP are described in Worksheet #14.

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SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
Ludlum Model 19 (or equivalent); Ludlum 2350-1 w/ 44-10 detector (or equivalent Ludlum 2360 w/ 43-89 detector (or equivalent SAM 940 (or equivalent);	1. Calibrate at lab featuring NIST traceable standards 2. Operational checks and verifications	1. Annually 2. Daily	1. Pass/fail 2. +/- 20% of baseline response criteria	1. If recalibration fails, then instrument combo is retained/exchanged by instrument vendor. 2. If checks and verifications fail, then instrument combo is placed out-of-service/returned to instrument vendor for repair/exchange. Subsequently, data collected with instrument since previous QC check will be reviewed.	RCT under direction of RSOR	None	None

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SAP Worksheet #23 – Analytical SOP References Table

Lab SOP Number [a]	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
HPS SOPs Section 3.3	Determination of Radium 226 by Gamma-Ray Spectroscopy (21 day ingrowth) DOE HASL 4.5.2.3 Revision 0, 08/31/12	Screening or Definitive	Soil Gamma Spectroscopy	EG&G Ortec Gamma Spectroscopy System	Curtis and Tompkins	N
ST-RD-0102	Gammavision Analysis, Revision 9, 05/18/12	Definitive	Water Gamma Spectroscopy	Gamma Spectrometer	TestAmerica-St. Louis	N
ST-RD-0403	Low Background Gas Flow Proportional Counting System Analysis Revision 13, 06/15/12	Definitive	Soil/Water Strontium Water Radium-226	Gas Flow Proportional Counter	TestAmerica-St. Louis	N
ST-RD-0210	Alpha Spectroscopy Analysis Revision 10, 03/19/12	Definitive	Soil/Water Alpha Isotope	Alpha Spectrometer	TestAmerica-St. Louis	N
ST-RD-0302	Liquid Scintillation Counter Analysis Rev. 13, 03/05/12	Definitive	Water Tritium	Liquid Scintillation Counter	TestAmerica-St. Louis	N
ST-MS-0002	Determination of Volatile Organics by GC/MS Revision 18, 03/19/12	Definitive	Soil/Water VOCs	GC/MS	TestAmerica-St. Louis	N
ST-MS-0001	GC/MS Semivolatiles Analysis Revision 14, 12/31/12	Definitive	Soil/Water SVOCs	GC/MS	TestAmerica-St. Louis	N
ST-GC-0016	Pesticide Gas Chromatographic Analysis Revision 13, 05/31/12	Definitive	Soil/Water Pesticides	GC	TestAmerica-St. Louis	N
ST-GC-0015	PCB GC Analysis Revision 11, 02/14/13	Definitive	Soil/Water PCBs	GC	TestAmerica-St. Louis	N
ST-GC-0014	Aromatic Volatiles and Volatile Petroleum Hydrocarbons by GC PID/FID Revision 11, 07/31/12	Definitive	Soil TPH-purgeable	GC/PID	TestAmerica-St. Louis	N

SAP Worksheet #23 – Analytical SOP References Table (Continued)

Lab SOP Number [a]	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ST-GC-0005	Extractable Total Petroleum Hydrocarbons by GC-FID Revision 18, 02/18/13	Definitive	Soil TPH-extractable	GC/FID	TestAmerica-St. Louis	N
ST-MT-0001	Analysis of Metals by Inductively Coupled Plasma/Mass Spectroscopy Revision 20, 01/20/12	Definitive	Soil/Water Metals	ICP-MS	TestAmerica-St. Louis	N
ST-MT-0005 ST-MT-0007	Preparation and Analysis of Mercury in Aqueous Samples by CVAA Revision 12, 03/20/12 Preparation and Analysis of Mercury in Solid Samples by Cold Vapor Atomic Absorption Spectroscopy Revision 12, 03/20/12	Definitive	Soil/Water Mercury	Cold Vapor AA	TestAmerica-St. Louis	N
Section III-A	Analysis of Asbestos in Bulk Building Materials by Polarized Light Microscopy Revision 2, 09/20/06	Definitive	Soil Asbestos	Microscopy	AmeriSci	N
ST-GC-0017	Herbicide Gas Chromatographic Analysis Revision 12, 05/31/12	Definitive	Water Herbicides	GC	TestAmerica-St. Louis	N

Notes:

[a] Analytical SOP revision number and date listed are current as of the date this SAP was published. All analytical SOPs are provided as Appendix A of this SAP.

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
EG&G Ortec Gamma Spectroscopy System	Ortec Gamma Vision-32 A66-B32 Operations Manual	Annual, after maintenance and at the request of the lab manager	+/- 10% for the radionuclides used for calibration	• Recalibration • Instrument maintenance • Notify lab manager	Curtis and Tompkins Laboratory Supervisor	HPS SOPs Section 3.3
Gamma Spectrometer	1. Energy calibration 2. FWHM calibration 3. Background	1. Annual 2. Annual 3. Monthly	For Energy and FWHM calibration: • Within 0.5% or 0.1 keV for all calibration points • Within 8% for all calibration points • Verify with second source that always contains at least Am-241, Co-60, and Cs-137 • Must be ± 10%D for each nuclide • For Background, acceptance criterion is 12 hours	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica-St. Louis Group Leader	ST-RD-0102

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Gas Flow Proportional Counter	• Plateau generation and/or verification • Discriminator setting • Initial long background count • Mass attenuated efficiency calibration • Eight source dual/single calibration curves	Annual	• Plot efficiencies vs masses • Calculate equation of curve – degree ≤3 • Remove outliers >15% deviation from theoretical values but not more than 20% of total points • Calculate coefficient of determination (R^2). R^2 must be ≥0.9 • Verify calibration with second source standard count – must be within 30 percent of true value and mean across all detectors <10%	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica-St. Louis Group Leader	ST-RD-0403
Alpha Spectrometer	1. Energy calibration 2. Efficiency calibration and background check 3. Subtraction spectrum 4. Pulser check and background check	1. Monthly 2. Monthly 3. Monthly 4. Daily	1. Three isotopes in 3–6 MeV range all within ± 40 KeV of expected value 2. >20% 3. Ultra Low Level: < 2 CPM Low Level: < 2–4 CPM Routine Level: < 4–10 CPM High Level: < 10–20 CPM 4. Pulser energy, peak centroid, peak resolution, peak area, calibration and background must pass statistical “boundary” out-of-range test	• Recalibrate • Instrument maintenance • Consult with Technical Director • If background check is > 20 CPM, then detector requires maintenance	TestAmerica-St. Louis Group Leader	ST-RD-0210

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Liquid Scintillation Counter	1. Statistical baseline for C-14 and H-3 backgrounds and efficiencies 2. Check of C-14 and H-3 backgrounds and efficiencies 3. Quench curve for specific nuclide	1. Startup or long-term use 2. Daily 3. Annual	1. Developed with statistical limits at time of startup 2. Within 3 sigma of baseline established at startup or when re-established 3. Second source verification ± 10% of true value	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica-St. Louis Group Leader	ST-RD-0302
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	%RSD<20% all compounds, Relative Response Factor meet method criteria	Repeat calibration	TestAmerica-St. Louis Analyst	ST-MS-0002
GC/MS	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ±30% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-MS-0002
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	+/- 20%D criteria for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-MS-0002
GC/PID	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Linear-mean RSD ≤ 20%	Repeat calibration	TestAmerica-St. Louis Analyst	ST-GC-0014
GC/PID	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 15% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0014

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/PID	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: Every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Re-inject CCV – if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0014
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	%RSD<20% all compounds, Relative Response Factor meet method criteria	Repeat calibration	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ±30% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	+/- 20%D criteria for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	%RSD<20% all compounds, Relative Response Factor meet method criteria	Repeat calibration	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Second Source calibration verification	Once after each initial calibration	Value of second source for all analytes within ±30% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	+/- 20%D criteria for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-MS-0001
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	RSD for each analyte ≤ 20%	Repeat calibration	TestAmerica-St. Louis Analyst	ST-GC-0016

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0016
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0016
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Mean RSD for each PCB ≤ 20%	Recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0015
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Rerun ICV one time, second failure requires re-calibration	TestAmerica-St. Louis Analyst	ST-GC-0015
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0015
GC/FID	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Linear mean RSD ≤ 20%	Recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0005
GC/FID	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0005

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/FID	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: Every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0005
ICP-MS	Initial Calibration (ICAL) – minimum one high standard and a calibration blank	Daily initial calibration prior to sample analysis	3 standards and a blank. Correlation Coefficient of ≥ 0.998	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0001
ICP-MS	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0001
ICP-MS	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence	All analytes within + 10% of expected value	Recalibrate – rerun 10 samples previous to failed CCV.	TestAmerica-St. Louis Analyst	ST-MT-0001
Cold Vapor AA	Initial Calibration (ICAL)	Daily initial calibration prior to sample analysis	Correlation coefficient R>=0.995 for linear regression	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0005 ST-MT-0007
Cold Vapor AA	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected value (second source)	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0005 ST-MT-0007
Cold Vapor AA	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence.	All analytes within + 20% of expected value	Recalibrate – rerun 10 samples previous to failed CCV.	TestAmerica-St. Louis Analyst	ST-MT-0005 ST-MT-0007

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Mean RSD for each herbicide ≤ 20%	Recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0017
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 30% of expected value (initial source)	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0017
GC	Calibration Verification (Initial [ICV] and Continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0017

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SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
EG&G Ortec Gamma Spectroscopy System	Clean cave; fill LNO_2	Physical check	Physical check	Weekly	Acceptable background	• Recalibrate • Instrument maintenance Consult lab manager	Curtis and Tompkins Laboratory Supervisor	HPS SOPs Section 3.3
	Background check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance Consult lab manager	Curtis and Tompkins Laboratory Supervisor	HPS SOPs Section 3.3
	Source check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance Consult lab manager	Curtis and Tompkins Laboratory Supervisor	HPS SOPs Section 3.3
Gamma Spectrometer	1. Clean cave; fill dewar with N2 2. QA check	1. Physical check 2. Background and source check	1. Physical check 2. Check deviation	1. Weekly 2. Daily	1. Acceptable background 2. Within 3 sigma of measured population	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica – St. Louis Group Leader / Analyst	ST-RD-0102
Gas Flow Proportional Counter	1. Clean instrument 2. Inspect windows 3. QA check	1. Physical check 2. Physical check 3. Background and source count	1. Physical check 2. Physical check 3. Check deviation	1. Daily 2. High counts and/or background 3. Daily	1. None applicable 2. No physical defects 3. Within 3 sigma of 20 day population	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica – St. Louis Group Leader/Analyst	ST-RD-0403

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Alpha Spectrometer	Clean planchette holders	Physical check	Physical check	Monthly	Acceptable background and calibration efficiencies	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica – St. Louis Group Leader/Analyst	ST-RD-0210
Liquid Scintillation Counter	1. QA check 2. Clean dust and debris from sample deck 3. Photon multiplier tubes cleaned by manufacturer	1. Background and efficiency verification for C-14 and H-3 2. Physical check 3. Physical check	1. Review of daily control data 2. Physical check 3. Physical check	1. Daily 2. Monthly 3. Semi-annual or annual	For all three maintenance activities: within 3 sigma of established baselines and stable baselines for C-14 and H-3 efficiencies	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica – St. Louis Group Leader/Analyst	ST-RD-0302
GCMS GC ICP-MS Cold Vapor AA	Parameter Setup	Physical check	Physical check	Initially; prior to DCC	Predetermined optimum parameter settings	Reset if incorrect	TestAmerica – St. Louis Analyst	ST-MS-0002, ST-GC-0014, ST-MS-0001, ST-GC-0015, ST-GC-0005, ST-MT-0001, ST-MT-0005, ST-MT-0007
GC/MS	Tune Check	Instrument Performance	Conformance to instrument tuning	Initially; prior to DCC	Compliance to ion abundance criteria	Repeat tune check to rule out standard degradation or inaccurate injection. If problem persists, perform retune the instrument and repeat tune check.	TestAmerica – St. Louis Analyst	ST-MS-0002, ST-MS-0001

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP-MS	ICS	Instrument Performance	Conformance to interference check	Prior to sample analysis	Within + 20% of expected value	Terminate analysis, reanalyze ICS to rule out standard degradation or inaccurate injection. If problem persists, perform instrument maintenance, repeat calibrations and reanalyze all associated samples.	TestAmerica – St. Louis Analyst	ST-MT-0001
ICP-MS	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification	ICB:No analytes detected > RL; CCB: no analyte detected > 3X MDL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	TestAmerica – St. Louis Analyst	ST-MT-0001
Cold Vapor AA	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification	No analytes detected > RL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	TestAmerica – St. Louis Analyst	ST-MT-0005 ST-MT-0007

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SAP Worksheet #26 – Sample Handling System

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Sampler / TtEC
Sample Packaging (Personnel/Organization): Sampler / TtEC
Coordination of Shipment (Personnel/Organization): Sampler / TtEC
Type of Shipment/Carrier: Courier or FedEx®
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian / Curtis and Tompkins and TestAmerica-St. Louis
Sample Custody and Storage (Personnel/Organization): Sample Custodian / Curtis and Tompkins and TestAmerica-St. Louis
Sample Preparation (Personnel/Organization): Sample preparation personnel / Curtis and Tompkins and TestAmerica-St. Louis
Sample Determinative Analysis (Personnel/Organization): Analyst / Curtis and Tompkins and TestAmerica-St. Louis
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 90 calendar days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): up to 40 calendar days depending on method holding times
Biological Sample Storage (No. of days from sample collection): Not applicable
SAMPLE DISPOSAL/ARCHIVE
Personnel/Organization: Sample Custodian / Curtis and Tompkins and TestAmerica-St. Louis
Number of Days from Analysis: chemical Samples – 90 calendar days; radiological samples may be returned to the site as requested.

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SAP Worksheet #27 – Sample Custody Requirements Table

An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the data are legally defensible, i.e., that the samples were obtained from the locations stated and that they reached the laboratory without alteration. To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented through the COC record. A sample is considered to be in custody if the following conditions have been observed:

- In actual possession or in view of the person who collected the samples
- Locked in a secure area
- Placed in an area restricted to authorized personnel
- Placed in a container and secured with an official seal, so that the sample cannot be reached without breaking the seal

Appendix B presents an example of the COC record. The COC record lists each sample and the individuals performing the sample collection, shipment, and receipt. Appendix B presents an example of a custody seal that will seal samples and the cooler during transportation to the laboratory.

The COC record will be the controlling document to ensure that the sample custody is maintained. Each time the sample custody is transferred, the former custodian will sign the COC on the _Relinquished By_ line, and the new custodian will sign the COC on the _Received By_ line. The date, time, and project or company affiliation will accompany each signature. When FedEx is used to ship samples to the laboratory, the waybill number and courier name will be recorded on the COC. The shipping container will be secured with two custody seals, thereby allowing for custody to be maintained by the shipping personnel until receipt by the laboratory.

Sample custody will be the responsibility of sampling personnel from the time of sample collection until the samples are accepted by the laboratory. Thereafter, the laboratory performing the analysis will maintain custody. The sample custodian will sign the COC, inventory each shipment, and note on the original COC record any discrepancy in the sample custody, temperature of the cooler for chemical samples, or broken sample containers. The laboratory will also note any discrepancies and notify the Project Chemist. The laboratory will have a system for tracking samples consistent with Section 5.8 of the Quality Systems Manual (QSM) (DoD 2010). Radiological soil samples submitted for analysis shall be retuned to the project site as requested for archiving and disposition. Chemical samples submitted for analysis shall be held for up to 90 calendar days after sample collection, at which time the samples will be disposed of by the laboratory.

In addition to providing a custody exchange record for the samples, the COC record serves as a formal request for sample analyses. The COC records will be completed, signed, and distributed as follows:

- One copy retained on-site for inclusion in the project files
- A copy faxed/e-mailed to the Project Chemist on a daily basis to allow tracking of samples sent to the laboratory to confirm laboratory receipt of samples

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

SAMPLE NUMBERING

Samples will be uniquely designated using a numbering system that identifies the Contract Task Order number and a sequential number (e.g., 9-001). The sample number will be recorded in the field logbook, on the labels, and the COC record at the time of sample collection. A complete description of the sample and sampling conditions will be recorded in the field logbook and referenced using the unique sample identification number.

SAMPLE PACKAGING

Radiological soil samples will be collected in containers that are labeled then couriered to Curtis and Tompkins laboratory.

For samples submitted to TestAmerica-St. Louis, immediately after sample labeling, custody seals will be affixed to each sample container. Each container will be placed in double-resealable plastic bags to protect the samples from moisture. For VOA vials and En Core samples, the custody seal will be placed on the outside of the first resealable bag; then the containers will be placed in a second resealable bag. This will prevent any contact with the adhesive from the custody seal and the samples. Glass containers will then be wrapped in bubble wrap. VOA vials will be wrapped with bubble wrap first, thenplaced in a resealable bag, and then placed in another resealable bag following application of a custody seal over the first bag.

Samples to be shipped to TestAmerica-St. Louis will be shipped in coolers. Each cooler will be shipped with a temperature blank as required for chemical analysis only. (A temperature blank is a container filled with tap water and stored in the cooler during sample collection and transportation.) The temperature of the cooler will be recorded by the laboratory on the COC record immediately upon receipt of the samples. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Double-bagged ice will be added inside the plastic bag at the bottom of the cooler, one layer of sample containers will be placed on the ice, and more double-bagged ice will be placed on top of the containers. This will be repeated until the cooler is filled with ice as the top layer in the cooler. (Ice is not required for containers for radiological analysis only.)

The COC record will include the air bill number, and the “Received By” box will be labeled with the commercial courier’s name. The COC record will be sealed in a double-resealable bag and then taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipment. The pouch for the air bill will be placed on the cooler and secured with clear tape. The air bill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, the original air bill will be placed on the cooler with the COC record, and copies of the air bill will be placed on the other coolers. The number of packages should be included on each air bill (1 of 2, 2 of 2). Saturday deliveries, if required, should be coordinated with the laboratory in advance, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by the commercial courier. “Dangerous goods” declarations will also be completed as applicable.

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil

Matrix: Soil
Analytical Group: Gamma Isotopes
Analytical Method/SOP Reference [a]: EPA 901.1 MOD / HPS SOPs Section 3.3 (Curtis and Tompkins)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Background Sample	Daily	Absolute value < MDA	[b]	Curtis and Tompkins Analyst	Accuracy	Absolute value < MDA
LCS	Weekly Weekly and may be performed 1 per preparatory batch (defined as ≤ 20 samples) for FSS samples	Gamma source check ± 20% of known activity Prepared LCS within 13 ± 6 pCi/g for Ra-226	[c]	Curtis and Tompkins Analyst	Accuracy	Gamma source check ± 20% of known activity Prepared LCS within 13 ± 6 pCi/g for Ra-226
Sample Duplicate	1 per preparatory batch (defined as ≤ 20 samples)	RPD ≤40% and/or RER ≤1	[d]	Curtis and Tompkins Analyst	Precision	RPD ≤40% and/or RER ≤1

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: Strontium
Analytical Method/SOP Reference [a]: EPA 905 MOD or DOE SR-03-RC MOD/SOP ST-RD-0403

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < MDA	b	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch	70–130% RPD ≤40% and/or RER ≤1	c	TestAmerica-St. Louis Analyst	Accuracy	70–130% RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch	RPD ≤40% and/or RER ≤1	d	TestAmerica-St. Louis Analyst	Precision	RPD ≤40% and/or RER ≤1
Carriers	Per sample, blank, LCS, LCSD, sample duplicate	Sr and Yt carriers: 30–110%	e	TestAmerica-St. Louis Analyst	Accuracy	Sr and Yt carriers: 30–110%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: Alpha Isotopes
Analytical Method/SOP Reference [a]: DOE A-01-R MOD/SOP ST-RD-0210

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < MDA	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch	70–130% RPD ≤40% and/or RER ≤1	[c]	TestAmerica-St. Louis Analyst	Accuracy	70–130% RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch	RPD ≤40% and/or RER ≤1	[d]	TestAmerica-St. Louis Analyst	Precision	RPD ≤40% and/or RER ≤1
Tracer	Per sample, blank, LCS, LCSD, sample duplicate	30–110%	[e]	TestAmerica-St. Louis Analyst	Accuracy	30–110%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: VOCs
Analytical Method/SOP Reference [a]: EPA 8260C/SOP ST-MS-0002

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	1,1-Dichloroethene 65–135% Benzene: 75–125% Chlorobenzene: 75–125% Toluene: 70–125% Trichloroethene: 75–125%	[c]	TestAmerica-St. Louis Analyst	Accuracy	1,1-Dichloroethene 65–135% Benzene: 75–125% Chlorobenzene: 75–125% Toluene: 70–125% Trichloroethene: 75–125%
MS/MSD	1 per preparatory batch per matrix	1,1-Dichloroethene 65–135% Benzene: 75–125% Chlorobenzene: 75–125% Toluene: 70–125% Trichloroethene: 75–125%	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	1,1-Dichloroethene 65–135% Benzene: 75–125% Chlorobenzene: 75–125% Toluene: 70–125% Trichloroethene: 75–125%
Surrogate	Per all field and QC samples	1,2-Dichloroethane-d_4: 80–131% 4-Bromofluorobenzene: 85–20% Toluene-d_8: 85–115%	[g]	TestAmerica-St. Louis Analyst	Accuracy	1,2-Dichloroethane-d_4: 80–131% 4-Bromofluorobenzene: 85–20% Toluene-d_8: 85–115%
Internal Standard	Per all field and QC samples	Fluorobenzene, Chlorobenzene-d5, 1,4-dichlorobenzene-d4: -50 – 100% of the response in the mid level of the initial calibration	[h]	TestAmerica-St. Louis Analyst	Accuracy	Fluorobenzene, Chlorobenzene-d5, 1,4-dichlorobenzene-d4: -50 – 100% of the response in the mid level of the initial calibration

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: SVOCs
Analytical Method/SOP Reference [a]: EPA 8270D/SOP ST-MS-0001

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	1,2,4-Trichlorobenzene 45–110%	[c]	TestAmerica-St. Louis Analyst	Accuracy	1,2,4-Trichlorobenzene 45–110%
		1,4-Dichlorobenzene 35–105%	[c]	TestAmerica-St. Louis Analyst	Accuracy	1,4-Dichlorobenzene 35–105%
		2,4-Dinitrotoluene 50–115%	[c]	TestAmerica-St. Louis Analyst	Accuracy	2,4-Dinitrotoluene 50–115%
		Acenaphthene 45–110%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Acenaphthene 45–110%
		2-Chlorophenol 45–105%	[c]	TestAmerica-St. Louis Analyst	Accuracy	2-Chlorophenol 45–105%
		n-Nitrosodi-n-propylamine 40–115%	[c]	TestAmerica-St. Louis Analyst	Accuracy	n-Nitrosodi-n-propylamine 40–115%
		4-Chloro-3-methyl phenol 45–115%	[c]	TestAmerica-St. Louis Analyst	Accuracy	4-Chloro-3-methyl phenol 45–115%
		4-Nitrophenol 15–140%	[c]	TestAmerica-St. Louis Analyst	Accuracy	4-Nitrophenol 15–140%
		Pentachlorophenol 25–120%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Pentachlorophenol 25–120%
		Phenol 40–100%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Phenol 40–100%
		Pyrene 45–125%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Pyrene 45–125%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS/MSD	1 per preparatory batch per matrix	1,2,4-Trichlorobenzene 45–110%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	1,2,4-Trichlorobenzene 45–110%
		1,4-Dichlorobenzene 35–105%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	1,4-Dichlorobenzene 35–105%
		2,4-Dinitrotoluene 50–115%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	2,4-Dinitrotoluene 50–115%
		Acenaphthene 45–110%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Acenaphthene 45–110%
		2-Chlorophenol 45–105%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	2-Chlorophenol 45–105%
		n-Nitrosodi-n-propylamine 40–115%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	n-Nitrosodi-n-propylamine 40–115%
		4-Chloro-3-methyl phenol 45–115	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	4-Chloro-3-methyl phenol 45–115
		4-Nitrophenol 15–140%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	4-Nitrophenol 15–140%
		Pentachlorophenol 25–120%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Pentachlorophenol 25–120%
		Phenol 40–100%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Phenol 40–100%
		Pyrene 45–125%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Pyrene 45–125%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Surrogate	Per all field and QC samples	2,4,6-Tribromophenol 35–125%	g	TestAmerica-St. Louis Analyst	Accuracy	2,4,6-Tribromophenol 35–125%
		2-Fluorobiphenyl 45–105%	g	TestAmerica-St. Louis Analyst	Accuracy	2-Fluorobiphenyl 45–105%
		2-Fluorophenol 35–105%	g	TestAmerica-St. Louis Analyst	Accuracy	2-Fluorophenol 35–105%
		Nitrobenzene-d_5 35–100%	g	TestAmerica-St. Louis Analyst	Accuracy	Nitrobenzene-d_5 35–100%
		Phenol-d_5 40–100%	g	TestAmerica-St. Louis Analyst	Accuracy	Phenol-d_5 40–100%
		Terphenyl-d_{14} 30–125%	g	TestAmerica-St. Louis Analyst	Accuracy	Terphenyl-d_{14} 30–125%
Internal Standard	Per all field and QC samples	1,4-dichlorobenzene-d4, naphthalene-d8, acenapthene-d10, phenanthrene-d10, chrysene-d12, perylene-d12: -50 – 100% of the response in the mid level of the initial calibration	h	TestAmerica-St. Louis Analyst	Accuracy	1,4-dichlorobenzene-d4, naphthalene-d8, acenapthene-d10, phenanthrene-d10, chrysene-d12, perylene-d12: -50 – 100% of the response in the mid level of the initial calibration

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: Pesticides
Analytical Method/SOP Reference [a]: EPA 8081B/SOP ST-GC-0016

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	4,4′-DDT 45–140% Aldrin 45–140% Dieldrin 65–125% Endrin 60–135% Gamma–BHC (Lindane) 60–125% Heptachlor 50–140%	[c]	TestAmerica-St. Louis Analyst	Accuracy	4,4′-DDT 45–140% Aldrin 45–140% Dieldrin 65–125% Endrin 60–135% Gamma–BHC (Lindane) 60–125% Heptachlor 50–140%
MS/MSD	1 per preparatory batch per matrix	4,4′-DDT 45–140% Aldrin 45–140% Dieldrin 65–125% Endrin 60–135% Gamma-BHC (Lindane) 60–125% Heptachlor 50–140%	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	4,4′-DDT 45–140% Aldrin 45–140% Dieldrin 65–125% Endrin 60–135% Gamma-BHC (Lindane) 60–125% Heptachlor 50–140%
Surrogate	Per all field and QC samples	Decachlorobiphenyl 55–130% Tetrachloro-m-xylene (TCMX) 70–125%	[g]	TestAmerica-St. Louis Analyst	Accuracy	Decachlorobiphenyl 55–130% Tetrachloro-m-xylene (TCMX) 70–125%
Column Degradation Check	Prior to calibration/every 12 hours in analytical run	DDT <15% Endrin <15%	[i]	TestAmerica-St. Louis Analyst	Accuracy	DDT <15% Endrin <15%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: PCBs
Analytical Method/SOP Reference [a]: EPA 8082A/SOP ST-GC-0015

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	b	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	Aroclor 1016: 40–140% Aroclor 1260: 60–130%	c	TestAmerica-St. Louis Analyst	Accuracy	Aroclor 1016: 40–140% Aroclor 1260: 60–130%
MS/MSD	1 per preparatory batch per matrix	Aroclor 1016: 40–140% Aroclor 1260: 60–130% RPD ≤ 30	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Aroclor 1016: 40–140% Aroclor 1260: 60–130% RPD ≤ 30
Surrogate	Per all field and QC samples	Decachlorobiphenyl 60–125%	g	TestAmerica-St. Louis Analyst	Accuracy	Decachlorobiphenyl 60–125%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: TPH-purgeable
Analytical Method/SOP Reference [a]: EPA 8015B/SOP ST-GC-0014

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	TPH-gasoline: 57–127%	[c]	TestAmerica-St. Louis Analyst	Accuracy	TPH-gasoline: 57–127%
MS/MSD	1 per preparatory batch per matrix	TPH-gasoline: 50–114% RPD ≤ 30	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	TPH-gasoline: 50–114% RPD ≤ 30
Surrogate	Per all field and QC samples	4-Bromofluorobenzene: 78–141%	[g]	TestAmerica-St. Louis Analyst	Accuracy	4-Bromofluorobenzene: 78–141%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: TPH-extractable
Analytical Method/SOP Reference [a]: EPA 8015B/SOP ST-GC-0005

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	TPH-diesel: 50–121%	[c]	TestAmerica-St. Louis Analyst	Accuracy	TPH-diesel: 50–121%
MS/MSD	1 per preparatory batch per matrix	TPH-diesel: 18–150% RPD ≤ 30	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	TPH-diesel: 18–150% RPD ≤ 30
Surrogate	Per all field and QC samples	o-terphenyl: 79–150%	[g]	TestAmerica-St. Louis Analyst	Accuracy	o-terphenyl: 79–150%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Matrix: Soil
Analytical Group: Metals/Mercury
Analytical Method/SOP Reference [a]: EPA 6020A and 7471B/SOP ST-MT-0001 and SOP ST-MT-0007

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > 2 × MDL	[b]	TestAmerica-St. Louis Analyst	Accuracy	No analytes detected > 2 × MDL
LCS and/or LCSD	1 per preparatory batch	80–120%	[c]	TestAmerica-St. Louis Analyst	Accuracy	80–120%
MS/MSD (lab duplicate)	1 per preparatory batch per matrix	80–120% RPD ≤ 20	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	80–120% RPD ≤ 20
Serial dilution	Each new sample matrix	1:5 dilution must agree within ±10% of original determination.	[j]	TestAmerica-St. Louis Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination.
Post-digestion spike	When serial dilution or matrix spike fails	80–120%	[k]	TestAmerica-St. Louis Analyst	Accuracy	75–125%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil (Continued)

Notes:

[a] Analytical SOP revision numbers listed are current as of the date this SAP was published.

[b] Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

[c] Reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.

[d] Reprep and reanalyze the sample and duplicate in the associated preparatory batch for failed analytes if sufficient sample material is available and the sample is homogeneous. If RPD/RER still out of range, report as matrix interference confirmed and write a nonconformance. If reanalysis is in range, re-extract samples in batch.

[e] Truncate carriers/tracers above 100% recovery to eliminate low biased results. Reprep and reanalyze sample if carrier is low (indicating high biased results) if there is activity in the sample above the reporting limit. No reanalysis if matrix interference is nonconformance during sample preparation.

[f] The data will be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.

[g] Reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.

[h] Reprep and reanalyze all failed samples for failed internal standards in the associated preparatory batch, if sufficient sample material is available.

[i] Replace injection port liner and trim or replace column. Reanalyze samples in the associated preparatory batch.

[j] Perform post-digestion spike addition if serial dilution does not meet criteria.

[k] Reanalyze post-digestion spike.

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SAP Worksheet #28.2 – Laboratory QC Samples Table – Water

Matrix: Water
Analytical Group: Gamma Isotopes and Radium-226
Analytical Method/SOP Reference [a]: EPA 901.1 MOD and 903.0 MOD/SOP ST-RD-0102 and SOP ST-RD-0403

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < MDA	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch	70–130% for americium-241, Cs-137, cobalt-60 (and Ra-226 for 903.0) RPD ≤40% and/or RER ≤1	[c]	TestAmerica-St. Louis Analyst	Accuracy	70–130% for americium-241, Cs-137, cobalt-60 (and Ra-226 for 903.0) RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch	RPD ≤40% and/or RER ≤1	[d]	TestAmerica-St. Louis Analyst	Precision	RPD ≤40% and/or RER ≤1
Carriers	Per sample, blank, LCS, LCSD, sample duplicate	EPA 903.0 only: Barium tracer 40–110%	[e]	TestAmerica-St. Louis Analyst	Accuracy	EPA 903.0 only: Barium tracer 40–110%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Strontium
Analytical Method/SOP Reference [a]: EPA 905 MOD or DOE SR-03-RC MOD/SOP ST-RD-0403

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < MDA	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch	70–130% RPD ≤40% and/or RER ≤1	[c]	TestAmerica-St. Louis Analyst	Accuracy	70–130% RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch	RPD ≤40% and/or RER ≤1	[d]	TestAmerica-St. Louis Analyst	Precision	RPD ≤40% and/or RER ≤1
Carriers	Per sample, blank, LCS, LCSD, sample duplicate	Sr and/or Yt tracers: 30–110%	[e]	TestAmerica-St. Louis Analyst	Accuracy	Sr and/or Yt tracers: 30–110%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Alpha Isotopes
Analytical Method/SOP Reference [a]: DOE A-01-R MOD/SOP ST-RD-0210

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < MDA	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch	70–130% RPD ≤40% and/or RER ≤1	[c]	TestAmerica-St. Louis Analyst	Accuracy	70–130% RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch	RPD ≤40% and/or RER ≤1	[d]	TestAmerica-St. Louis Analyst	Precision	RPD ≤40% and/or RER ≤1
Tracer	Per sample, blank, LCS, LCSD, sample duplicate	30–110%	[e]	TestAmerica-St. Louis Analyst	Accuracy	30–110%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Tritium
Analytical Method/SOP Reference [a]: EPA 906.0 MOD/SOP ST-RD-0302

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < MDA	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch	67–111% RPD ≤40% and/or RER ≤1	[c]	TestAmerica-St. Louis Analyst	Accuracy	67–111% RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch	RPD ≤40% and/or RER ≤1	[d]	TestAmerica-St. Louis Analyst	Precision	RPD ≤40% and/or RER ≤1

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: VOCs
Analytical Method/SOP Reference [a]: EPA 8260C/SOP ST-MS-0002

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	1,1-Dichloroethene: 70–130% Benzene: 80–120% Chlorobenzene 80–120% Toluene: 75–120% Trichloroethene: 70–125%	[c]	TestAmerica-St. Louis Analyst	Accuracy	1,1-Dichloroethene: 70–130% Benzene: 80–120% Chlorobenzene 80–120% Toluene: 75–120% Trichloroethene: 70–125%
MS/MSD	1 per preparatory batch per matrix	1,1-Dichloroethene: 70–130% Benzene: 80–120% Chlorobenzene 80–120% Toluene: 75–120% Trichloroethene: 70–125% RPD ≤ 20	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	1,1-Dichloroethene: 70–130% Benzene: 80–120% Chlorobenzene 80–120% Toluene: 75–120% Trichloroethene: 70–125% RPD ≤ 20
Surrogate	Per all field and QC samples	1,2-Dichloroethane-d_4: 70–120% 4-Bromofluorobenzene: 75–120% Toluene-d_8: 85–120%	[g]	TestAmerica-St. Louis Analyst	Accuracy	1,2-Dichloroethane-d_4: 70–120% 4-Bromofluorobenzene: 75–120% Toluene-d_8: 85–120%
Internal Standard	Per all field and QC samples	Fluorobenzene, Chlorobenzene-d5, 1,4-dichlorobenzene-d4: -50 – 100% of the response in the mid level of the initial calibration	[h]	TestAmerica-St. Louis Analyst	Accuracy	Fluorobenzene, Chlorobenzene-d5, 1,4-dichlorobenzene-d4: -50 – 100% of the response in the mid level of the initial calibration

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: SVOCs
Analytical Method/SOP Reference [a]: EPA 8270D/ SOP ST-MS-0001

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	1,2,4-Trichlorobenzene: 35–105%	[c]	TestAmerica-St. Louis Analyst	Accuracy	1,2,4-Trichlorobenzene: 35–105%
		1,4-Dichlorobenzene: 30–100%	[c]	TestAmerica-St. Louis Analyst	Accuracy	1,4-Dichlorobenzene: 30–100%
		2,4-Dinitrotoluene: 50–120%	[c]	TestAmerica-St. Louis Analyst	Accuracy	2,4-Dinitrotoluene: 50–120%
		Acenaphthene: 45–110%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Acenaphthene: 45–110%
		2-Chlorophenol: 35–105%	[c]	TestAmerica-St. Louis Analyst	Accuracy	2-Chlorophenol: 35–105%
		n-Nitrosodi-n-propylamine: 35–130%	[c]	TestAmerica-St. Louis Analyst	Accuracy	n-Nitrosodi-n-propylamine: 35–130%
		4-Chloro-3-methyl phenol: 45–110%	[c]	TestAmerica-St. Louis Analyst	Accuracy	4-Chloro-3-methyl phenol: 45–110%
		4-Nitrophenol: 0–125%	[c]	TestAmerica-St. Louis Analyst	Accuracy	4-Nitrophenol: 0–125%
		Pentachlorophenol: 40–115%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Pentachlorophenol: 40–115%
		Phenol: 0–115%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Phenol: 0–115%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS (cont.)		Pyrene 50–130%	c	TestAmerica-St. Louis Analyst	Accuracy	Pyrene 50–130%
MS/MSD	1 per preparatory batch per matrix	1,2,4-Trichlorobenzene 35–105%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	1,2,4-Trichlorobenzene 35–105%
		1,4-Dichlorobenzene 30–100%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	1,4-Dichlorobenzene 30–100%
		2,4-Dinitrotoluene 50–120%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	2,4-Dinitrotoluene 50–120%
		Acenaphthene 45–110%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Acenaphthene 45–110%
		2-Chlorophenol 35–105%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	2-Chlorophenol 35–105%
		n-Nitrosodi-n-propylamine 35–130%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	n-Nitrosodi-n-propylamine 35–130%
		4-Chloro-3-methyl phenol 45–110%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	4-Chloro-3-methyl phenol 45–110%
		4-Nitrophenol 0–125%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	4-Nitrophenol 0–125%
		Pentachlorophenol 40–115%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Pentachlorophenol 40–115%
		Phenol 0–115%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Phenol 0–115%
		Pyrene 50–130%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Pyrene 50–130%
Surrogate	Per all field and QC samples	2,4,6-Tribromophenol 40–125%	g	TestAmerica-St. Louis Analyst	Accuracy	2,4,6-Tribromophenol 40–125%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Surrogate (cont.)		2-Fluorobiphenyl 50–110%	g	TestAmerica-St. Louis Analyst	Accuracy	2-Fluorobiphenyl 50–110%
		2-Fluorophenol 20–110%	g	TestAmerica-St. Louis Analyst	Accuracy	2-Fluorophenol 20–110%
		Nitrobenzene-d_5 40–110%	g	TestAmerica-St. Louis Analyst	Accuracy	Nitrobenzene-d_5 40–110%
		Phenol-d_5 10–59%	g	TestAmerica-St. Louis Analyst	Accuracy	Phenol-d_5 10–59%
		Terphenyl-d_{14} 50–135%	g	TestAmerica-St. Louis Analyst	Accuracy	Terphenyl-d_{14} 50–135%
Internal Standard	Per all field and QC samples	1,4-dichlorobenzene-d4, naphthalene-d8, acenapthene-d10, phenanthrene-d10, chrysene-d12, perylene-d12: -50 – 100% of the response in the mid level of the initial calibration	h	TestAmerica-St. Louis Analyst	Accuracy	1,4-dichlorobenzene-d4, naphthalene-d8, acenapthene-d10, phenanthrene-d10, chrysene-d12, perylene-d12: -50 – 100% of the response in the mid level of the initial calibration

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Pesticides
Analytical Method/SOP Reference [a]: EPA 8081B/SOP ST-GC-0016

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	b	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	4,4′-DDT 45–140% Aldrin 25–140% Dieldrin 60–130% Endrin 55–135% Gamma-BHC (Lindane) 25–135% Heptachlor 40–130%	c	TestAmerica-St. Louis Analyst	Accuracy	4,4′-DDT 45–140% Aldrin 25–140% Dieldrin 60–130% Endrin 55–135% Gamma-BHC (Lindane) 25–135% Heptachlor 40–130%
MS/MSD	1 per preparatory batch per matrix	4,4′-DDT 45–140% Aldrin 25–140% Dieldrin 60–130% Endrin 55–135% Gamma-BHC (Lindane) 25–135% Heptachlor 40–130%	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	4,4′-DDT 45–140% Aldrin 25–140% Dieldrin 60–130% Endrin 55–135% Gamma-BHC (Lindane) 25–135% Heptachlor 40–130%
Surrogate	Per all field and QC samples	Decachlorobiphenyl 30–135%| Tetrachloro-m-xylene (TCMX) 25–140%	g	TestAmerica-St. Louis Analyst	Accuracy	Decachlorobiphenyl 30–135%| Tetrachloro-m-xylene (TCMX) 25–140%
Column Degradation Check	Prior to calibration/every 12 hours in analytical run	DDT <15% Endrin <15%	i	TestAmerica-St. Louis Analyst	Accuracy	DDT <15% Endrin <15%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: PCBs
Analytical Method/SOP Reference [a]: EPA 8082A/SOP ST-GC-0015

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	b	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	Aroclor 1016: 25–145% Aroclor 1260: 30–145%	c	TestAmerica-St. Louis Analyst	Accuracy	Aroclor 1016: 25–145% Aroclor 1260: 30–145%
MS/MSD	1 per preparatory batch per matrix	Aroclor 1016: 25–145% Aroclor 1260: 30–145%RPD ≤ 20	f	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Aroclor 1016: 25–145% Aroclor 1260: 30–145%RPD ≤ 20
Surrogate	Per all field and QC samples	Decachlorobiphenyl: 40–135%	g	TestAmerica-St. Louis Analyst	Accuracy	Decachlorobiphenyl: 40–135%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Metals/Mercury
Analytical Method/SOP Reference [a]: EPA 6020A and 7470A/SOP ST-MT-0001 and SOP ST-MT-0005

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > 2 × MDL	[b]	TestAmerica-St. Louis Analyst	Accuracy	No analytes detected > 2 × MDL
LCS and/or LCSD	1 per preparatory batch	80–120%	[c]	TestAmerica-St. Louis Analyst	Accuracy	80–120%
MS/MSD (lab duplicate)	1 per preparatory batch per matrix	80–120% RPD ≤ 20	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	80–120% RPD ≤ 20
Serial dilutions	Each new sample matrix	1:5 dilution must agree within ±10% of original determination.	[j]	TestAmerica-St. Louis Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination.
Post-digestion spike	When serial dilution or matrix spike fails	80–120%	[k]	TestAmerica-St. Louis Analyst	Accuracy	75–125%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Herbicides
Analytical Method/SOP Reference [a]: EPA 8151A/SOP GC-0017

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch	Dalapon 40–110%	[c]	TestAmerica-St. Louis Analyst	Accuracy	Dalapon 40–110%
MS/MSD	1 per preparatory batch per matrix	Dalapon 40–110% RPD ≤ 20%	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Dalapon 40–110% RPD ≤ 20%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Notes:

[a] Analytical SOP revision numbers listed are current as of the date this SAP was published.

[b] Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

[c] Reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.

[d] Reprep and reanalyze the sample and duplicate in the associated preparatory batch for failed analytes if sufficient sample material is available and the sample is homogeneous. If RPD/RER still out of range, report as matrix interference confirmed and write a nonconformance. If reanalysis is in range, re-extract samples in batch.

[e] Truncate carriers/tracers above 100% recovery to eliminate low biased results. Reprep and reanalyze sample if carrier is low (indicating high biased results) if there is activity in the sample above the reporting limit. No reanalysis if matrix interference is nonconformance during sample preparation.

[f] The data will be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.

[g] Reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.

[h] Reprep and reanalyze all failed samples for failed internal standards in the associated preparatory batch, if sufficient sample material is available.

[i] Replace injection port liner and trim or replace column. Reanalyze samples in the associated preparatory batch.

[j] Perform post-digestion spike addition if serial dilution does not meet criteria.

[k] Reanalyze post-digestion spike.

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SAP Worksheet #29 – Project Documents and Records Table

Document	Where Maintained
Work Plan and associated plans including SAP and Health and Safety Plan	Project file; NAVFAC SW Administrative Record
Field logbook	Project file
Field forms	Project file; project file copy will subsequently be sent to NAVFAC SW Administrative Record as part of closure report
COC	Laboratory; NAVFAC SW Administrative Record
Shipping records	Project file
Field surveillance reports	Project file
Field Change Requests	Project file; project file copy will subsequently be sent to NAVFAC SW Administrative Record as part of closure report
Laboratory data package including: • Copy of chain of custody • Sample receipt and login • Laboratory internal chain of custody • Instrument calibration information • Chromatograms as applicable • Sample preparation logs • Sample analysis/run logs • Nonconformance Reports including corrective actions • Laboratory signed review page	Laboratory and project file; project file copy will subsequently be sent to NAVFAC SW Administrative Record as part of closure report
Data validation report	Validator and project file; project file copy will subsequently be sent to NAVFAC SW Administrative Record as part of closure report

Project files are maintained at the project site under the oversight of the PQCM until completion of the project. Files are then sent to the TtEC San Diego office for storage. Once the CTO is complete and closed out, the files are sent to an off-site archive for 10 years.

SAP Worksheet #29 – Project Documents and Records Table (Continued)

Field documentation associated with sampling activities includes logbooks, sample labels, COCs, sample shipping records, field surveillance reports, and FCR forms. In addition, laboratory and validator documentation will be generated during this project. These types are described in the following sections.

Field Logbook

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. All entries will be recorded in indelible black or blue ink. At the end of each work day, the logbook pages will be signed by the responsible sampler, and any unused portions of the logbook pages will be crossed out, signed, and dated. If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used. At a minimum, the logbook will contain the following information:

- Project name and site location
- Date and time
- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Descriptions of deviations from this SAP
- Problems encountered and corrective action taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples

Sample Labels

Sample labels will be filled out in indelible black or blue ink and affixed to sample containers at the time of sample collection. An example sample label is provided in Appendix B. Each sample label will be covered with clear tape. Each sample container will be labeled with the following, at a minimum:

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock) from the start of sampling
- Sampler's initials
- Preservative (if any)
- Sample weight (data completed by laboratory)

Chain of Custody

COC information is described in Worksheet #27.

Sample Shipping Records

Samples will be transported to the laboratory via courier or FedEx. For samples shipped via FedEx, the COC will be packaged within the cooler, and the sender's copy of the airbill will serve as custody documentation and will be maintained on-site in the project file. Sample shipping procedures are detailed in Worksheet #27.

Field Surveillance Reports

Field Surveillances will be performed in accordance with the three phases of inspection as required by the QC Program. A Preparatory Inspection will be performed by the PQCM prior to the first sampling activities. This will include a general orientation for health and safety. An Initial Inspection will be conducted at the beginning of field sampling activities for project. Daily field inspections and subsequent surveillances will be performed at the discretion of the PQCM or the QCPM throughout the duration of the project. The PQCM will use the Initial Inspection Checklist during inspection.

Field Change Request

An FCR will be prepared by the Program Chemist, or a designee, if a change to the SAP occurs during sampling activities. These changes will be minor and not result in a change in scope and/or DQOs for this project. The FCR must be approved prior to field implementation. The FCR may include the revised worksheets from this SAP.

Major changes to work scope affecting the original DQOs or meeting criteria described in EWI #2, 3EVR.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs) (NAVFAC SW 2006) will require preparation of a SAP Addendum. The SAP Addendum must be approved by the NAVFAC SW QAO prior to conducting sampling and analysis.

Laboratory Documentation

Laboratory data packages will include the following at a minimum:

- Sample receipt and login

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Laboratory internal COC
- Instrument calibration logs
- Sample preparation logs
- Sample analysis/run logs
- Sample results case narrative
- Sample disposal records
- Nonconformance reports including corrective actions

The laboratory will prepare analytical data packages comprising the above documentation for each sample delivery group (SDG) and provide them to TtEC. Laboratory deliverables will include a copy of the hard copy data package, submitted as either EPA Level III- or IV-equivalent packages as specified on the COC. Detailed information on the requirement of hard copy data packages is provided below. The report pages will be sequentially numbered. The report will contain a table of contents referencing individual sections in the data package, the original copy of COC records, a copy of all corrective action reports, and a narrative documenting the resolution of all corrective actions and nonconformances. All samples will be cross-referenced to the associated QC samples. The packages will be assembled in the following sequence:

- Cover page (with laboratory name, address, phone number, contact person, and SDG number, as well as the project name and project number)
- Table of contents
- Case narrative
- Sample management records, including the original, white copy of COC records (including cooler temperature and sample condition), shipping documents, and laboratory sample receipt forms
- Cross-reference table
- Analytical results and QA/QC information by test as follows:
  - Radiological raw data sequence
    a. Sample results forms, including method blanks
    b. Sample raw data (EPA Level IV only)
    c. QC summaries
    d. Initial calibration (ICAL)
    e. Calibration checks, including all related continuing calibration verifications (CCVs)
    f. Instrument run log
    g. Sample preparation log

SAP Worksheet #29 – Project Documents and Records Table (Continued)

– Organic raw data sequence

a. Sample result forms, including method blanks
b. Sample raw data after each result form (EPA Level IV only)
c. Surrogate summaries (surrogate results may appear on the sample result forms)
d. QC summaries
e. Tune data (gas chromatograph/mass spectrometer [GC/MS] only)
f. ICAL
g. Daily calibration checks, including related CCVs
h. Resolution check standards (GC/MS and pesticides), if applicable
i. QC LCS, MS/MSD raw data (EPA Level IV only)
j. Instrument run log
k. Sample preparation log

If manual integration is required for any organic analysis, supporting information for all manual integrations (i.e., chromatograms before and after manual integration as well as a brief explanation for the manual integration) will be included in the data package deliverables and evaluated during data validation.

– Inorganic raw data sequence

a. Sample results forms, including method blanks
b. Sample raw data (EPA Level IV only)
c. QC summaries
d. ICAL
e. Daily calibration checks, including all related CCVs
f. Calibration blanks, including all related continuing calibration blanks
g. Interference check standards A and B for inductively coupled plasma (ICP)-atomic emission spectrometer (AES) only
h. QC raw data (EPA Level IV only)
i. Post-digestion spike results
j. Analytical spike results
k. Method of standard additions
l. ICP-AES serial dilutions
m. Instrument run log
n. Sample preparation log

All relevant laboratory raw data and documentation including, but not limited to, logbook, data sheets, electronic files, and reports, will be maintained by the laboratory for at least 5 years. TtEC must be notified 30 days before disposal of any relevant records.

SAP Worksheet #29 – Project Documents and Records Table (Continued)

In addition to the hard copy data, an EDD will be submitted by the laboratory in a format compatible with TtEC requirements. Both the EDDs and the hard copy report will present results to two or three significant figures. For radiological results, at least three significant figures will be used for all results. For organic results, at least two significant figures will be used for all results. For inorganic results, at least two significant figures will be used for results less than 10, and at least three significant figures will be used for results greater than 10. Results for QC analyses (method blanks, MS/MSD, LCS, and duplicates) will be reported up to three significant figures.

When revisions to laboratory data reports are required, the revised pages (an original and copy) will be stamped with the notation “amended or revised report.” If revisions affect the laboratory EDDs, the revised EDD will then be sent along with the revised hard copy pages. In addition, a hard copy or electronic copy of items submitted to the validator by the laboratory will also be submitted to the Project Chemist.

Data Validation Reports

Analytical data generated by the laboratory will be validated by an independent data validation company as required in EWI #1, 3EN2.1, Chemical Data Validation (SWDIV 2001). The validation report will include the data validation findings worksheets. The reports will be arranged in increasing SDG numbers and grouped by the type of analysis; i.e., a group of reports will consist of SDGs with the same analysis arranged in increasing numerical order. Each SDG will be submitted as a separate data validation report. Reports covering multiple SDGs are <u>not</u> acceptable.

The validation reports will contain the following information:

- Title page that contains project name, sample collection date, validator subcontractor name, report date, type of analysis, laboratory, SDG, sample identifications (including MS/MSD, duplicate, reanalysis, or dilution samples), sample matrix (e.g., soil, water), and validation level (EPA Level III or IV).
- Introduction page that includes the number of samples per matrix, analytical method reference, validation guideline reference, and section references to summary qualification flags, and denotes QC samples. Statements regarding flag classification (protocol/advisory) and whether raw data check was performed will also be included.
- Section headings for each analytical method will include the following:
  - Technical holding times
  - GC/MS instrument performance check (tune) if applicable
  - Calibration
    a. ICAL
    b. Initial calibration verification (second source standard)
    c. CCV

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Laboratory blanks
- Accuracy and precision data
  a. Surrogate spike recoveries
  b. MS/MSD
  c. LCSs/LCS duplicates (LCSDs)
  d. Internal standards
- Target compound identification
- System performance checks
- Analyte quantitation and QLs
- Field QC samples (if not applicable, report will note)
- Overall assessment of data
- Assessment of compliance with statement of work requirements

* QC deviation summaries, which will include in a tabular format the following:
  - Unique identification of QC run (e.g., date/time)
  - Associated project and sample numbers (not the laboratory internal sample IDs)
  - Associated constituents
  - Actual value for noted deviation
  - Applicable QC criteria
  - Applicable qualifiers
  - Qualifier classifications (advisory or protocol)
* Validation findings worksheets
* Qualifier classification

Any revisions will be submitted within 1 week of receiving the review comments from the Project Chemist. Report revision submittal packages will include a cover page and revised pages.

In addition to a hard-copy report, the validator will receive the EDD and populate the final validation qualifiers in the EDD. The validated EDD will be returned to TtEC for upload into the database.

The data validation subcontractor will maintain validation records for at least 5 years. TtEC will be notified 30 days before disposal of any records.

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SAP Worksheet #30 – Analytical Services Table

Matrix	Analytical Group	Sampling Locations/ ID Number	Analytical Method	Data Package Turnaround Time	Laboratory/ Organization (contact information)	Backup Laboratory/ Organization (contact information)
Soil	Gamma Isotopes	All	EPA 901.1	30 business days	Curtis and Tompkins Contact: Mr. Phil Smith 201A & 201B Fisher Avenue San Francisco, CA 94124 (415) 216-2768	TestAmerica-St. Louis Contact: Erika Starman 13715 Rider Trail North Earth City, MO 63045 (314) 298-8566
Soil/Water	All analytical groups as listed in SAP Worksheet #23 as applicable to TestAmerica-St. Louis, EMAX, and AmeriSci	All	All analytical groups as listed in SAP Worksheet #23 as applicable to TestAmerica-St. Louis, EMAX, and AmeriSci	30 business days	TestAmerica-St. Louis Laboratory Contact: Erika Starman 13715 Rider Trail North Earth City, MO 63045 (314) 298-8566	GEL Contact: Tasha Horton 2040 Savage Road Charleston, SC 29407 (843) 556-8171

SAP Worksheet #30 – Analytical Services Table (Continued)

The following sections describe analytical laboratory requirements, including qualifications, sample custody, and QC procedures.

Laboratory Qualifications

Curtis and Tompkins and TestAmerica-St. Louis have been selected to analyze samples for this project. Asbestos analysis will be subcontracted to AmeriSci. Curtis and Tompkins and TestAmerica-St. Louis laboratories have successfully completed the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) certification for the matrices and methods listed in Worksheet #23 and will maintain current status throughout the duration of this project. Curtis and Tompkins and TestAmerica-St. Louis are also certified by the CDPH under the California National Environmental Laboratory Accreditation Program (NELAP) for all of the analytical methods listed in Worksheet #23. Both laboratories are capable of providing the project QC and data deliverables required by this SAP and the QSM for Environmental Laboratories (DoD 2010). Asbestos testing is a specialty testing and is not part of DoD ELAP or CDPH NELAP accreditations; however, AmerSci does have the National Voluntary Laboratory Accreditation Program certification to perform asbestos analysis.

Curtis and Tompkins' main laboratory which only performs chemical analyses is located in Berkeley, California. However, Curtis and Tompkins has a satellite laboratory located at the TtEC project site at Hunters Point Naval Shipyard. TestAmerica-St. Louis will be used to perform chemical analyses, additional radiological analyses that Curtis and Tompkins does not perform (or is not certified by DoD ELAP and CDPH to perform), and as a back-up laboratory for Curtis and Tompkins.

Definition of Detection and Quantitation Limits

Radiological analyses reports data with detections limits different from chemical analyses. The following definitions are included herein to explain those differences:

- **MDA:** For this project, the minimum detectable activity (MDA) pertains only to radiological analyses as is defined as follows in accordance with the Multi-Agency Radiological Laboratory Analytical Protocols: the MDA is calculated as a sample-specific value and typically these values assumed both a Type I (α) and Type II (β) error of 5 percent.

- **MDL:** The method detection limit (MDL) (associated with chemical analyses only) is an estimate of the measured concentration at which there is 99 percent confidence that a given analyte is present in a given sample matrix. The MDL is the concentration at which a decision is made regarding whether an analyte is detected by a given method. The MDL can be calculated from replicate analyses of a matrix containing the analyte. Results reported above the MDL (and below the QL as defined below) are considered "estimated" concentrations and are qualified by the laboratory with a "J" qualifier.

SAP Worksheet #30 – Analytical Services Table (Continued)

- **QL:** Quantitation limit (QL), associated with chemical analyses only, is defined as the concentration of an analyte in a laboratory sample at which the measurement process gives results within a specified relative standard deviation. Unless otherwise specified in a specific method or SOP, this relative standard deviation is typically 10 percent. In addition, the QL is the lowest value used for the calibration curve for a given method. Results reported above the QLs are considered detected concentrations with no qualifications.

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SAP Worksheet #31 – Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Field Sampling Surveillance	At a minimum, once at the beginning, once during, and once toward the end of the project	Internal	TtEC	PQCM, TtEC	Project Manager, TtEC	Project Manager, TtEC	Project Manager and QCPM, TtEC
Management Review	Once during the project duration	Internal	TtEC	QCPM, TtEC	Project Manager, TtEC	Project Manager, TtEC	PQCM, TtEC

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SAP Worksheet #32 – Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Title and Organizational Affiliation) *	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Title and Organizational Affiliation)	Time Frame for Response
Field Sampling Surveillance	Surveillance Report	Project Manager, TtEC	7 days after completion of the inspection	Corrective Action Report	Project Manager and QCPM, TtEC	5 days after notification
Management Review	Surveillance Report	Project Manager, TtEC	7 days after completion of the inspection	Corrective Action Report	Project Manager, TtEC	14 days after notification

Notes:
* Any significant findings and/or corrective actions will also be reported to the BRAC PMO RPM who will communicate with the regulatory agencies including the EPA within 5 days.

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SAP Worksheet #33 – QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Surveillance Report	Once at the beginning, once during, and once towards the end of field sampling activities	Determined during the project	PQCM, TtEC	Project Manager and QCPM, TtEC
Management Review Report	Once after management review is completed	Determined during the project	QCPM, TtEC	Project Manager and Program Manager, TtEC

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SAP Worksheet #34 – Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Title and Organizational Affiliation)
Field logbook	Field logbooks will be reviewed weekly and verified for information accuracy and completeness. The inspection will be documented in daily QC reports.	I	PQCM, TtEC
COC forms	COC forms will be reviewed daily upon their completion and verified for completeness.	I	PQCM, TtEC Project Chemist, TtEC
Sample receipt	For samples shipped via courier or FedEx, the Project Chemist will verify receipt of samples by the laboratory the day following shipment.	I	Project Chemist, TtEC
Sample logins	Sample login information will be reviewed and verified for accuracy and completeness in accordance with the requirements in this SAP.	E	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
Laboratory data prior to release	Laboratory data will be reviewed to verify that the requirements in this SAP have been met. Prior to release, data will be verified as follows:	E	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
	All data (100 percent) comply with the method- and project-specific requirements and any deviations or failure to meet criteria is documented for the project file.	E	Analyst, Curtis and Tompkins/TestAmerica-St. Louis
	All manual entries (100 percent) are free of transcription errors and manual calculations are accurate; computer calculations are spot-checked to verify program validity; data reported are compliant with method- and project-specific QC requirements; raw data and supporting materials are complete; spectral assignments are confirmed; descriptions of deviations from method or project requirements are documented; significant figures and rounding have been appropriately used; reported values include dilution factors; and results are reasonable.	E	Peer Analyst, Curtis and Tompkins/TestAmerica-St. Louis
	Data reported are compliant with method- and project-specific QC requirements; the reported information is complete; the information in the report narrative is complete and accurate; and results are reasonable.	E	Supervisor, Curtis and Tompkins/TestAmerica-St. Louis

SAP Worksheet #34 – Verification (Step I) Process Table (Continued)

Verification Input	Description	Internal/ External	Responsible for Verification (Title and Organizational Affiliation)
Laboratory data prior to release (Continued)	Data reported are compliant with method- and project-specific QC; analytical methods are performed in compliance with approved SOPs. This review may be conducted after release of data since reviews are done only on 10 percent of the data.	E	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
Laboratory data due at turnaround time listed on COC	Laboratory data will be verified for having been obtained following the protocols in this SAP and being of sufficient quality to satisfy DQOs.	I	RSO or designee, TtEC Project Chemist, TtEC
Laboratory data packages	All laboratory data packages will be verified by the laboratory performing the work for completeness and technical accuracy prior to submittal. Data packages will then be reviewed by the Project Chemist for accuracy and completeness in accordance with the data package requirements described in Worksheet #29. Subsequently, data packages will be evaluated externally by undergoing third-party data validation as described in Worksheet #36.	E I I	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis RSO or designee, TtEC Project Chemist, TtEC
Field and electronic data	One hundred percent of manual entries will be reviewed against the hard-copy information and 10 percent of electronic uploads will be checked against the hard copy.	I I	RSO or designee, TtEC Project Chemist, TtEC

SAP Worksheet #35 – Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Title and Organizational Affiliation)
IIa	Sample Collection	Ensure that the sampling procedures described in this SAP were used to collect samples and that any deviations to those procedures were documented in a FCR.	PQCM, TtEC Project Chemist, TtEC
IIa	Sample Handling	Ensure that the procedures described in this SAP for sample handling, packaging, and transport to the laboratory were followed.	PQCM, TtEC Project Chemist, TtEC
IIa	Sample Documentation	Ensure that the COC procedures described in this SAP were followed for sample collection and that logbooks or field forms were completed as required.	PQCM, TtEC Project Chemist, TtEC
IIa	Analytical Procedures	Ensure that the analytical methods and deliverable requirements described in this SAP were followed including holding times, analyte lists, and QC criteria.	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
IIa	Laboratory data reports	Data reports will be validated by the laboratory performing the work for technical accuracy and requirements listed in Worksheet #29 prior to submittal.	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
IIb	Sampling Procedures	Review of sampling procedures to appropriately document if any deviations occurred and if corrective action is required.	PQCM, TtEC
IIb	Analytical Procedures	Review of analytical procedures to appropriately document if any deviations occurred and if corrective action is required.	RSO or designee, TtEC Project Chemist, TtEC
IIb	Project Quantitation Limits and Laboratory QC Criteria	Ensure project quantitation limits and laboratory QC criteria were followed and any deviations documented.	RSO or designee, TtEC Project Chemist, TtEC

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SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (Title and Organizational Affiliation)
IIa	Soil/Water	All	In accordance with Curtis and Tompkins and TestAmerica-St. Louis SOPs listed in Worksheet #23 and DoD QSM	RSO or designee, TtEC Project Chemist, TtEC
IIb	Soil/Water	All	In accordance with DoD QSM and EPA Level III and IV guidelines (see description below)	Third-party data validator, LDC

The following documents will be used as guidance for validating all data: Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA 540/R-99-008 (EPA 1999); Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540-R-04-004 (EPA 2004); EWI #1, 3EN2.1, Chemical Data Validation (SWDIV 2001); Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846, Third Edition and final updates (EPA 1986); QSM (DOD 2010); and the QC criteria specified in this SAP. Currently, there are no standards for data validation of radiological analyses. Therefore, guidance documents on validation of radiological data and modified functional guidelines will be used by the validator.

Data validation will be performed as required by an independent data validation company. For this project, 80 percent of the data will require EPA Level III-equivalent data validation and 20 percent EPA Level IV-equivalent data validation. EPA Level III-equivalent data validation includes the comparison of QC parameters to the appropriate criteria or limits. (QC parameters include holding times, tune, calibration, blanks, spikes, surrogates, and internal standards, as applicable.) EPA Level IV-equivalent data validation includes not only what is performed in a Level III-equivalent validation but also includes review of raw data and backup documentation (for calibrations, standards, analysis run logs, etc.). This information is used for checking calculations of quantified analytical data during a Level IV-equivalent data validation review. Appendix C includes the data validation checklists used for each method. These checklists provide the criteria used to validate/qualify the results. All samples in a batch will be qualified for associated QC parameters based on these checklists. In addition to the checklists in Appendix C, the following criteria will be evaluated by the validator and flagged as indicated:

- Manual integration will be evaluated during data validation for the organic methods (i.e., volatiles, semivolatiles, pesticides, PCBs and herbicides). If the manual integration is not calculated appropriately, the validator will flag the associated results with a "J" for estimated.

- Second column confirmations for pesticides and herbicides analyses and DDT/Endrin breakdown for pesticides will be evaluated during data validation. If results between primary and second column confirmations have an RPD ≥ 40%, the associated results will be flagged with a "J" for estimated. If the DDT/Endrin breakdown is ≥ 15%, the associated results will be flagged with a "J" for estimated.

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table (Continued)

- For radiological methods, if the calibration criteria listed in Worksheet #24 is not met, the associated results will be flagged with a "J" for estimated.

Analytical results that have been validated may be qualified as protocol or advisory. Protocol violations are when the laboratory deviates from the referenced analytical methods or the project-specific QLs, QC limits, or QC criteria. Advisory violations are when technical validation criteria have not been met. These qualifications will be noted in the validation reports.

SAP Worksheet #37 – Usability Assessment

After the analytical data have been reviewed, verified, and validated in accordance with Worksheets #34 to 36, a data quality assessment (DQA) report may be prepared to assess data quality and usability. The DQA will include review of the following:

- Sample collection and analytical methods to verify that these were performed as discussed in Worksheets #14 and #17
- Project-specific QLs as listed in Worksheet #15 to verify that project-specific remedial goals were met
- DQOs to determine whether they have been achieved by the data collected
- Project-specific data quality indicators for precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters as discussed below

Analytical DQOs as assessed through the PARCC parameters are as follows.

Precision

Precision is the measure of the reproducibility of a set of replicate results or the agreement among repeat observations made under the same conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. Field duplicate, laboratory duplicate, MSD, and LCSD (if analyzed) samples will be used to assess field and analytical precision. The precision measurement will be determined using the RPD between the duplicate sample results as follows:

$$\text{RPD} = 100 \times 2 \times (\text{result - duplicate result})/(\text{result + duplicate result})$$

$$\text{RER} = (\text{result activity – duplicate activity})/(\text{sample uncertainty + duplicate uncertainty})$$
using 2 sigma propogated uncertainty

The RPD limits for laboratory duplicate, MSD, and LCSD are presented in Worksheet #28, and the field duplicate limits are listed in Worksheet #12. Associated samples that do not meet the criteria will be evaluated by the validator.

Accuracy

Accuracy is defined as the nearness of a result or the mean of a set of results to the true or accepted value. Analytical accuracy is measured by comparing the percent recovery (%R) of analytes spiked into a sample against a control limit. Spiked samples (typically from wet chemical analysis and separation processes) include MS, MSD, and LCS analyzed for every batch of up to 20 samples. They serve as a measure of analytical accuracy and surrogate standards added to all samples, blanks, MS, MSD, and LCS analyzed for organic contaminants to evaluate the method’s accuracy and help to determine matrix interferences. %R is calculated as follows:

SAP Worksheet #37 – Usability Assessment (Continued)

$$\%R = 100 \times (\text{spiked sample result - unspiked sample result})/\text{amount of spike added}$$

The laboratory will review the QC samples and surrogate standard recoveries for each analysis to ensure that the %R lies within the control limits listed in Worksheet #28. Otherwise, data will be flagged.

Representativeness

Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to the procedures in this SAP. Errors in sample collection, packaging, preservation, or COC procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

Completeness

Completeness is the percentage of measurements made that is judged to be valid. The completeness goal is to generate a sufficient amount of valid data to meet project needs. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with a rejected (R) flag. The requirement of completeness is 95 percent for samples and is determined using the following equation:

$$\%\ \text{completeness} = 100 \times (\text{number of valid analyte results}/\text{number of possible results})$$

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during interlaboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units and standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

REFERENCES

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DoD (Department of Defense). 2010. Quality Systems Manual for Environmental Laboratories. Version 3. October.

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E&E (Ecology and Environment, Inc.). 1983. Initial Assessment Study, Naval Air Station, Alameda, California. Prepared for the Department of the Navy, Navy Assessment and Control of Installation Pollutants Department, Naval Energy and Environmental Support Activity, Port Hueneme, CA.

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NAVFAC SW (Naval Facilities Engineering Command Southwest). 2006. EWI #2, 3EVR.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs). April.

NFESC (Naval Facilities Engineering Service Center). 1999. Navy Installation Restoration Chemical Data Quality Manual (IRCDQM). October.

SWDIV (Southwest Division Naval Facilities Engineering Command). 2001. Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation. November.

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APPENDIX A

ANALYTICAL LABORATORY STANDARD OPERATING PROCEDURES (on CD only)

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Determination of Radium 226 by Gamma-Ray Spectroscopy
(21 day ingrowth) DOE HASL 4.5.2.3

Approved:

8/28/12	8/29/12
Laboratory Director/ Date	QA Director / Date
8/28/12	8/28/12
HPS Laboratory Supervisor/ Date	HPS Laboratory Supervisor/ Date

Read, Understood and Agreed:

08·28·12	8/28/12
Signature / Date	Signature / Date
8-28-12	8/28/12
Signature / Date	Signature / Date
Signature / Date	Signature / Date
Signature / Date	Signature / Date

Re-Approved:

Signature / Date	Signature / Date

Curtis & Tompkins, Ltd.

Determination of Radium 226 by Gamma-Ray Spectroscopy
(21 day ingrowth) DOE HASL 4.5.2.3/EPA 903.1
Table of Content

Determination of Radium 226 by Gamma-Ray Spectroscopy
(21 day ingrowth) DOE HASL 4.5.2.3/EPA 903.1

SCOPE: This document describes procedures and quality control criteria for the determination of Radium 226 (Ra226) by gamma ray spectroscopy in soil/solid matrices processed by C&T Radiochemistry SOP 3.6 (Preparation of Soil Samples for Gamma Spectroscopy) after a 21 day ingrowth period. Additional isotopes can be determined in the same sample by using appropriate libraries and calibration standards. Ra226 can be determined in other matrices, Biota, Water by matching calibration standards and using appropriate geometries. This procedure describes the analysis, calculations, documentation, data assessment, quality control and acceptance criteria for Ra226 determination by Gamma Spectroscopy.

The Minimum Detectable Activity (MDA) for Ra226 using this procedure is 1.3 pCi/gr. MDA and Uncertainty can be reduced by counting samples for longer periods of time. Measurement uncertainty can be as high as 100% when the measured results are near or below the detection limit. Ra226 is determined by measuring the Ra226 decay daughter; 214Bi at 609 keV after a 21 day incubation The sample must be sealed and stored for 22 days before 214Bi reaches secular equilibrium with 226Ra. This “in growth” measurement provides an efficient determination of Ra226. More direct determinations of Ra226 by Alpha spectrometry may yield more accurate and precise results however, alpha spec procedures are more labor intensive and expensive.

Summary of the Method

Soil samples are dried, ground and sieved to #10 mesh. 300-400 gram samples are counted in 250 mL sealable metal containers. This “Tuna Can” geometry is maintained consistently for calibration and for Laboratory Control Standard (LCS). Samples and calibrations standards are placed in the gamma-ray spectroscopy systems and counted following daughter ingrowth (21+days). Results are reported in activity as pCi (picoCurie) or pCi/g (picoCurie per gram).

Isotopes and Detection Limits

Isotope	**CAS #**	**MDA (pCi/gr)**
Americium-241	86954-36-1	0.9
Cesium-137	10045-97-3	0.07
Cobalt-60	10198-40-0	0.03
Europium-152	14683-23-9	0.1
Europium-154	15585-10-1	0.2
Radium-226	13982-63-3	1.3
Thorium-232	7440-29-1	0.9
Uranium-235	15117-96-1	0.18

REFERENCES

US-EPA Method 901.1 and/or 903.1 Gamma Spectroscopy
DoE HASL 300 Sec 4.5.2.3 Ga-01-R Gamma Radioassay 2/97

MultiAgency Radiological Analytical Protocols Manual (MARLAP) Volume II Chapter 15 Section 15.6 Gamma Detection Methods
DoD Quality Systems Manual, Version 4.2, October 2010
Volume 1 TNI NELAC Standard, EL-V1-2009, September 2009

HPS Sampling and Analysis Plan (HPS-SAP) Revision 1 July 2011
HPS SOP 3.6 Preparation of Soil Samples for Gamma Spectroscopy
HPS SOP 2.3 Radiological Data Review

C1402-98 Standard Guide for High-Resolution Gamma-ray Spectrometry
Ortec Solid-State Photon Detector Operator's Manual GEM Series HpGe (High-Purity Germanium) Coaxial Detector System

Ortec GammaVision-32 A66-B32. Global Value Productivity Add-On for GammaVision-32 Software User's Manual, Version 2.2
Gamma Vision-32, "Gamma-Ray Spectrum Analysis and MCA Emulator for Microsoft Windows 98, 2000, NT, and XP." Software User's Manual A66-B32. Version 6.09.

Maestro-32, "MCA Emulator for Microsoft Windows 98 SE, 2000 Pro, and XP Pro." User's Manual A65-B32. Version 6.0.

Practical Gamma-Ray Spectroscopy, Gordon Gilmore, Second Edition, (2008) Wiley

SAMPLE STORAGE PRESERVATION & HOLDING TIME
All samples are collected by client field technicians and provided with a chain of custody.
No sample preservation is required for gamma-ray spectroscopy.
Appropriate sample containers: plastic bags or jars, and once prepared, tuna cans
Samples are delivered, shipped, and stored at ambient temperature
There is no maximum holding time for preparation or analysis. When determining 226-Radium using progeny ingrowth, a hold time before counting of 21 days is required.
All samples in process are stored and secured in the sample storage or sample preparation Conex(s). Following analysis, all samples are secured in archive storage at ambient temperature and held until authorization is received from the client for disposal.

QC REQUIREMENTS
Instrument Calibration procedures, specifications and acceptance criteria with corrective actions are established. Method performance is monitored through the use of laboratory control standards (LCS), duplicate sample analysis, and participation in a proficiency sample program. Issues related to low level environmental radiochemical testing as well as waste disposal costs preclude the use of tracers, spikes, and other QC samples.

The following QC samples are required per batch of 20 samples, more samples are allowed in the batch if the samples were prepared and analyzed for the GS186 product and allowed to incubate for the ingrowth period to achieve a more reliable measurement for Ra-226:

a) Prep Blank
b) One LCS
c) One sample duplicate

Prep Blanks

Prep Blanks are reference blank soil processed by Radiochemistry SOP 3.6 Dried, milled/crushed to pass #10 sieves, and canned with other samples in the batch. The can is labeled prep blank and counted under the same conditions and settings as samples. C&T QC Department has access to the source and preparation of blank soil.

Prep Blank results are evaluated against the weekly background measurement and updated as appropriate.

Frequency: One per batch of 20 samples or One daily if sample was prepared and screened by the GS186 product.
Acceptance Criteria: Absolute value less than analyte RL
Corrective Action: Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

Duplicate Samples

Frequency: 1 per prep batch, max 20 samples per batch or one daily if sample was prepared and screened by the GS186 product.
Acceptance Criteria: Relative percent difference (RPD) ≤40% or relative error ratio (RER) ≤1
Corrective Action: Re-prepare and reanalyze the sample and duplicate in the associated preparatory batch for failed target analytes if sufficient sample material is available and the sample is homogeneous. If RPD/RER still out of range, report as matrix interference confirmed and write a nonconformance. If reanalysis is in range, re-prepare samples in the batch provided sufficient sample exists to do so. Evaluate the data to determine the source of difference and if there is a matrix effect or analytical error.

Laboratory Control Samples (LCS)

Suitable LCS material is not commercially available; an LCS was prepared in November of 2011 at the HPS laboratory containing approximately 10 pCi/gr Ra226. This is the LCS material used to control this analysis. C&T QC Department has access to the source and preparation of the LCS material described in other documents as “Magic Dirt”.

LCS Criteria

Frequency: One per batch or one daily if sample was prepared and screened by the GS186 product.
Acceptance Criteria: Within establish internal control limits: +/- 20% of known activity
Corrective Action: If the LCS fails perform troubleshooting and instrument maintenance as

needed and reanalyze the LCS and all samples affected by the changes made to the instrument.

Minimum Detectable Activity (MDA)/Minimum Detectable Concentration (MDC)/Lower Level of Detection (LLD)

See Isotopes and Detection Limits table above

Sample weight should be 300g to 400g in the Tuna Can. Soil sample counting time is typically 45 Minutes (2700 seconds) to achieve detection limits for all isotopes of concern.

If less than 300g of soil is present in the tuna can, the counting period may change as informed by data quality objectives and approved by the HPS Laboratory Director or Lab supervisor.

The detection limit for remediation is based on a Critical Level Calculation. Ortec GammaVision-32 software, used in this procedure, provides a Critical Level MDA process, sometimes referred to as the Method Detection Limit (MDL). The Critical Level is 2.33 times the square root of the isotope of concern's background level in the spectrum. For purposes of this procedure, the terms MDA and MDL may be utilized interchangeably.

Matrix Spike (MS)
MS/MSD's are not analyzed because no suitable comparable radioactive material or tracer is commercially available at a relevant (low) activity level.

Initial Calibration QC Specifications
Frequency: as needed for detectors being brought back from maintenance or failed CCV's, or once annually per detector.
Acceptance criteria: +/- 10% of the true value of the nuclides used for the calibration.
Corrective actions: 1) Recalibration, 2) Instrument maintenance, 3) Notify Lab Director
All ICAL events must be documented in the instrument maintenance logs

Continuing Calibration Verification (Performance Checks)
CCV checks are performed on each detector daily prior to use using a CCV check source calibration standard
Acceptance criteria: +/- 10% of the true value of the nuclides used for the calibration.
Corrective actions are: 1) Recalibration, 2) Instrument maintenance, 3) Notify Lab Director

Background Measurement
Frequency: Daily
Acceptance Criteria: Absolute value less than analyte RL
Corrective Action: Any sample associated with a prep blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a

non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

In addition to the daily background checks, a long background check (14,000sec) is performed at the end of each week for background correction for the following week.

Instrument Contamination Monitoring

Instrument contamination is monitored by background checks see Background Measurement above and Daily Background Check and 6 month Instrumentation Background Check below.

SAFETY

Laboratory safety procedures shall be implemented as required in accordance with the specifications stated in C&T's Health and Safety Manual. At the HPS lab, the procedures and requirements of the Tetra Tech safety manual, "Accident Prevention/Site Safety and Health Plan", Latest Version apply as well and the procedures and specifications stated in, "Hunter's Point Radiation Protection Plan and Attachments", Latest Version.

There is no eating or drinking in the prep or counting labs at either HPS or Berkeley facilities

All work areas shall be kept as clean as possible at all times and the entire work area shall be cleaned at the conclusion of the last shift of the day.

Promptly clean any spills that occur using the guidance contained in the Health and Safety Manuals and support of the Radiation Safety Officer and Health and Safety Officer if necessary.

INTERFERENCES

Electrical noise is a common interference. Line conditioners are used to minimize electrical surges.

Background interference is also a concern, and appropriate corrective action for this interference is to increase counting times.

Precautions

- Keep HpGe (High Purity Germanium) detectors cold. Minimizing the number of times the detectors are allowed to get to room temperature will extend the life of the crystal/detector.
- For Liquid Nitrogen cooled detectors, ensure the detector cold-finger is submerged in liquid nitrogen at least 8 hours before applying any voltage to the crystal.
- For mechanical cooled detectors, check air filter cleanliness at 2 week intervals, clean

with water rinse and/or replace with new as needed

- In cases where the detector is removed from the liquid nitrogen source, or when a detector shutdown signal is triggered due to increasing temperature, the cold finger should be stabilized at room temperature for a minimum of 24 hours prior to re-submerging in liquid nitrogen.
- Never exceed the manufacturer's recommended operating voltage for the detector. Operate detectors using the correct polarity.
- For detectors that do not have the Detector Interface Module (DIM) hardwired to the detector, ensure N-type detectors are connected to a Negative DIM and P-type detectors are connected to a Positive DIM.
- Do not open the detector shielding during counting operations.

Instrument high voltages and gains are established using the procedures described in Ortec Solid-State Photon Detector Operator's Manual GEM Series HpGe (High-Purity Germanium) Coaxial Detector System.

EQUIPMENT AND SUPPLIES

Ortec Gamma Radiation Counting Equipment

EG&G Ortec Beryllium Window HPGe Gamma Spectroscopy System
High Purity Germanium detector with built in preamplifier and lead shield
Dewar flask with fill collar (30 Liter); Linear amplifier; Detector Interface Module (DIM)
Ethernet transceiver with cable or UBS connection
Multi-channel Analyzer with DSP(Digital Signal Processing) system & WinTel Computers
GammaVision for Windows Model A66-B32 Version 6.09; Global Value Version 2.2

Supplies

250ml plastic jar: ESS Part# 0250, SKS Part# 5786
250ml seam sealable metal can: Wells Can Company Part #BP307, Part #BP307EE
Liquid Nitrogen (LIN) Airgas Industrial Grade

Maintenance Activities

Maintenance procedures for Gamma spectroscopy equipment it is in APPENDIX 4: INSTRUMENT MAINTENANCE of this SOP.

PROCEDURE

Note: This procedure is only valid for the tuna can geometry. If a different geometry is used, separate calibrations must be performed using the different detector-source geometries.

Initial Calibration Procedure

The calibration procedure is specified in the Ortec Gamma Vision-32 A66-B32 Operations Manual, abstracted below.

The energy calibration data is used to define the energies of the peaks in the spectrum. These adjustments allow the calculated energies to correspond to the correct library entry, to correctly identify the peak and attribute it to the corresponding nuclide.

Calibrating the detector efficiency relates the number of gamma rays emitted from a source to the number of gamma rays collected in the full-energy peak by the detector. Efficiency calibration data includes effects from the detector itself, the detector source geometry, the materials surrounding the detector, and the absorption in the source material or matrix. Incorrect efficiency calibrations will cause the nuclide activity to be incorrectly reported.

Calibration Standards see APPENDIX_2: CALIBRATION STANDARDS

Tuna Can Soil Standard (Density: 1.5 g/cc)

23.5 mm Diameter Multi-energy Button Source. Isotope Eu-152

Energy and Efficiency Calibrations

1. Place the Eu-152 multi-energy button source on top of two stacked empty tuna can geometries.
2. Open GammaVision and Click on ACQUIRE then click on MCB PROPERTIES using the menu bar displayed on GammaVision opening screen.
3. Click on the amplifier tab displayed on the MCB PROPERTIES screen, then click on START AUTO in the OPTIMIZE BLOCK to commence peak optimization.
4. Remove the EU-152 button source and replace with the mixed gamma TUNA CAN standard upon completion of peak optimization. Click on GO displayed in the menu bar of the opening screen of Gamma Vision to initiate a count.
5. Set the cursor at channel 10,660 during the accumulation of counts and adjust the 1332.5 keV Co-60 energy peak to center on the cursor using the ALT+SHIFT+ (+ or -) keys. Once the 1332.5 keV peak is centered at channel 10,660, secure the count by clicking on the STOP button in the menu bar.
6. Acquire a tuna can specific geometry calibration spectrum using the opening screen of Gamma Vision by clicking on ANALYZE then SETTINGS in the menu bar to display the Sample Type Settings screen. Click on PRESETS to view the LIVE TIME block to ensure 10,000 seconds is displayed. Close window and return to opening screen. Click on GO to start the spectrum accumulation. A typical calibration spectrum will contain each peak with at least 10,000 net area counts. Pb-210 at 46.54 keV peak energy is considered the most limiting parameter. Once 10,000 net counts have accumulated in the Pb-210 channel, the count can be stopped.

7. Save the calibration spectrum to the path “C\User\Cal\Spetra\DetX\X_GEOMETRY SOURCENUM.spc” where:

   X = Detector Number

   GEOMETRY = Geometry Description

   SOURCENUM = Source number (i.e,

   C\User\Cal\Det1\1_250 ml Bottle U603.clb)

8. Close all Detector Windows returning to Gamma Vision opening window and click on BUFFER in the Detector ID window. Click on FILE then click on RECALL. Scroll thru the “Look in” window to find the USER FOLDER. Click on USER FOLDER to open folder. Click on CAL folder to open the folder, then, click on SPECTRA to locate the saved calibration spectrum. Click on the saved spectrum to load into BUFFER.
9. Click on Analyze then click on Settings then click on Sample Type. Select the Browse button next to “File:” field and open the file “C:\User\SDF\Cal.Sdf”. Click the OK button.
10. If a previously applicable Calibration File exists click on Calibrate then select Recall Calibration. Select the calibration file and Click the Open button. Select CALIBRATE, then, CALIBRATION WIZARD from the BUFFER menu bar.

    Select the option CREATE NEW ENERGY and EFFICIENCY CALIBRATIONS. The TCC Calibration option should remain at the current setting. Select the NEXT button.

    In the ENERGY CALIBRATION WIZARD page, select the library file“C\User\Lib\EfficiencyCalibration.Lib” for mixed gamma using the Browse button. Click on the NEXT button.

    In the EFFICIENY CALIBRATION WIZARD page, select the appropriate CERTIFICATE file in the CERTIFICATE file window. If a certificate file for the applicable source does not exist, then create a Certificate file for the source as follows:

    Click on the Certificate File Browse Button and select the file to edit from the directory “C:\User\Efficiency Tables,” then click on the open button. (Note: If a file for the applicable source does not exist, then any of the existing file may be copied and renamed as necessary to create a logical name for the source using geometry and source identification.)

    Select the Certificate File Edit button to edit/review the source data.

    Verify or modify the source data as applicable. If any changes are made to any peak data, then select UPGRADE to apply those changes to the data grid before moving to another peak in the grid.

    After all changes are made to the data grid, select the SAVE AS button and save the Efficiency Table/Certificate File to the “C:\User\Efficiency Tables” directory with an appropriate name including the geometry and source identification.

Select the OK button to close Certificate File Editor.

Energy, FWHM, and Efficiency Calibrations

1. Click on NEXT to perform the Energy, FWHM, and Efficiency Calibrations.
2. Select the EDIT ENERGY button to review the Energy and FWHM Calibrations.
3. Verify that at least the 46.54 keV peak and the 1836.01 peak are present in the table for a mixed gamma source as these points are at the low and high extremes for measurement and verify that at least 3 points exist between those extremes.
4. Verify that all delta values in the table for the energy calibration are within +/- 0.2%.
5. On the ENERY CALIBRATION sidebar window select FWHM option in the FIT section. Verify that all delta values in the table for the FWHM calibration are within +/- 5%. Delete any points that have a delta > +/- 5%.
6. Close the ENERGY CALIBRATION sidebar.
7. Select the EDIT EFFICIENCY button to review the EFFICIENCY calibration fit.
    a. Verify the FIT TYPE (or MODE) is appropriate for the detector type, i.e., P-type detectors or N-type with Aluminium end cap most commonly use POLYNOMIAL BELOW the knee. N-type detectors without an Aluminium end cap most commonly use QUADRADIC ABOVE and BELOW the KNEE fit with the knee set at 150 keV.
    b. Verify that all delta values in the table for the efficiency calibration are within +/- 5% with the following clarifications:

8. Hg-203 may be deleted from the efficiency table if the calibration spectrum was acquired more than a few months after the assay date. This is due to the increased error associated with the decay correction using a nuclide with a relatively short half-life.

9. Some geometries in close proximity to the detector will experience more coincidence summing of the Y-88 and Co-60 peaks. As a result, the 661.66 keV peak and the 898.01 keV peak may have delta values greater than the 5%. For those two peaks, a maximum delta up to 10% is generally accepted. This results in a conservative activity calculation in samples for Cs-137 and a more accurate assessment of other peaks in this energy range.

10. Peaks with nearby interferences that result in a high delta should be removed from the calibration. For example, the 511 keV peak may interfere with the 514 keV peak

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depending on the count time and geometry resulting in an erroneous efficiency value for the 514 keV peak in the calibration.

11. The Knee value may need to be adjusted to ensure a smooth curve fit at the transition point. For geometries that are very close proximity to the detector (i.e. Filter Paper), the knee value may provide a better curve fit at approximately 160 kev rather than 150 kev. The user may use trial and error to determine the best fit.

12. When using the Quadratic fit the knee may be adjusted to improve the calibration fit if necessary. Verify that the fitted line is smooth in the transition point near the knee.

13. Close the Efficiency Calibration sidebar window.

14. Select the SAVE CALIBRATION button and save the calibration to "C;\User\Cal\X_GEOMETRY.clb." where X is the detector and GEOMETRY is an appropriate geometry name (i.e., 1_250mlBottle.clb). If the Interpolative Fit was used as a result of the selected spectrum source being used for QC, then the calibration file name must be X_QC.clb where X is the detector number.

(Note: Except for the detector number all calibration names must be consistent for the automation routines to properly select the specified files!Refer to the GVSampleDataSC Software Manual for more detail related to file identification.)

Enter the calibration description in the format "Detector #X GEOMETRY" where X is the detector number and GEOMETRY is appropriate for Tuna Can when prompted.

Select the FINISH button to close calibration wizard.

Print the calibration report from the menu "Calibration\Print Calibration…"

Close the spectrum BUFFER window and save the spectrum when prompted.

Run the efficiency VERIFICATION AUTOMATION routine from the GVQUICKSTART to verify that the calibration is accurate and all related files were updated successfully. (For the QC calibration, an EFFICIENCY VERIFICATION is not necessary. Run the normal QC to verify the calibration accuracy).

Place the Eu-152 multi-energy button source on top of two stacked empty tuna can geometries.

Acquire a QC calibration spectrum using the opening screen of Gamma Vision by clicking on ANALYZE then SETTINGS in the menu bar to display the Sample Type Settings screen. Click on PRESETS to view the LIVE TIME block to ensure 600 seconds is displayed. Close window and return to opening screen. Click on GO to start the spectrum accumulation. Repeat steps 5.1.8 through 5.1.23 to create a QC calibration file.

QC Criteria for Gamma Spectroscopy Calibrations

Total Source Activity

Efficiency and Energy calibrations will be performed annually, and/or following maintenance, power supply anomalies such as power surge spectrum shifts, and failure of control chart parameters 2 sigma warning and 3 sigma control provided by Gamma Vision software.

Energy Calibration

A valid NIST traceable source will be used for all energy calibrations. Two sets of parameters will be accumulated: energy verses channel number and peak shape, i.e., FWHM versus energy. The inputs to this function are a spectrum with isolated peaks distributed over the energy range of interest and a library of peak energies. The formula for energy versus channel number is:

$$E = a_1 + a_2C + a_3C^2$$

Where:
E = energy
a_i = coefficients
C = channel number

The formula for FWHM vs. channels is:

$$F = b_1 + b_2C + b_3C^2$$

Where:
F = FWHM
b_i = coefficients
C = channels

The calculation for FWHM in energy:

$$F(e) = F(c)\,(a_2 + 2a_3 + C)$$

Where:
F(e) = FWHM in energy
F(c) = FWHM in channels at channel C
a_2 = energy calibration slope defined by Eq.1
a_3 = energy calibration quadratic coefficient defined in Eq.1
C = channel number

When the FWHM fit is made, the fit is checked for validity. If the FWHM curve is negative at any part of the spectrum or the curve bends over (has a maximum and then goes down), a warning message, “NON-PHYSICAL FWHM FIT” will be displayed. The FWHM curve can be displayed to see why the fit is incorrect or if the delta between data points and FWHM fit is greater than 25%. The curve may be accepted if the warning is due to the fit outside the energy of interest, or some of the data points need to be deleted. The calibration spectrum should have good resolution peaks with a minimum of 1,000 counts (preferably 10,000 counts), so, counting longer may remedy the poor fit. In the event Pb-210 is utilized for efficiency calibrations, the Pb-210 peak may be less than 1,000 counts and ignored if desired.

Efficiency Calibration
A valid NIST traceable source that contains isolated singlet peaks over the entire energy range of interest is used for efficiency calibrations.

The polynomial efficiency/energy formula is:

$$\epsilon = e^{\{\Sigma a_i E2\text{-}i\}}$$

Where:
ϵ = efficiency at energy E
a_i = fitting coefficients
E = energy in Mev

The result of an efficiency calibration calculation is one or two sets of coefficients (one for the fit above the maximum and one for below) and a set of energy-efficiency pairs. The energy-efficiency pairs are used for the interpolative fit.

Continuing Calibration Verification & Second Source Calibration Verification

1. Continuing Calibration Verifications (CCV) using calibration standards from a different source or lot number from the same source can be considered laboratory control standards (LCS) to verify the efficiency and energy calibrations established in the ICAL and check the general operating parameters of the system.
2. CCV checks are performed on each detector daily prior to use using a CCV check source calibration standard which should be from a different source or lot number from those used to calibrate the ICAL the detector.
3. A second source standard or Laboratory Control Standard (LCS) is used to verify the primary calibration standard following initial detector calibration and weekly thereafter during detector operation. The LCS contains isotopes encompassing the full energy range in the gamma-ray spectrum measurement. The acceptance criteria for LCS is +/- 20% of the known value for isotopes in the LCS. The corrective action for a failing LCS requires re-analysis or an explanation in the narrative portion of the data report.

Efficiency Verification
An Efficiency Verification is performed after the initial calibration. The steps for running an Efficiency Verification are as follows:

1) Place the Mixed Gamma Source on the detector
2) In the Global Value window initiate the Efficiency Verification Job
3) Enter the technician's name and password performing the Job

4) Enter the Source Reference Number when prompted
5) Click OK to start the count
6) At the end of the count an Excel file is automatically populated with results. Using the Source Certificate of Calibration enter the referenced γps for all the radionuclides.
7) If the percent difference is within 20% for all the nuclides listed then the detector is operating normally.

Daily Background Check

1. Perform a daily background check on each Gamma Detector to monitor detector contamination and power supply anomalies.
2. A daily background report is automatically generated after completing this test.
3. The daily background is not subtracted from the reported sample results, and serves as a quality control check for changes in background for an individual detector.

6 month Instrumentation Background Check

1. Perform a system component background check for each detector and shield every six months, and/or after a new detector is installed and/or returned to service after maintenance. Record these checks in the detector maintenance log.
2. Check pre-determined parameters (background counts, background count rate) and verify results are within acceptable limits. If the result is less than two standard deviations from the mean, no action is necessary.
3. If the result is between two and three standard deviations from the mean, note the result in the instrument maintenance log.
4. If the result is greater than three standard deviations from the mean, notify the lab supervisor or Lab Manager and the detector must be taken out of service until corrective action is completed. Note these activities in the detector maintenance log.

Gamma Counting Procedure

1. The following steps are to be followed after completing the Daily Background Check, Daily Quality Control Check, and Weekly Laboratory Control Standard Check have been performed as required in accordance with procedures above.
2. Enter sample information into Global Values as follows.
3. Start the gamma-ray spectroscopy counting routine by opening "GLOBAL VALUE", then "GLOBAL VALUE QUICK START". Ensure the proper detector is selected for counting. From "GLOBAL VALUE QUICK START" "AUTOMATION GROUPS" screen, open "ANALYZE SAMPLES" file, then from "AUTOMATION JOBS" screen, open "COUNT SAMPLE". Scan the barcode attached to the sample.
4. From the "GV SAMPLE DATA TETRA TECH" automated pop-up screen "SAMPLE DATA" section, verify that the "SAMPLE ID", "CONTRACT", "SAMPLE DATE/TIME", "UNIT NUMBER", are properly populated. Enter sample description into the "SAMPLE DESCRIPTION" field (if necessary). Enter the “INGROWTH SEAL DATE”

5. From the "GV SAMPLE DATA TETRA TECH" automated pop-up screen "ANALYSIS DATA" section, verify the following fields:
   a. "ANALYSIS METHOD" is appropriate for the sample.
   b. "GEOMETRY" is appropriate for the sample (i.e., Smear 47 mm Disk, Soil 250ml Plastic Bottle, Soil 250ml Tuna Can) to ensure an appropriate efficiency is used.
   c. "LIBRARY" is appropriate for the sample (i.e., Efficiency Calibration, Efficiency Verification, Generic Analysis No Decay, Null, or QC). Note that the typical library for analysis is "Generic Analysis No Decay".
   d. "ACTIVITY UNITS" is appropriate for the sample (i.e.,pCi, Ci, Bq, or DPM). Note that the activity units are typically "pCi".
   e. "COUNT TIME" is appropriate for the sample. Note that the typical count time is 2700 seconds.
6. From the "GV SAMPLE DATA" automated pop-up screen "ANALYSIS DATA" section, enter the sample quantity in the "SAMPLE QUANTITY" field. Note that for a soil sample this should be in the range of 300 to 400 grams. We're working on a LIMS application to automate this entry based on sample ID and capture weight data.
7. Place sample to be counted onto high purity Germanium crystal (HpGe).
8. Select "CONTINUE" to start the spectral analysis and collection. Notify the Lab Director for guidance if a FAILURE NOTIFICATION" window appears at any point in the sample analysis set up process.
9. Upon completion of the gamma-ray spectroscopy analysis, click on "SAMPLES" on the "GLOBAL VALUE QUICK START" at HPS or equivalent Gamma Vision window at Berkeley. Enter USERNAME and PASSWORD, and select "OK". Select the spectrum for the sample analyzed from the "SPECTRUM" field drop down menu. Review the completed gamma-ray spectroscopy analytical report to ensure that the following report attributes are satisfactory:
   f. Sample description
   g. Live time equals the selected count time
   h. Efficiency selected is appropriate to the sample
   i. Radionuclide Library selected is appropriate for the sample
   j. Minimum Detectable Activity (MDA) for respective radionuclides meets the criteria listed in the Sampling Analysis Plan

<u>Duplicate Sample Analysis</u>

1. One laboratory duplicate sample will be analyzed once per twenty samples utilized for unrestricted release. Samples prepared for the GS186 product at HPS may be batched with more than 20 samples, in these cases SOP is to count selected samples after the 21 day ingrowth process has occurred LIMS will track the preparation batch and if possible the duplicate sample assigned to the larger batch can be counted to related the appropriate prep duplicate to the sample.
2. Samples are to be run on the same detector, preferably not in consecutive order. In the

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event that the samples are run consecutively, the sample container will be physically removed from the shielding housing, relocated to the sample storage location, prior to replacing the sample on the detector. This process ensures that the likelihood of a sample returning to the same geometry on the detector face is random, as would normally be during sample analysis.

3. The acceptable criterion for the duplicate pairs stated in the HPS SAP is a relative percent difference (RPD) of <40%. Additional requirements may be imposed through other work documents. The formula for RPD is:

   RPD = 100x2(result -duplicate result) / (result + duplicate result)

Blank Sample Analysis

Blanks are performed at the beginning of every workday before a QC sample is run. The steps for running a Blank are as follows:

1) Place the soil prep blank sample on top of the detector
2) In the Global Value (HPS) of Gamma Vision (BRK) window, initiate the Background Check Job. Enter the technician's name and password
3) Click OK to start the count
4) At the end of the count a LIMS file is automatically populated with results for the condition of the detector.
5) Review the conditions and acceptance criteria for the Background check.
6) If the Background check passes then the detector is operating normally and the QC check can be initiated. If the Background check does not pass notify the Supervisor or his/her designee.
7) If no deviation is found then reference 6.3 Troubleshooting in the Ortec Solid-State Photon Detector Operator's Manual for possible causes.
8) When the corrective action is completed perform the QC check again and make an entry in the detector maintenance log.
9) If the detector performance cannot be remedied, the Supervisor or his/her designee will need to determine further corrective action.

LCS Analysis

LCS are not easily performed given the requirements for radioactive materials for these tests. The steps for running an LCS are the same as a Continuing Calibration/Efficiency Verification except the LCS Job is selected in the Global Value (HPS) or Gamma Vision (BRK) Window.

C&T has prepared LCS material at a nominal activity of 10 pCi Ra226 per gram. The material (Magic Dirt) is available for use at both labs and should be employed when the SAP or client specifications require this determination.

Sample Result Review & Evaluation

Samples are counted and reviewed by Lab Technicians and automatically reviewed for compliance to rules for Gamma Spectroscopy determinations by LIMS. (Gamma Spectroscopy Data Review SOP). Samples that are compliant to all the rules are automatically reported by LIMS. Samples that fail to meet one or more to the rules are automatically queued for supervisory review by LIMS. Data reviewed by supervisors or Lab Managers or their designees are “published” after passing corrective action determined as a result of review effort.

The data review procedure is specified in HPS SOP 2.3 Gamma Spectroscopy Data Review.

Once samples are reviewed an email is sent to the TtEC point of contact stating that all samples have been reviewed and published to the C&T LabLine internet portal alternatively, they’re sent to the project manager for project level review and reporting.

DOCUMENTATION

All initial calibrations, any maintenance event, changes to the instrumentation, or changes to associated hardware and software must be documented in the maintenance benchbooks for each detector.

WASTE DISPOSAL

All laboratory activities associated with this procedure will be performed in a fashion designed to generate the least amount of waste possible using ALARA (as low as reasonably acceptable) necessary to achieve the data quality objectives.

Samples in Tuna cans shall be stored in the counting lab at Berkeley and in the sample control Conex at HPS for 30 days after completion of the work. Samples with no detectable radiation above background levels can be disposed of in the dumpster. Samples with detectable radiation require disposal as low level waste or can be returned to the customer using appropriate shipping procedures. HPS has a long term sample storage facility that is used to archive samples until the appropriate disposition has been determined.

Expired sources are stored in secure containment until disposition. Some sources can be returned to their manufacturer for credit against the cost of a new standard, alternatively they can be disposed of as low level radioactive waste using appropriate procedures at each lab facility.

Materials used for preparation of samples (Masslinn, bench diapers etc.) and those used for decontamination should be disposed in labeled radioactive waste bags. These bags are collected weekly and transferred to the waste facilities at each location.

Low level radioactive waste (materials, extracts, byproducts) shall be stored in appropriate containers as directed by the "HPS Waste Management Plan" and the SOP for Lab Waste Disposal at Berkeley.

POLLUTION PREVENTION

All HPS laboratory activities will be performed in accordance with the base wide "Hunter's Point Shipyard Pollution Prevention Plan".

REVISION HISTORY

This SOP is Revision 0 the first version of this SOP

APPENDIX_1:CALCULATIONS

The ***background determination*** calculates the first pass background on the low-energy side of the peak using a 5-point average of the channel contents for the region from the peak-centroid channel to the channel which is 6 times the library match width (normally 0.5) times the calculated FWHM (from the calibration) below the centroid. The 5-point average data at a given point is the sum of the data from two channels below the point to two channels above the point divided by 5. This is equivalent to smoothing the data with a smoothing width of 5 and coefficients of 0.2 for all points. The background value is the minimum value of the moving 5-point average and the background channel number is the center channel of the 5. If the minimum average value is within one sigma (counting statistics) of the actual channel value at the assigned channel point, this 5-point average is the low energy background value for this peak. If the average value is not within one sigma of the actual data, a 3-point average is used instead of the 5-point average to calculate a new minimum value. This 3-point average minimum value is compared with the actual data at the assigned channel and is accepted if it is within 1 sigma of the actual data. If the 3-point average also fails this test, the data value at the assigned channel is used for the background. The same process is repeated for the high-energy side of the peak to calculate the background value above the peak. The background under the peak is the straight line between these two values. The net peak area and background are calculated from this first pass.

The ***peak area calculation***, to obtain the library peak area for a particular energy, is to fit the spectrum region with a background plus peak shape function. This so-called "directed fit" can be applied to peaks and has the ability to produce negative peak areas. The negative peak area will produce a negative activity and this will be replotted. Negative activities are required by some reporting agencies for statistical purposes. The fit is iterated until the reduced chi square for the fit changes by less than 1% from the previous iteration up to a maximum of 10 iterations. Most cases will converge in 3 to 4 iterations. Since these values are derived from a fitting process, it is difficult to redo the calculations manually.

The ***counting statistical uncertainty*** is the uncertainty in the gross area and the uncertainty in the background added in quadrature. The uncertainty in the gross area is the square root of the area. The uncertainty in the background is not as simple because the background is a calculated number. The background area uncertainty is the uncertainty in the channels used to calculate the end points of the background multiplied by the ratio of the number of channels in the peak to the number of channels used to calculate the background. For wide peaks and low counts per channel, there is high uncertainty in the calculated background.

$$bkg\ error = \left(\frac{(background\ area)\,(peakwidth)}{(width\ of\ low\ average + width\ of\ high\ average)}\right)^{1/2}$$

$$gross\ area\ error = \sqrt{gross\ area}$$

$$net\ area\ error = \sqrt{(gross\ area\ error)^2 + (background\ error)^2}$$

The peak width is calculated at the half maximum, tenth maximum, and twenty-fifth maximum for the net peak shape. The peak width points are linearly interpolated between the two channels that bracket the respective height value.

The ***peak centroid channel*** in total summation is the center-of-moment of the peak and is calculated as the weighted channel number of the peak. That is, the peak centroid is the sum of the net channel contents times the channel number divided by the sum of the channel contents. The centroid is calculated as:

Where: *l, h* = the peak low and high channels i= the channel number
Ci = net contents of channel i

For the directed fit method, the centroid can be refined from the fitting process.

Fraction Limit is used to verify the identification of a particular nuclide in a spectrum, the number of located peaks is compared to the number of possible peaks. This value gives more weight to the more intense peaks. It is expressed as follows:

where *BranchingRatio* is the branching ratio for the peak for the given nuclide, *1*is the sum over the located peaks, and *p* is the sum over the possible peaks. This fraction is between 100 for all peaks located and 0 for no peaks located. This value is compared to a limit value to determine whether this nuclide's peaks are present in sufficient measure to say the nuclide is present. The*fraction limit test* is passed if the fraction is above the selected value

The ***uncertainty*** printed on the report can be either counting or total uncertainty. They can be printed at 1,2, or 3 sigma. The counting uncertainty is the uncertainty of the peak area due to statistical uncertainty. For a peak net area, the counting uncertainty can be expressed in percent of the peak area. This same percent is used to express the percent counting uncertainty in the activity values. The total uncertainty estimate (1 sigma) is determined by summing in quadrature

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the individual uncertainties from the various analysis components.

$$\sigma_t = \sqrt{\sigma_{count}^2 + \sigma_{nor}^2 + \sigma_{rsum}^2 + \sigma_{abs}^2 + \sigma_{nuc}^2 + \sigma_{eff}^2 + \sigma_{geo}^2 + \frac{\sigma_{uni}^2}{3}}$$

Where:
σ_t =total uncertainty estimate
σ_{count} = counting uncertainty estimate
σ_{nor} = additional normally distributed uncertainty estimate
σ_{rsum} = random summing uncertainty estimate
σ_{abs} = absorption uncertainty estimate
σ_{nuc} = nuclide uncertainty estimate
σ_{eff} = efficiency uncertainty estimate
σ_{geo} = geometry uncertainty estimate
σ_{uni} = uniformly distributed uncertainty estimate

All components of uncertainty estimates except are computed at the I-sigma level.
The uncertainty estimate for a uniformly distributed error is used at the full range. If a collection factor is not used, the uncertainty estimate is zero for that component.

The ***nuclide activity*** is calculated for all peaks in the library whose energy is between the energy limits selected for the analysis (in-range). There are several methods of determining if a nuclide is present or not, and if MDA should be reported. The nuclide is reported as present if one of the following is true:

1. The first in-range peak of the nuclide in the library is present in the spectrum, and the counting uncertainty is below the peak cutoff.
2. All of the peaks marked as key lines are present.
3. The fraction limit test is passed.

The nuclide activity (in becquerels), based on the peak at energy, *E,* is given by:

$$A_{Ei} = \frac{N_{Ei}}{\varepsilon_E * t * \gamma_d}$$

Where: A_{Ei} = the activity of nuclide i based on energy *E*
N_{Ei} = the net peak area for peak at energy *E*
ε_E = the detector efficiency at energy *E*
t = the livetime
Y_d = the gamma-rays/disintegration for energy *E* of this nuclide

The gamma-rays/disintegration value is in the library and the efficiency factor is stored in the calibration file.

This "peak activity" is reported in the nuclide peak matrix. If there is more than one peak in the energy analysis range for a nuclide, then an attempt to average the peak activities is made. The result of the average is the average nuclide activity.

APPENDIX_2: CALIBRATION STANDARDS

NIST Traceable Standards: Eckert & Ziegler Part #85624-918 Total Activity 2.0 ųCi in Tuna Can geometry.

Radionuclide	Quantity in Microcuries
Cd-109	0.85
Co-57	0.019
Ce-139	0.029
Hg-203	0.062
Sn-113	0.049
Cs-137	0.024
Y-88	0.082
Co-60	0.038
Am-241	0.061
Sr-85	0.061
Pb-210	0.77

Put the LCS specifications and identity here

APPENDIX_3: INSTRUMENT CONDITIONS

Instrument conditions can vary slightly between instruments. All specific instrument conditions are found with each instrument's method file at each instrument's workstation.

APPENDIX_4: INSTRUMENT MAINTENANCE

As defined by HPS SAP Worksheet #25, page 160

Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person
Clean cave; fill LNO2	Physical check	Physical check	Weekly	Acceptable background	-Recalibrate -Instrument maintenance -Consult lab manager	HPS Laboratory Manager
Background check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	-Recalibrate -Instrument maintenance -Consult lab manager
Source check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	-Recalibrate -Instrument maintenance -Consult lab manager

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APPENDIX_5: DEFINITIONS

Calibration Check - is a standard in the mid range of the energy range that is used to verify the calibration on a daily basis. This is equivalent to continuing calibration verification (CCV) per NELAC.

Laboratory Control Sample (LCS) is a NIST traceable standard from a different lot or if available different vendor than the primary calibration standard. The LCS must include the high, middle and low energy ranges of the isotopes being measured. It serves as an independent check of the calibration. It is run when a new curve is generated.

Prep Blank/Method Background Sample -is an empty tuna can allowed to sit open in the sample prep Conex 250ml jar counted for the same time as a sample and used to assess background contamination.

Efficiency -the percent of decay events from a certified standard radioactive source, in a specific reproducible geometry that are seen and measured by a detector.

Traceable Calibration Standard -A certified calibrated radioactive source prepared as or from a standard reference material traceable to the National Institute of Standards & Technology (NIST), Eckert & Ziegler Isotope Products and others.

ADC -analog to digital converter.

Full Width Maximum (FWHM) -the full width of a gamma-ray peak distribution measured at half the maximum peak height measured above the continuum (background).

Dead Time -the time while the pre amplifier is collecting an electrical pulse generated by photon/detector interaction and is unable to collect another pulse.

Geometry -a standard sample or source counting configuration (i.e. 250 ml polypropylene jar) and its relationship to the detector.

In growth-the expected amount of a decay product that will exist at a later time because of ingrowth from a specified ancestor.

Title: GAMMAVISION ANALYSIS

Approvals (Signature/Date):

Chris Hough Radiochemistry Manager	5/18/12 Date	Michael Ridenhower Health & Safety Manager / Coordinator	5/18/12 Date
Marti Ward Quality Assurance Manager	5/18/12 Date	Elaine Wild Laboratory Director	5/18/12 Date

This SOP was previously identified as SOP No. ST-RD-0102 Rev. 8

Facility Distribution No.: 0	**Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This procedure applies to all germanium detectors and the computer assisted germanium spectroscopy analysis system.

1.2 Due to the nature of gamma spectroscopy, once the system is calibrated to a particular geometry a similar matrix may be run as long as it is prepared to match a calibrated geometry.

1.3 This SOP is based on EPA Method 901.1 and DOE EML HASL 300 Method GA-01-R.

1.4 The reporting limits, method detectable activities and QC limits are maintained in the Information Management System (QuantIMS. Because of their dynamic nature, they are not specifically listed in this document, but can be retrieved at any time using TraQAr tools. A copy of the SACs are included in this SOP to demonstrate this information.

2.0 SUMMARY OF METHOD

2.1 This procedure provides detailed instructions for energy calibration, efficiency determination, quality control checks, background and sample counting of the germanium spectroscopy system.

3.0 DEFINITIONS

3.1 See the TestAmerica Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

4.0 INTERFERENCES

4.1 Germanium spectrometry has potential interference. Interferences are usually in the form of radionuclides with unresolved photon emissions. These interferences are limited by the careful design/construction of the gamma spectral identification and interference libraries.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

6.0 EQUIPMENT AND SUPPLIES

6.1 Germanium spectroscopy system utilizing a computer based data acquisition system.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Commercially prepared mixed gamma standards in reproducible geometries, with all appropriate NIST Source Certificate information.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Samples may be collected in glass or plastic containers.

8.3 Aqueous samples are preserved with nitric acid to a pH of less than 2.

8.4 Sample hold time is 180 days from collection.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample , and Sample Duplicate.

9.2 **Method Blank (MB)**

9.2.1 A method blank must be counted with every sample batch.

9.2.1.1 For soils, a method blank is sodium sulfate filled in the specified geometry.

9.2.1.2 For waters, a method blank is DI water filled in the specified geometry.

9.2.1.3 For filters, a method blank is a blank petri dish.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS must be counted with every sample batch.

9.3.1.1 For water, a purchased mixed nuclide source in the specified geometry.

9.3.1.2 For soil, a purchased mixed nuclide source in the specified geometry.

9.3.1.3 For filters, a purchased mixed nuclide source in a petri dish.

9.4 **Sample Duplicate**

9.4.1 A Sample Duplicate is a recounted field sample to demonstrate instrument precision, since there is no sample preparation.

9.4.1.1 If requested, the laboratory may perform a Sample Duplicate which is an additional aliquot of a field sample.

9.5 **Procedural Variations/ Nonconformance and Corrective Action**

9.5.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.5.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Initial Calibration

10.1.1 Prepare a minimum of **8** energy levels.

10.1.1.1 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include significant changes in instrument operating parameters, and major instrument maintenance (e.g. replacing the detector)

10.1.1.2 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

10.1.2 Energy calibrations shall be established for the germanium spectroscopy systems **annually**, or when the calibration quality control check indicates an unacceptable change in the energy calibration parameters.

10.1.3 FWHM calibrations shall be established for the germanium spectroscopy systems **annually**, or when the calibration quality control check indicates an unacceptable change in the energy calibration parameters.

10.1.4 Energy Calibration Criteria

10.1.4.1 The curve should have eight calibration points used to determine the energy relationship of the calibration.

10.1.4.2 The calibration source must have radionuclides that "bracket" the intended range of calibration.

10.1.4.3 The energy difference should be within 0.05% for all calibration points or within 0.2keV for the calibration points.

10.1.4.4 The FWHM must be less than 3.0 keV at 1332 keV.

10.1.4.5 FWHM difference should be within 8% for all calibration points.

10.1.5 Efficiency Calibration Criteria

10.1.5.1 The curve should have at least eight points to determine the efficiency

10.1.5.2 A minimum of 10,000 counts will be accumulated for each data point

10.1.5.3 The efficiency difference should be within 8% for each point

10.1.5.4 The calibration verification (a recount of the calibration source) should be within 8% of the known value.

10.2 Initial Calibration Verification (ICV)

10.2.1 An initial calibration verification standard must be a different standard source than the one used for the initial calibration.

10.2.1.1 The ICV check does not include short half nuclides which may exist in the purchased standard. At a minimum, the ICV will always contain Amercium 241, Cesium 137 and Cobalt 60.

10.2.2 An ICV must be performed with every initial calibration.

10.2.3 The ICV percent recovery must be within +/- 10% criteria for each nuclide.

10.2.4 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV, or analysis of a different ICV). Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.3 Background

10.3.1 Background subtraction spectrum shall be established for the germanium spectroscopy systems **monthly**, or when the background quality control check indicates an unacceptable change in the daily background parameters, or as needed per client requirements.

10.3.1.1 Background count time is 36 hours.

10.3.1.1.1 If a client project requires a longer count time, then the background must be performed at the longer time before initiating analysis.

10.4 Daily Checks

10.4.1 The energy, resolution and efficiency calibrations for a detector shall be checked with its respective source each day that the germanium spectroscopy system is used.

10.4.2 The detector background shall be checked each day that the germanium spectroscopy system is used.

10.4.3 Calibration and background checks are acceptable if the value on the Analyze Spectrum utility is less than the action (3σ) limit. The routine calibration and background quality control parameters that will be monitored are:

10.4.3.1 Energy for energy alignment (low- and high-energy)

10.4.3.2 Activity check (low-, mid-, and high-energy) difference – limits are set to represent the percent difference between the source activity and the reported activity.

10.4.3.3 Full-Width at the Half Maximum (FWHM) for peak shape monitoring (low-, mid-, and high-energy)

10.4.3.4 Background Count Rate

10.4.3.5 Channel centroid check – (low, high)

10.4.3.6 Calibration (FWHM and background) quality control parameters will be found **acceptable** if the result is within the (3σ) limits.

10.4.3.7 Energy and channel fixed limits are set symetrical around target.

10.4.3.8 Calibration (efficiency, resolution, energy alignment, and background) quality control parameters will be found **not acceptable** if the result is outside the established limits (3σ range) and marked as "OOS" (Out Of Service). In the case of an action, the daily QC check may be counted again or tagged out. The Daily QC check may only be recounted once without corrective action.

10.4.3.8.1 If the out of control parameter is found acceptable for the rerun, the instrument can be used for the analysis of samples. No corrective action is necessary for this situation since the uncertainty can be attributed to the stochastic uncertainty of decay process (statistics), uncertainty of the sources, or a known uncorrected trend.

10.4.3.8.2 If the instrument fails to meet the acceptance criteria for the rerun for peak centroid and activity, the instrument must be declared "Out of Service". The detector/instrument must be "tagged out". (See ST-QA-0036 for NCM details regarding tagging out of service).

10.4.3.8.3 If the QC check fails for a second time, the analyst may want to:

10.4.3.8.3.1 Check the expiration date of the radioactive standard to confirm the material is current, for the isotopes being utilized.

10.4.3.8.3.2 Check source positioning and all instrument settings.

10.4.3.8.3.3 Check all cables for any apparent damage and confirm that all cables are routed to proper connectors and are in good working order.

10.4.3.9 The instrument may be returned to service once the malfunction has been corrected and the above acceptance criteria have been met. Corrective actions must be noted in the instrument maintenance log.

10.4.3.10 If a parameter has two successive values in the warning/investigate limits, the system will be examined for a trend and noted in the maintenance log. Decisions will be based upon the Data Quality Objectives (DQO) and the degree of the bias in relation to the parameter.

10.5 Calibration Software Handling

10.5.1 Gamma Detector System Energy and Shape Calibration

10.5.1.1 Acquire a spectrum from a calibration standard in the manual mode for an appropriate duration. Save the spectrum to the path "C:\User\Cal\Spectra\DetX\OriginalCountfileName.spc" where:

10.5.1.1.1 X = Detector Number
10.5.1.1.2 Analysis method
10.5.1.1.3 Select library
10.5.1.1.4 Enter correct sample data.
10.5.1.1.5 Enter correct conversion time.

10.5.1.2 Close all detectors windows in the current instance of gamma vision, then recall the appropriate calibration spectrum into the buffer window.
10.5.1.3 Select the menu "Analyze\Setting\Sample type…."
10.5.1.4 Select the browse button next to the "File" field and open the file. Click the "OK" button of the window to close it.
10.5.1.5 Recall the application Calibration File from the menu "Calibration \Recall Calibration…"
10.5.1.6 Select the menu "Calibrate\Calibration wizard…"
10.5.1.7 Select the option to create new energy calibrations. Select the next button.
10.5.1.8 On the energy calibration wizard page, select the file "DET_EnergyStandardMix Lib" or appropriate library for mixed gamma used the browser button if desired. Select the next button.
10.5.1.9 Select the next button to perform the energy, FWHM.
10.5.1.10 Select the edit energy button to review the energy.

10.5.1.10.1 Close the energy calibration sidebar window.

10.5.1.11 Select the save calibration button and save the calibration to "Cal\Energy\X_Energy.clb" where X is the detector.
10.5.1.12 Enter the calibration description in the format "X_ENERGY_GEOMETRY" where X is the detector number and Geometry is an appropriate geometry description when prompted. Select the Finish button to close the calibration wizard.
10.5.1.13 Print the calibration report from the menu "Calibrate \print calibration.

10.5.2 Gamma Detector System Efficiency Calibration

10.5.2.1 Acquire a spectrum from a calibration standard in the manual mode for an appropriate duration. Save the spectrum to the path "C:\User\Cal\Spectra\DetX\OriginalCountfileName.spc" where:

10.5.2.1.1 X = Detector Number
10.5.2.1.2 Analysis method
10.5.2.1.3 Select library
10.5.2.1.4 Enter correct sample data.
10.5.2.1.5 Enter correct conversion time.

10.5.2.2 Close all detector windows in the current instance of Gamma Vision, then recall the appropriate calibration spectrum into the buffer window.
10.5.2.3 Select the menu "Analyze\Setting\Sample Type"
10.5.2.4 Select the browse button next to the "File", field and open the file. Click the "OK" button at the bottom of the window to close it.
10.5.2.5 Recall the applicable calibration file from the menu "Calibration\Recall Calibration" (if the geometry file currently exists)
10.5.2.6 Select the menu "Calibrate\Calibration Wizard"
10.5.2.7 Select the option to create new energy and efficiency calibration. Select next button.
10.5.2.8 On the Energy Calibration Wizard page select the file "EnergyStandardMix Lib" or appropriate library for mixed gamma used the browser button if desired. Select the Next button.
10.5.2.9 On the Efficiency Calibration Wizard page, select library file, "DET_EfficiencyCalibration.Lib" for mixed gamma sources.
10.5.2.10 On the Efficiency Calibration Wizard page, select the appropriate Certification file from the directory.

10.5.2.11 Select the next button to perform the energy FWHM and efficiency calibration.

10.5.2.12 Select the Edit Energy button to review the energy and FWHM Calibration.

10.5.2.12.1 Close the Efficiency Calibration side window.

10.5.2.13 Select the save calibration button and save the calibration to Cal\X_Geometry.clb" where X is the detector and geometry is an appropriate geometry name.

10.5.2.14 Enter the calibration description in the format "x_Geometry_Source number_date counted" where X is the detector number and geometry is an appropriate geometry description when prompted. Select the finish button to close the calibration wizard.

10.5.2.15 Print calibration report from the menu "Calibrate\Print Calibration"

10.5.2.16 Select "Analyze", select "Entire spectrum in memory" and file point.

10.5.2.17 Close the spectrum Buffer window and save the spectrum when prompted.

10.5.3 Detector Long Background Counting

10.5.3.1 Remove any samples from the detector, clean the detector, close the shield lid and start acquisition.

10.5.3.2 Select detector 1 in Global Value Quick Start

10.5.3.3 Select Monthly Background PBC under Automation Groups

10.5.3.4 Select Background PBC Long Count under Automation Jobs.

10.5.3.5 Login using name and password.

10.5.3.6 Select "OK", ensure detector cave is empty.

10.5.3.7 Repeat for each detector which background you would like to start.

10.5.3.8 After the background is complete it will save as a PBC file.

11.0 PROCEDURE

11.1 Calibration Quality Control (Daily Check)

11.1.1 Place the calibration quality control sample on the detector, and start acquisition.

11.1.2 Select detector from Global Value Quick Start.

11.1.3 Select Quality Control under Automation Groups.

11.1.4 Select Daily Quality Control Check under Automation Jobs.

11.1.5 Login with user name and password.

11.1.6 Select "OK", ensure source is on detector.

11.1.7 Repeat for each detector.

11.1.8 Record in the instrument run log.

11.2 Background Quality Control (Daily Background)

11.2.1 Remove any samples from the detector, and start acquisition

11.2.2 Select detector global value quick start.

11.2.3 Select quality control under automation groups.

11.2.4 Select daily background check under automation jobs.

11.2.5 Login with username and password.

11.2.6 Select "OK", ensure detector cave is empty.

11.2.7 Repeat for each detector.

11.2.8 Record in the instrument run log.

11.3 Sample Counting

11.3.1 Remove any samples from the detector and start acquisition.

11.3.2 Place the sample on the detector.

11.3.3 Select detector from global value quick start.

11.3.4 Select analyze samples under automation groups

11.3.5 Select count sample under automation jobs.

11.3.6 Login with username and password.

11.3.7 Scan sample description from barcode report.
11.3.8 Select analysis method, sample type, geometry, library, correct date, count time, continue
11.3.9 Select "OK", ensure sample is on detector.
11.3.10 Record in the instrument run log.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 All calculations are performed in GammaVision; conversions are performed in RadCapture. Calculations are found in QAM.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank
13.2.1 Acceptance Criteria:
13.2.1.1 No target analytes may be present in the method blank above the reporting limit.
13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target anlaytes present above ½ RL), will be noted on the client requirements sheet.
13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:
13.2.2.1 Method Blank Contamination – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.3 Laboratory Control Sample (LCS)
13.3.1 Acceptance Criteria:
13.3.1.1 All control analytes must be within the specified control limits for accuracy (%Recovery) and precision (RPD).
13.3.2 Corrective Action for LCS not meeting acceptance criteria:
13.3.2.1 LCS Spike Recovery excursion (high) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).
13.3.2.2 LCS Spike Recovery excursion (low) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).
13.3.2.3 RPD/RER Duplicate excursion – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.4 Duplicate
13.4.1 Acceptance Criteria:
13.4.1.1 All control analytes must be within the specified control limits for precision (RPD), max. 40% RPD, RER < 1.
13.4.2 Corrective Action for LCS not meeting acceptance criteria:

13.4.2.1 RPD/RER Duplicate excursion – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.5 Insufficient Sample

13.5.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA and DOE Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in QAM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. St. St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Environmental Health and Safety Manual for “Waste Management and Pollution Prevention.”

17.0 REFERENCES

17.1 Department of Energy (DOE) Environmental Monitoring Laboratory (EML) HASL-300 28th Edition, method GA-01-R, Gamma Radioassay

17.2 EPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water Method 901.1

17.3 Ortec MCB Connections-32, Hardware Property Dialogs Manual, current version

17.4 MAESTRO-32, MCA Emulator, current version

17.5 Gammavision -32, Gamma-Ray Spectrum Analysis and MCA Emulator, current version

17.6 Master library Source: Gerhard Erdtmann, Werner Soyka

17.7 TestAmerica Quality Assurance Manual (QAM), current revision
17.8 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.
17.9 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points
17.10 Associated SOPs:
17.10.1 ST-RC-0004, current revision, Preparation of Soil Samples for Radiochemical Analysis
17.10.2 ST-RC-0025, current revision, Preparation of Samples for Gamma Spectroscopy
17.10.3 ST-QA-0002, current revision, Standards and Reagent Preparation
17.10.4 ST-QA-0014, current revision, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.10.5 ST-QA-0036, current revision, Non-Conformance Memorandum (NCM) Process

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

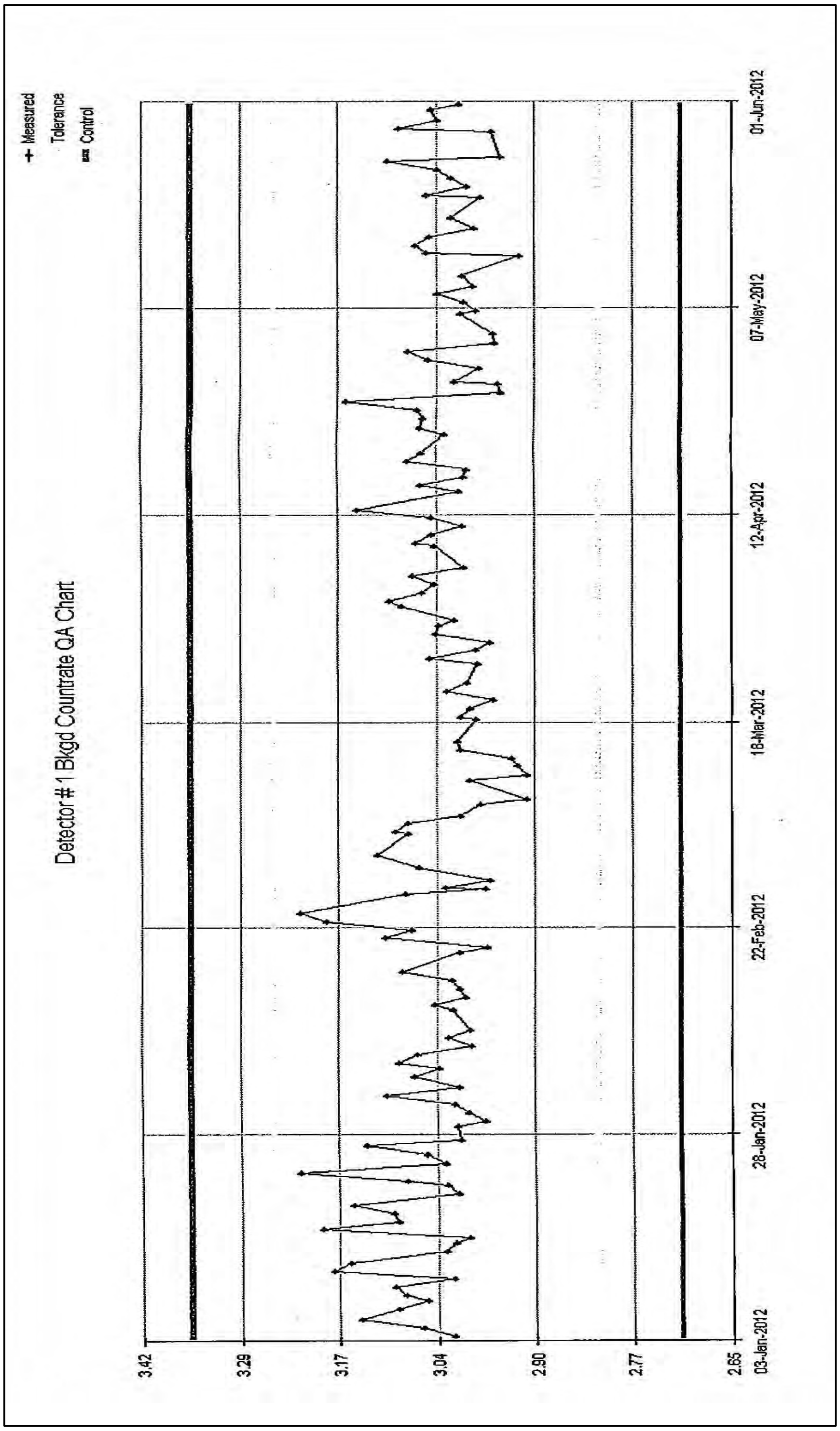
18.1 None.

19.0 CHANGES FROM PREVIOUS REVISION

19.1 Annual Review, No Changes.
19.2 Rev. 8:
19.2.1 Increased background count times from 12 to 36 hours in section 10.3.1.1.
19.2.2 Updated the procedure for detector long background counting in section 10.5 to reflect new software.
19.2.3 Updated daily calibration checks, daily background and sample counting procedures in section 11.0 to reflect new software.
19.3 Rev. 9:
19.3.1 Replaced quartz sand with sodium sulfate to be used for soil method blanks in section 9.2.
19.3.2 Updated section 10.4 regarding instrument daily checks.
19.3.3 Updated data assessment and acceptance criteria in section 13.0
19.3.4 Updated section 9.0 regarding batch, method blank and laboratory control samples.
19.3.5 Updated the calibation points for an internal calibation in section 10.1.
19.3.6 Updated the percent recovery regarding the ICV in section 10.2.
19.3.7 Updated software storage file name throughout section 10.5.

Attachment 1

Attachment 1



TAL Reference Data Summary

Structured Analysis Code: I-G7-4F-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Iodine by GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6581							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5409	Iodine 125	10	pCi/L			0														
4047	Iodine 129	10	pCi/L			0	C	Y			90	110	40							
4049	Iodine 131	10	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-K5-4F-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Direct Addition of Sample
Method: Gamma Iodine by GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6581							Spike List 0						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5409	Iodine 125	30	pCi/g			0														
4047	Iodine 129	30	pCi/g			0	C	Y			91	130	40							
4049	Iodine 131	30	pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: I-G7-0A-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/L			0														
3997	Actinium 228		pCi/L			0														
3984	Americium 241		pCi/L			0	C	Y			90	111	40							
4280	Antimony 124		pCi/L			0														
4103	Antimony 125		pCi/L			0														
3999	Barium 140		pCi/L			0														
4001	Beryllium 7		pCi/L			0														
4798	Bismuth 211 eq Th-227		pCi/L			0														
5053	Bismuth 207		pCi/L			0														
5068	Bismuth-210M		pCi/L			0														
4800	Bismuth 212		pCi/L			0														
4005	Bismuth 214		pCi/L			0														
4009	Cerium 141		pCi/L			0														
4804	Cerium 139		pCi/L			0														
4011	Cerium 144		pCi/L			0														
4031	Cesium 134		pCi/L			0														
4033	Cesium 137	20	pCi/L			0	C	Y			90	111	40							
4029	Chromium 51		pCi/L			0														
5399	Cobalt 56		pCi/L			0														
4023	Cobalt 57		pCi/L			0														
4025	Cobalt 58		pCi/L			0														
4027	Cobalt 60		pCi/L			0	C	Y			89	110	40							
4035	Europium 152		pCi/L			0														
4037	Europium 154		pCi/L			0														
4039	Europium 155		pCi/L			0														
4049	Iodine 131		pCi/L			0														
4043	Iron 59		pCi/L			0														
4156	Lead 210		pCi/L			0														
4077	Lead 212		pCi/L			0														
4079	Lead 214		pCi/L			0														
4055	Manganese 54		pCi/L			0														
4061	Niobium 94		pCi/L			0														
4063	Niobium 95		pCi/L			0														
4051	Potassium 40		pCi/L			0														
4081	Promethium 144		pCi/L			0														
5225	Protactinium 234M		pCi/L			0														
5220	Rhodium 106		pCi/L			0														

Structured Analysis Code: I-G7-0A-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4099	Ruthenium 103		pCi/L			0														
4101	Ruthenium 106		pCi/L			0														
5044	Scandium 46		pCi/L			0														
5404	Silver 108m		pCi/L			0														
4779	Silver 110m		pCi/L			0														
4057	Sodium 22		pCi/L			0														
4125	Thallium 208		pCi/L			0														
4816	Thorium 227		pCi/L			0														
4119	Thorium 231		pCi/L			0														
4123	Thorium 234		pCi/L			0														
4278	Tin 113		pCi/L			0														
4131	Uranium 235		pCi/L			0														
4133	Uranium 238		pCi/L			0														
4137	Yttrium 88		pCi/L			0														
4141	Zinc 65		pCi/L			0														
4143	Zirconium 95		pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G6-0A-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			90	115	40							
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5676	Bismuth 210 eq Pb-210		pCi/g			0														
4798	Bismuth 211 eq Th-227		pCi/g			0														
5067	Bismuth-207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4804	Cerium 139		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137	0.2	pCi/g			0	C	Y			90	123	40							
4029	Chromium 51		pCi/g			0														
5399	Cobalt 56		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			90	114	40							
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
5415	Gadolinium 153		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
5416	Iridium 192		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0														
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4061	Niobium 94		pCi/g			0														

Structured Analysis Code: A-G6-0A-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4063	Niobium 95		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
5571	Radium 226		pCi/g			0														
2259	Radium 228		pCi/g			0														
4097	Radon 222		pCi/g			0														
5220	Rhodium 106		pCi/g			0														
4099	Ruthenium 103		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
5044	Scandium 46		pCi/g			0														
5404	Silver 108m		pCi/g			0														
4779	Silver 110m		pCi/g			0														
4057	Sodium 22		pCi/g			0														
5553	Tantalum 182		pCi/g			0														
5554	Terbium 160		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4816	Thorium 227		pCi/g			0														
4392	Thorium 229		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **A-K1-0A-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			90	115	40							
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
5556	Barium-137		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
4798	Bismuth 211 eq Th-227		pCi/g			0														
5067	Bismuth-207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4802	Cadmium 109		pCi/g			0														
5557	Calcium-45		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4804	Cerium 139		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137	0.2	pCi/g			0	C	Y			90	123	40							
4029	Chromium 51		pCi/g			0														
5399	Cobalt 56		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			90	114	40							
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
5415	Gadolinium 153		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
5416	Iridium 192		pCi/g			0														
4043	Iron 59		pCi/g			0														
5438	Kr-85		pCi/g			0														
4156	Lead 210		pCi/g			0														

Structured Analysis Code: A-K1-0A-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
5558	Manganese-56		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4806	Mercury 203		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
5877	Niobium 83		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4063	Niobium 95		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
4073	Protactinium 234		pCi/g			0														
2257	Radium (226)		pCi/g			0														
2259	Radium 228		pCi/g			0														
5094	Radium-225		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
5220	Rhodium 106		pCi/g			0														
4099	Ruthenium 103		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
5044	Scandium 46		pCi/g			0														
5404	Silver 108m		pCi/g			0														
4779	Silver 110m		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4107	Strontium 85		pCi/g			0														
5553	Tantalum 182		pCi/g			0														
5554	Terbium 160		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4816	Thorium 227		pCi/g			0														
4115	Thorium 228		pCi/g			0														
4117	Thorium 230		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4121	Thorium 232		pCi/g			0														

Structured Analysis Code: A-K1-0A-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
5559	Vanadium-48		pCi/g			0														
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: A-0X-0A-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: CALCULATION ONLY
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3743	Total Uranium		ug/g			0														

TAL Reference Data Summary

Structured Analysis Code: I-G7-Z7-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5869	Actinium 227 (assumes equilibrium w/		pCi/L			0														
3997	Actinium 228		pCi/L			0														
3984	Americium 241		pCi/L			0	C	Y			90	111	40							
4280	`Antimony 124		pCi/L			0														
4103	Antimony 125		pCi/L			0														
5556	Barium-137		pCi/L			0														
4211	Barium/Lanthanum-140		pCi/L			0														
4168	Barium 133		pCi/L			0														
3999	Barium 140		pCi/L			0														
4001	Beryllium 7		pCi/L			0														
4798	Bismuth 211 eq Th-227		pCi/L			0														
5053	Bismuth 207		pCi/L			0														
5068	Bismuth-210M		pCi/L			0														
4800	Bismuth 212		pCi/L			0														
4005	Bismuth 214		pCi/L			0														
5557	Calcium-45		pCi/L			0														
4009	Cerium 141		pCi/L			0														
4804	Cerium 139		pCi/L			0														
4011	Cerium 144		pCi/L			0														
4031	Cesium 134		pCi/L			0														
4033	Cesium 137	20	pCi/L			0	C	Y			90	111	40							
5399	Cobalt 56		pCi/L			0														
4023	Cobalt 57		pCi/L			0														
4025	Cobalt 58		pCi/L			0														
4027	Cobalt 60		pCi/L			0	C	Y			89	110	40							
4035	Europium 152		pCi/L			0														
4037	Europium 154		pCi/L			0														
4039	Europium 155		pCi/L			0														
4213	Hafnium 181		pCi/L			0														
4049	Iodine 131		pCi/L			0														
5416	Iridium 192		pCi/L			0														
4043	Iron 59		pCi/L			0														
4053	Lanthanum 140		pCi/L			0														
4156	Lead 210		pCi/L			0														
4075	Lead 211		pCi/L			0														
4077	Lead 212		pCi/L			0														
4079	Lead 214		pCi/L			0														

Structured Analysis Code: I-G7-Z7-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5558	Manganese-56		pCi/L			0														
4055	Manganese 54		pCi/L			0														
4806	Mercury 203		pCi/L			0														
4069	Neptunium 237		pCi/L			0														
4172	Neptunium 239		pCi/L			0														
5877	Niobium 83		pCi/L			0														
4061	Niobium 94		pCi/L			0														
4063	Niobium 95		pCi/L			0														
4051	Potassium 40		pCi/L			0														
4081	Promethium 144		pCi/L			0														
4083	Promethium 146		pCi/L			0														
4085	Promethium 147		pCi/L			0														
5225	Protactinium 234M		pCi/L			0														
4071	Protactinium 231		pCi/L			0														
4073	Protactinium 234		pCi/L			0														
2257	Radium (226)		pCi/L			0														
2259	Radium 228		pCi/L			0														
4810	Radium 223 (assumes equilibrium w/		pCi/L			0														
4095	Radium 224		pCi/L			0														
4101	Ruthenium 106		pCi/L			0														
5044	Scandium 46		pCi/L			0														
4057	Sodium 22		pCi/L			0														
4059	Sodium 24		pCi/L			0														
4107	Strontium 85		pCi/L			0														
4125	Thallium 208		pCi/L			0														
4816	Thorium 227		pCi/L			0														
4115	Thorium 228		pCi/L			0														
4117	Thorium 230		pCi/L			0														
4119	Thorium 231		pCi/L			0														
4121	Thorium 232		pCi/L			0														
4123	Thorium 234		pCi/L			0														
4278	Tin 113		pCi/L			0														
4131	Uranium 235		pCi/L			0														
4133	Uranium 238		pCi/L			0														
5559	Vanadium-48		pCi/L			0														
4137	Yttrium 88		pCi/L			0														
4141	Zinc 65		pCi/L			0														
4143	Zirconium 95		pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G6-Z7-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5869	Actinium 227 (assumes equilibrium w/		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			90	115	40							
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5676	Bismuth 210 eq Pb-210		pCi/g			0														
4798	Bismuth 211 eq Th-227		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137	0.2	pCi/g			0	C	Y			90	123	40							
5399	Cobalt 56		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			90	114	40							
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0														
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4063	Niobium 95		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
4073	Protactinium 234		pCi/g			0														

Structured Analysis Code: A-G6-Z7-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)		pCi/g			0														
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
5248	Rh-106		pCi/g			0														
4099	Ruthenium 103		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
5044	Scandium 46		pCi/g			0														
5404	Silver 108m		pCi/g			0														
4779	Silver 110m		pCi/g			0														
4057	Sodium 22		pCi/g			0														
5868	Thallium 207 eq Th-227		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4816	Thorium 227		pCi/g			0														
4117	Thorium 230		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4121	Thorium 232		pCi/g			0														
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **A-K1-Z7-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			90	115	40							
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
5556	Barium-137		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
4798	Bismuth 211 eq Th-227		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4802	Cadmium 109		pCi/g			0														
5557	Calcium-45		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4804	Cerium 139		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137	0.2	pCi/g			0	C	Y			90	123	40							
4029	Chromium 51		pCi/g			0														
5399	Cobalt 56		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			90	114	40							
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
5415	Gadolinium 153		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
5416	Iridium 192		pCi/g			0														
4043	Iron 59		pCi/g			0														
5438	Kr-85		pCi/g			0														
4156	Lead 210		pCi/g			0														
4077	Lead 212		pCi/g			0														

Structured Analysis Code: A-K1-Z7-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4079	Lead 214		pCi/g			0														
5558	Manganese-56		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4806	Mercury 203		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
5877	Niobium 83		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4063	Niobium 95		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
4073	Protactinium 234		pCi/g			0														
2257	Radium (226)		pCi/g			0														
2259	Radium 228		pCi/g			0														
5094	Radium-225		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
5220	Rhodium 106		pCi/g			0														
4099	Ruthenium 103		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
5044	Scandium 46		pCi/g			0														
5404	Silver 108m		pCi/g			0														
4779	Silver 110m		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4107	Strontium 85		pCi/g			0														
5553	Tantalum 182		pCi/g			0														
5554	Terbium 160		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4816	Thorium 227		pCi/g			0														
4115	Thorium 228		pCi/g			0														
4117	Thorium 230		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4121	Thorium 232		pCi/g			0														
4123	Thorium 234		pCi/g			0														

Structured Analysis Code: A-K1-Z7-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6506							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
5559	Vanadium-48		pCi/g			0														
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **A-GM-0B-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Fill Geometry - 10-DAY Ingrowth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0														
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0														
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0	C	N	9.3	pCi/g	75	135	40							
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
4071	Protactinium 231		pCi/g			0														

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Structured Analysis Code: A-GM-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Fill Geometry - 10-DAY Ingrowth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1.0	pCi/g			0	C	Y	12.2	pCi/g	80	110	40							
2259	Radium 228		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4121	Thorium 232		pCi/g			0	C	Y	9.5	pCi/g	90	127	40							
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0	C	N	11.9	pCi/g	75	135	40							
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: A-J9-0B-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry -> 21 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0														
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0														
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0	C	N	9.3	pCi/g	75	135	40							
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														

Structured Analysis Code: A-J9-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry -> 21 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4071	Protactinium 231		pCi/g			0														
4073	Protactinium 234		pCi/g			0														
2257	Radium (226)	1.0	pCi/g			0	C	Y	12.2	pCi/g	80	110	40							
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4121	Thorium 232		pCi/g			0	C	Y	9.5	pCi/g	90	127	40							
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0	C	N	11.9	pCi/g	75	135	40							
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: A-ML-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry 21 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0														
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0														
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0	C	N	9.3	pCi/g	75	135	40							
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														

Structured Analysis Code: A-ML-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry 21 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4071	Protactinium 231		pCi/g			0														
2257	Radium (226)	1.0	pCi/g			0	C	Y	12.2	pCi/g	80	110	40							
5571	Radium 226	1.0	pCi/g			0														
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4115	Thorium 228		pCi/g			0														
4121	Thorium 232		pCi/g			0	C	Y	9.5	pCi/g	90	127	40							
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0	C	N	11.9	pCi/g	75	135	40							
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **A-MW-0B-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry 10 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0														
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0														
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0	C	N	9.3	pCi/g	75	135	40							
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
4071	Protactinium 231		pCi/g			0														

Structured Analysis Code: A-MW-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Fill Geometry 10 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1.0	pCi/g			0	C	Y	12.2	pCi/g	80	110	40							
2259	Radium 228		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4121	Thorium 232		pCi/g			0	C	Y	9.5	pCi/g	90	127	40							
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0	C	N	11.9	pCi/g	75	135	40							
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: A-NA-0B-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, 14 day ingrowth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0														
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0														
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0	C	N	9.3	pCi/g	75	135	40							
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														

Structured Analysis Code: A-NA-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, 14 day ingrowth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
2257	Radium (226)	1.0	pCi/g			0	C	Y	12.2	pCi/g	80	110	40							
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4121	Thorium 232		pCi/g			0	C	Y	9.5	pCi/g	90	127	40							
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0	C	N	11.9	pCi/g	75	135	40							
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **A-6O-0B-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind and Fill - 14 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0														
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0														
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0	C	N	9.3	pCi/g	75	135	40							
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														

Structured Analysis Code: A-6O-0B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind and Fill - 14 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6547							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
2257	Radium (226)	1.0	pCi/g			0	C	Y	12.2	pCi/g	80	110	40							
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4121	Thorium 232		pCi/g			0	C	Y	9.5	pCi/g	90	127	40							
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0	C	N	11.9	pCi/g	75	135	40							
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G7-4F-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Iodine by GA-01-R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6894							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5409	Iodine 125	10	pCi/L			0														
4047	Iodine 129	10	pCi/L			0	C	Y			75	125	25							
4049	Iodine 131	10	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-K5-4F-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Direct Addition of Sample
Method: Gamma Iodine by GA-01-R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6894							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5409	Iodine 125	30	pCi/g			0														
4047	Iodine 129	30	pCi/g			0	C	Y			75	125	25							
4049	Iodine 131	30	pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: I-G7-0A-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/L			0														
3997	Actinium 228		pCi/L			0														
3984	Americium 241		pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4280	Antimony 124		pCi/L			0														
4103	Antimony 125		pCi/L			0														
4211	Barium/Lanthanum-140		pCi/L			0														
3999	Barium 140		pCi/L			0														
4001	Beryllium 7		pCi/L			0														
4798	Bismuth 211 eq Th-227		pCi/L			0														
5053	Bismuth 207		pCi/L			0														
5068	Bismuth-210M		pCi/L			0														
4800	Bismuth 212		pCi/L			0														
4005	Bismuth 214		pCi/L			0														
4009	Cerium 141		pCi/L			0														
4804	Cerium 139		pCi/L			0														
4011	Cerium 144		pCi/L			0														
4031	Cesium 134		pCi/L			0														
4033	Cesium 137	20	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4029	Chromium 51		pCi/L			0														
5399	Cobalt 56		pCi/L			0														
4023	Cobalt 57		pCi/L			0														
4025	Cobalt 58		pCi/L			0														
4027	Cobalt 60		pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4035	Europium 152		pCi/L			0														
4037	Europium 154		pCi/L			0														
4039	Europium 155		pCi/L			0														
5415	Gadolinium 153		pCi/L			0														
4213	Hafnium 181		pCi/L			0														
4049	Iodine 131		pCi/L			0														
5416	Iridium 192		pCi/L			0														
4043	Iron 59		pCi/L			0														
4156	Lead 210		pCi/L			0														
4077	Lead 212		pCi/L			0														
4079	Lead 214		pCi/L			0														
4055	Manganese 54		pCi/L			0														
4061	Niobium 94		pCi/L			0														
4063	Niobium 95		pCi/L			0														

Structured Analysis Code: I-G7-0A-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4051	Potassium 40		pCi/L			0														
4081	Promethium 144		pCi/L			0														
4083	Promethium 146		pCi/L			0														
5225	Protactinium 234M		pCi/L			0														
5220	Rhodium 106		pCi/L			0														
4099	Ruthenium 103		pCi/L			0														
4101	Ruthenium 106		pCi/L			0														
5044	Scandium 46		pCi/L			0														
5404	Silver 108m		pCi/L			0														
4779	Silver 110m		pCi/L			0														
4057	Sodium 22		pCi/L			0														
5553	Tantalum 182		pCi/L			0														
5554	Terbium 160		pCi/L			0														
4125	Thallium 208		pCi/L			0														
4816	Thorium 227		pCi/L			0														
4119	Thorium 231		pCi/L			0														
4123	Thorium 234		pCi/L			0														
4278	Tin 113		pCi/L			0														
4131	Uranium 235		pCi/L			0														
4133	Uranium 238		pCi/L			0														
4137	Yttrium 88		pCi/L			0														
4141	Zinc 65		pCi/L			0														
4143	Zirconium 95		pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G6-0A-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
4798	Bismuth 211 eq Th-227		pCi/g			0														
5067	Bismuth-207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4804	Cerium 139		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137	0.2	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4029	Chromium 51		pCi/g			0														
5399	Cobalt 56		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
5415	Gadolinium 153		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
5416	Iridium 192		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0														
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4063	Niobium 95		pCi/g			0														

Structured Analysis Code: A-G6-0A-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by DOE GA-01-R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														
5220	Rhodium 106		pCi/g			0														
4099	Ruthenium 103		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
5044	Scandium 46		pCi/g			0														
5404	Silver 108m		pCi/g			0														
4779	Silver 110m		pCi/g			0														
4057	Sodium 22		pCi/g			0														
5553	Tantalum 182		pCi/g			0														
5554	Terbium 160		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4816	Thorium 227		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G7-Z7-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3997	Actinium 228		pCi/L			0														
3984	Americium 241		pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4280	Antimony 124		pCi/L			0														
4103	Antimony 125		pCi/L			0														
4168	Barium 133		pCi/L			0														
4001	Beryllium 7		pCi/L			0														
4798	Bismuth 211 eq Th-227		pCi/L			0														
5053	Bismuth 207		pCi/L			0														
5068	Bismuth-210M		pCi/L			0														
4800	Bismuth 212		pCi/L			0														
4005	Bismuth 214		pCi/L			0														
4009	Cerium 141		pCi/L			0														
4011	Cerium 144		pCi/L			0														
4031	Cesium 134		pCi/L			0														
4033	Cesium 137	20	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
5399	Cobalt 56		pCi/L			0														
4023	Cobalt 57		pCi/L			0														
4025	Cobalt 58		pCi/L			0														
4027	Cobalt 60		pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4035	Europium 152		pCi/L			0														
4037	Europium 154		pCi/L			0														
4039	Europium 155		pCi/L			0														
4213	Hafnium 181		pCi/L			0														
4049	Iodine 131		pCi/L			0														
5416	Iridium 192		pCi/L			0														
4043	Iron 59		pCi/L			0														
4156	Lead 210		pCi/L			0														
4075	Lead 211		pCi/L			0														
4077	Lead 212		pCi/L			0														
4079	Lead 214		pCi/L			0														
4055	Manganese 54		pCi/L			0														
4061	Niobium 94		pCi/L			0														
4063	Niobium 95		pCi/L			0														
4051	Potassium 40		pCi/L			0														
4081	Promethium 144		pCi/L			0														
5225	Protactinium 234M		pCi/L			0														
4101	Ruthenium 106		pCi/L			0														

Structured Analysis Code: I-G7-Z7-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5044	Scandium 46		pCi/L			0														
4057	Sodium 22		pCi/L			0														
4125	Thallium 208		pCi/L			0														
4816	Thorium 227		pCi/L			0														
4119	Thorium 231		pCi/L			0														
4123	Thorium 234		pCi/L			0														
4278	Tin 113		pCi/L			0														
4131	Uranium 235		pCi/L			0														
4133	Uranium 238		pCi/L			0														
4141	Zinc 65		pCi/L			0														
4143	Zirconium 95		pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: A-G6-Z7-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5869	Actinium 227 (assumes equilibrium w/		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5676	Bismuth 210 eq Pb-210		pCi/g			0														
4798	Bismuth 211 eq Th-227		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137	0.2	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
5399	Cobalt 56		pCi/g			0														
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g.			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0														
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4061	Niobium 94		pCi/g			0														
4063	Niobium 95		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														
4071	Protactinium 231		pCi/g			0														
4073	Protactinium 234		pCi/g			0														

Structured Analysis Code: A-G6-Z7-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry
Method: Gamma Cs-137 & Hits by EPA 901.1 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)		pCi/g			0														
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
5248	Rh-106		pCi/g			0														
4099	Ruthenium 103		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
5044	Scandium 46		pCi/g			0														
5404	Silver 108m		pCi/g			0														
4779	Silver 110m		pCi/g			0														
4057	Sodium 22		pCi/g			0														
5868	Thallium 207 eq Th-227		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4816	Thorium 227		pCi/g			0														
4119	Thorium 231		pCi/g			0														
4121	Thorium 232		pCi/g			0														
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

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TAL Reference Data Summary

Structured Analysis Code: A-J9-0B-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry -> 21 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3995	Actinium 227		pCi/g			0														
3997	Actinium 228		pCi/g			0														
3984	Americium 241		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4280	Antimony 124		pCi/g			0														
4103	Antimony 125		pCi/g			0														
4211	Barium/Lanthanum-140		pCi/g			0														
4168	Barium 133		pCi/g			0														
3999	Barium 140		pCi/g			0														
4001	Beryllium 7		pCi/g			0														
5053	Bismuth 207		pCi/g			0														
5068	Bismuth-210M		pCi/g			0														
4800	Bismuth 212		pCi/g			0														
4005	Bismuth 214		pCi/g			0														
4009	Cerium 141		pCi/g			0														
4011	Cerium 144		pCi/g			0														
4031	Cesium 134		pCi/g			0														
4033	Cesium 137		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4023	Cobalt 57		pCi/g			0														
4025	Cobalt 58		pCi/g			0														
4027	Cobalt 60		pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4035	Europium 152		pCi/g			0														
4037	Europium 154		pCi/g			0														
4039	Europium 155		pCi/g			0														
4213	Hafnium 181		pCi/g			0														
4049	Iodine 131		pCi/g			0														
4043	Iron 59		pCi/g			0														
4156	Lead 210		pCi/g			0														
4077	Lead 212		pCi/g			0														
4079	Lead 214		pCi/g			0														
4055	Manganese 54		pCi/g			0														
4069	Neptunium 237		pCi/g			0														
4172	Neptunium 239		pCi/g			0														
4051	Potassium 40		pCi/g			0														
4081	Promethium 144		pCi/g			0														
4083	Promethium 146		pCi/g			0														
4085	Promethium 147		pCi/g			0														
5225	Protactinium 234M		pCi/g			0														

Structured Analysis Code: A-J9-0B-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, and Fill Geometry -> 21 day in-growth
Method: Gamma Ra-226 & Hits By DOE GA-010R MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6858							Spike List 6859						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4071	Protactinium 231		pCi/g			0														
2257	Radium (226)	1.0	pCi/g			0														
2259	Radium 228		pCi/g			0														
4810	Radium 223 (assumes equilibrium w/		pCi/g			0														
4095	Radium 224		pCi/g			0														
4101	Ruthenium 106		pCi/g			0														
4057	Sodium 22		pCi/g			0														
4059	Sodium 24		pCi/g			0														
4125	Thallium 208		pCi/g			0														
4121	Thorium 232		pCi/g			0														
4123	Thorium 234		pCi/g			0														
4278	Tin 113		pCi/g			0														
4131	Uranium 235		pCi/g			0														
4133	Uranium 238		pCi/g			0														
4137	Yttrium 88		pCi/g			0														
4141	Zinc 65		pCi/g			0														
4143	Zirconium 95		pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G7-4F-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Direct Addition of Sample to Geometry
Method: Gamma Iodine by GA-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6581							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5409	Iodine 125	10	pCi/L			0														
4047	Iodine 129	10	pCi/L			0	C	Y			90	110	40							
4049	Iodine 131	10	pCi/L			0														

Title: LOW BACKGROUND GAS FLOW PROPORTIONAL COUNTING (GFPC) SYSTEM ANALYSIS

Approvals (Signature/Date):

Chris Hough 6/14/12 Date Radiochemistry Department Manager	Michael Ridenhower 6/14/12 Date Health & Safety Manager / Coordinator
Marti Ward 6.14.12 Date Quality Assurance Manager	for Elaine Wild 6/15/12 Date Laboratory Director

This SOP was previously identified as SOP No. ST-RD-0403 Rev. 12

Facility Distribution No.: __0__ **Distributed To:** __See Electronic Distribution Sheet__

1.0 SCOPE AND APPLICATION

1.1 This SOP is applicable to all Low Background Proportional Counting instruments. TestAmerica St. Louis performs Radium 226, 228, Strontium 89, 90, gross alpha/beta, Neptunium and Chlorine 36.

1.2 This SOP is based on SW846 method 9310, 9315 and 9320; EPA methods 900.0, 903.0, 904.0, 905.0; and DOE EML HASL 300 method, Ba-01-R, Sr-02 and Sr-03-RC.

1.3 The SOP applies to GFPC analysis of liquid and solid matrices.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 This procedure provides instructions for the daily calibration and maintenance of the Low Background Proportional Counting instrumentation.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common terms and data qualifiers.

3.2 IQC - a computerized Quality Control Program where the counting results of Daily Radioactive check sources and Daily Background checks are entered and compared to statistical average data. A measurement within ± 3 standard deviations indicates the detector is operating within acceptable parameters.

3.3 αLL - discriminator setting indicating the alpha lower voltage limit.

3.4 Alpha Voltage Only - detector voltage capable of collecting ions created by alpha radiation only. Ion pairs created by beta radiation are not collected.

3.5 αUL - discriminator setting indicating the instruments alpha upper voltage limit.

3.6 βLL - discriminator setting indicating the beta lower voltage limit.

3.7 βUL - discriminator setting indicating the beta upper voltage limit.

3.8 Crosstalk - a measure of the amount of beta radiation that is collected in the alpha radiation channel; it is also a measure of alpha radiation collected in the beta channel.

3.9 Plateau - a point on a graph of count rate vs. detector bias voltage where further increases in bias will not result in an increase in measured counting rate.

3.10 LB4100 – LBPC (Low background Gas Flow Proportional Counting instrument).

4.0 INTERFERENCES

4.1 A detector contaminated with radioactive material will result in a high background and interfere with the correct measurement of a sample.

4.1.1 If a sample “times out” reaching 10000 counts before the allotted time, and the sample count rate is 60 cpm or greater, then another daily background check is performed on that detector. If the detector background check is unacceptable, the detector is taken Out Of Service until action is taken to bring the background check within acceptable limits. If the chamber requires action to remove contamination and a new background check is acceptable, then a 30 minute empty chamber count should be performed to determine if a new long background needs to be performed on that detector.

4.2 The actual counting efficiency for alpha radiation decreases greatly with a density > 6.0 mg/cm2. Therefore, the maximum acceptable mass density is typically 5 mg/cm 2 or less that 100 mg for a 2" planchet.

4.3 For beta radiation, reliable data may be obtained counting samples with a density as high as 10 mg/cm 2 or greater.

4.4 Sample thickness as well as moisture content may impact the alpha and/or beta results.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1.1 None.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

6.0 EQUIPMENT AND SUPPLIES

6.1 Low Background Proportional Counter, equivalent to the Canberra/Oxford/Tennelec LB4100, or Protean MPC9604.

6.2 Gas mixture, 90% argon, 10% Methane

6.3 Blank planchets

6.4 PC based data acquisition system, OSUM software, IQC software

7.0 STANDARDS AND REAGENTS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision

7.2 Radioactive sources to measure beta radiation,: Sr-90 and Ra-228 sources.

7.3 Radioactive sources to measure alpha radiation: Am-241, Th-230 and Ra-226

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 See associated sample preparation SOPs ST-RC-0020, ST-RC -0021, ST-RC -0036, ST-RC -0040, ST-RC -0041and ST-RC -0050, for more detailed information.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Sample Duplicate (Dup). In the event that there is insufficient sample to analyze a sample duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.3.1 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) may be performed upon client request, and are noted in the Client Requirement Sheets and Log-in.

9.2 **Method Blank (MB)**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.4 **Matrix Spike**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Sample Duplicate**

9.5.1 A Sample Duplicate is an additional aliquot of a field sample taken through the entire analytical process to demonstrate precision.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Voltage Plateau Determination

10.1.1 **Frequency**:

10.1.1.1 Performed as a part of the Intial Calibration.

10.1.2 **Voltage Plateau Determination on LB4110 Red**

10.1.2.1 Place the Am-241 sources in Drawers A and B.

10.1.2.2 Select the auto-sequence file “Plateau”

10.1.2.3 Highlight the detectors in Drawers A and B
10.1.2.4 Click on ‘Run”
10.1.2.5 Type ‘Alpha’ for the sample ID for the detectors with the alpha source
10.1.2.6 Click ‘Done’. The voltage plateau will begin automatically.
10.1.2.7 When the alpha counts are complete, the highlighted detectors will flash. Click ‘Unit status’ and highlight the voltage plateau file name. Click on ‘Re-load’. Enter ‘Beta” as the sample ID.
10.1.2.8 Place the Sr^{90} beta source on the detector.
10.1.2.9 Click ‘Done’. The voltage plateau will complete automatically.
10.1.2.10 When the plateau is complete click on ‘Data Output’. Select the plateau file. Print the graphs and data for calibration packages. Archive the data file.
10.1.2.11 Repeat the steps above for drawers C and D.

10.1.3 **<u>Criteria for Plateaus for LB4110 Red</u>**
10.1.3.1 Voltage range used to determine the plateau is 300-1500V
10.1.3.2 Voltage increase per step is **<**50V per step

10.1.4 **<u>Voltage Plateau Determination on Protean MPC 9604</u>**
10.1.4.1 The manufacturer has counted plateaus and permanently set the discriminator voltages. The manufacturer does not recommend recounting plateaus. The detectors are manufactured to have a high dead time. However, a cross talk test may be performed using different nuclide sources to indicate acceptable discriminator settings. This procedure is outlined in the discriminator setting section of this SOP.

10.1.5 **<u>Criteria for Plateaus for Protean MPC 9604</u>**
10.1.5.1 Plateaus are permanently set for this instrument from the manufactuer.

10.2 **Discriminator Settings**

10.2.1 **<u>Frequency:</u>**
10.2.1.1 Performed as a part of the Intial Calibration.

10.2.2 **<u>Discrimator Settings on LB4110 Red</u>**
10.2.2.1 From the unit menu, select ‘Change ROI’
10.2.2.2 Place a beta source in each detector
10.2.2.3 Highligh a detector with a beta source
10.2.2.4 The alpha upper limit should be set at 100% and the beta lower limit should be set a 0%. The alpha lower limit and the beta upperlimit should both be set at 50%.
10.2.2.5 Select ‘Count’. Accumulate at least 100,000 beta counts
10.2.2.6 Reduce the beta upper limit/alpha lower limit until there is 3.5% beta into alpha crosstalk.
10.2.2.7 Raise the alpha lower limit until there is 0.10% beta into alpha crosstalk.
10.2.2.8 Raise the beta upper limit until it is 5% less than the alpha lower limit.
10.2.2.9 Select ‘Halt’.
10.2.2.10 Repeat steps above until all detectors have been set.
10.2.2.11 Select ‘Close’. Discriminator settings are updated automatically.

10.2.3 **<u>Discrimator Settings on Protean MPC 9604</u>**
10.2.3.1 Collect a minimum of 10,000 counts for each of Am-241, Th-230 and Po-210 sources
10.2.3.2 Calculate the percentage of crosstalk and compare the results to historical and expected values. Consult the Technical director if the values fall out of range.

10.3 **Initial Calibration**:

10.3.1 **<u>Frequency</u>**:

10.3.1.1 The Gas Flow Proportional Counter (GFPC) is calibrated initially and each year thereafter. Recalibration may be required if indicated during the operation of the instrument.

10.3.2 The specific calibration source preparations can be found in the file containing the previous calibration.

10.3.3 All nuclide sources shall be NIST traceable.

10.3.4 The efficiency calibration shall consist of at least seven single or dual sets of mass attenuated calibration standards, unless a single point source efficiency is to be determined.

10.3.5 The standards shall have enough activity to generate at least 10000 counts in 90 minutes of count time for the most highly attenuated source. The count rate shall not exceed 5000 counts per second.

10.3.5.1 For alpha and beta analysis, separate sets of calibration sources shall be prepared.

10.3.6 The mass attenuation is accomplished by utilization of a salt solution with comparable make up to the majority of samples seen in the laboratory.

10.3.6.1 Alternatively, the mass attenuation may be accomplished by using the same carrier solution used in a specific analysis.

10.3.7 Each standard shall be counted in every detector to be calibrated.

10.3.8 **<u>Criteria for a Single or Dual Set Calibration</u>**

10.3.8.1 The efficiency of the detector (the dependent variable) shall be plotted on a single graph against the masses (the independent variable) for all data points.

10.3.8.2 The equation of the calibration curve shall be determined using polynomial functions and be included on the plot of the curve. The curve shall be continuous and smooth.

10.3.8.3 The degree of the polynomial shall not exceed three. The number of discreet source pairs shall be two more than the degree of the polynomial.

10.3.8.4 The percent difference of the measured efficiency and theoretical efficiency shall be calculated for all data points.

10.3.8.5 Points that are visual outliers or demonstrate less than 15 percent difference between the measured efficiency and theoretical efficiency may be removed at the analyst's discretion. Low residual mass sources and samples are difficult to plate with acceptable duplicate precision. Therefore, high outliers may not necessarily be removed from the calibration if they mimic live sample masses. In any case outliers above 15 percent shall be removed from the calibration curve. No more than 20 percent of the data points may be removed. Reasons for removal or inclusion of outliers shall be documented in the calibration narrative. Once outliers are removed, the percent difference between the measured efficiency and theoretical efficiency must be recalculated using the new polynomial coefficients generated from removal of data points. If outliers over 15 percent difference remain between the measured efficiency and theoretical efficiency the Radiochemistry Manager/QA must be consulted before calibration may continue.

10.3.8.6 The coefficient of determination (r^2) shall be calculated and displayed on the plot with the equation of the trend line. An r^2 greater than or equal to 0.9 is required to proceed to counting of verification sources.

10.3.8.7 If the coefficient of determination (r^2) is not greater than or equal to 0.9 on the plot of all data points (with or without outliers removed), the data may be plotted using the mean of the paired values for both the efficiencies and the masses. This action is acceptable to reduce the variability caused when plating low mass sources. Calculate the percent difference of each datum value from the mean of the paired points. If the percent difference for any datum value is greater than 10 percent for alpha or 7.5 percent for beta delete the data pair and perform another statistical fit to the data. More than 20 percent of all data points may not be removed from the curve. The coefficient of determination (r^2) shall be calculated and displayed on the plot with the equation of the trend line. An r^2 greater than or equal to 0.9 is required to proceed to counting of verification sources.

10.4 **Independent Calibration Verification (ICV)**

10.4.1 **Frequency**:

10.4.1.1 Performed with every intial calibration

10.4.2 GFPC initial calibrations must be verified by a second source standard.

10.4.3 The ICV standard is NIST traceable.

10.4.4 The ICV is counted to accumulate at least 5,000 counts.

10.4.5 **ICV for Dual Set Calibrations**:

10.4.5.1 Prepare at least one set of calibration verification sources consisting of a low, medium and high residual mass within the calibration range of the curve.

10.4.5.2 Prepare a blank at the same time.

10.4.5.3 The sources shall contain radionuclide from a second source. Second sources may include a second dilution from the same primary source used for the calibration curve.

10.4.5.3.1 Alternatively, verification source nuclides may consist of different nuclides than the calibration curve if it is customary to do so.

10.4.5.4 Count each secondary source and the blank in all detectors that were calibrated.

10.4.5.5 Calculate the results in terms of percentage recovery.

10.4.5.6 Calculate the mean results of all masses across each detector.

10.4.5.7 Criteria:

10.4.5.7.1 Individual points are within 30 percent of the true value

10.4.5.7.2 The mean result of all masses across all detectors is less than 10 percent.

10.4.5.7.3 If any detector fails the validation tests the Technical Director must be consulted to provide corrective action.

10.4.6 **ICV for Single Set Calibrations**:

10.4.6.1 Prepare at least one set of verification sources varying in expected mass within the calibration range of the curve.

10.4.6.2 Prepare a blank at the same time.

10.4.6.3 The sources shall contain radionuclide from a second source. Second sources may include a second dilution from the same primary source used for the calibration curve.

10.4.6.3.1 Alternatively, verification source nuclides may consist of different nuclides than the calibration curve if it is customary to do so.

10.4.6.4 Count the secondary source and the blank in all detectors that were calibrated.

10.4.6.5 Calculate the results in terms of percentage recovery.

10.4.6.6 Calculate the mean results of all masses across each detector.

10.4.6.7 Criteria:

10.4.6.7.1 Individual points are within 30 percent of the true value

10.4.6.7.2 The mean result of all masses across all detectors is less than 10 percent.

10.4.6.7.3 If any detector fails the validation tests the Technical Director must be consulted to provide corrective action.

10.5 **Setting Performance Check Criteria After Calibration**

10.5.1 Twenty background check samples are counted and used to establish quality control limits for the daily background checks.

10.5.2 Twenty alpha/beta check sources are counted after calibration and used to establish quality control limits for the daily source checks.

10.5.3 The limits will be a running average of the four months post calibration.

10.5.3.1 The limits are to be documented.

10.5.3.2 The limits will be re-established monthly at the following frequency

10.5.3.2.1 1st month – take first five data points from the new month and fifteen data points from the initial calibration.

10.5.3.2.2 2nd month – take first five points from new month, five from prior month and ten from initial calibration.

10.5.3.2.3 3rd month – take first five points from new month, five points each from the previous two months and five from the initial calibration.

10.5.3.2.4 4th month – take first five data points from new month and five points each from the previous three months.

10.5.3.3 Limits are set.

10.6 Alpha to Beta Crosstalk Determination

10.6.1 The mean mass is determined for each data point used to calculate the mass attenuation curve.

10.6.1.1 These curves are calculated and plotted and the percent of alpha into beta crosstalk is determined. This is done by dividing the beta counts per minute as observed in the beta channel from the alpha calibration source counts by the sum of the alpha and beta counts per minute.

10.6.1.2 The mean percent of alpha into beta is determined for each mass point by using the count data accumulated for two sets of alpha sources.

10.6.1.3 The crosstalk curve is plotted as mean crosstalk values relative to the mean mass for the two sets of data.

10.6.1.3.1 In this manner the crosstalk factor can be determined for any given mass.

10.6.1.4 The equation of the curve shall be determined using polynomial functions.

10.6.1.5 The coefficient of determination (R^2) shall be calculated and displayed on the plot as well as the equation for the trendline.

10.7 Beta to Alpha Crosstalk Determination

10.7.1 Since beta to alpha crosstalk does not vary across mass, a mean beta to alpha crosstalk correction factor is calculated.

10.7.2 The percent of beta into alpha is determined by dividing the alpha counts per minute as observed in the alpha channel from the beta calibration source counts by the sum of the alpha and beta counts per minute.

10.7.3 The mean percent of beta into alpha is determined for all mass points. The mean percent is insignificant in calculating results, therefore is not applied to the result calculation.

10.8 Long Background

10.8.1 **Frequency**:

10.8.1.1 Monthly or whenever instrument conditions have significantly changed since the previous background was performed (e.g. detector replaced, etc.)

10.8.1.2 Minimum count time: 1000 minutes.

10.8.2 Wash the planchet holder and clean the drawers with a 20% radiac wash or ethyl alcohol.

10.8.2.1 Do not spray cleaner directly onto the drawers. Spray cleaner on a Kimwipe, a cotton ball, or paper towel and wipe out the drawers.

10.8.3 Check that instrument settings are as specified in 11.1.

10.8.4 **<u>Red Long Background Count Set Up</u>**

10.8.4.1 Place the cursor on the red box in the upper left hand corner of the screen and <u>right click</u> on the mouse.

10.8.4.2 Select 'edit parameters'. Verify the count time on the screen is set to 1000 minutes and the iterations is set to 1. If they are different than 1000 min and 1iteration, change them to 1000 min and 1 iteration. Then select 'close' to exit this window.

10.8.4.3 Place clean empty planchets in instruments.

10.8.4.4 Place the cursor on the red box in the upper left hand corner of the screen and <u>right click</u> on the mouse.

10.8.4.5 Select 'create batch' from the instrument menu.

10.8.4.6 Select 'background'

10.8.4.7 Select the detectors that are to be counted by double clicking the mouse on the drawer desired which selects all detectors in that drawer or on each individual detector in the display.

10.8.4.8 Select 'run'

10.8.4.9 Select 'done'

10.8.4.10 When backgrounds are complete, review the printouts for acceptance.

10.8.5 **<u>Protean Long Background Count Set Up</u>**

10.8.5.1 Create Manual batch in RadCapture

10.8.5.2 Export Manual batch from RadCapture

10.8.5.3 At Protean instrument:

10.8.5.4 Select 'Detector'

10.8.5.5 Select 'Sample Log'

10.8.5.6 Select appropriate Long Background (ex: Sept_Lng_Bkg_00) you want to start under sample ID

10.8.5.7 Change count time to 1000min

10.8.5.8 Select 'Start'

10.8.5.9 Continue these steps with detectors 1-23.

10.8.5.10 Review the data for acceptance when the backgrounds are complete.

10.8.6 **<u>Printing Protean Long Backgrounds</u>**

10.8.6.1 Select 'Print Protean data icon' on the desk top

10.8.6.2 Select OK

10.8.6.3 Enter Batch #

10.8.6.4 Print

10.8.7 **<u>Protean Long Background Entry into Protean</u>**

10.8.7.1 Select Input data

10.8.7.2 Select Definitions

10.8.7.3 Select Calibrations

10.8.7.4 Select Properties

10.8.7.5 Select References 0-7 for Detectors 0 thru 7 and 8-15 for Detectors 8 thru 15

10.8.7.6 Enter Background CPM's for Alpha and Beta from printed data sheet

10.8.8 **<u>Orange and Purple Long Background Count Set-Up</u>**

10.8.8.1 Select detector 0

10.8.8.2 Select 'source log'

10.8.8.3 Select 'monthly long background' by clicking on the file list arrow.

10.8.8.4 Ensure count time is set to 1000 minutes.

10.8.8.5 Select 'start'

10.8.8.6 Continue these steps with detectors 1-23.

10.8.8.7 Review the data for acceptance when the backgrounds are complete.

10.8.9 **Printing Orange and Purple Long Backgrounds**

10.8.9.1 Select 'Data
10.8.9.2 Select 'Source Count Data'
10.8.9.3 Select 'Source Name' Monthly Long BKG
10.8.9.4 Select 'This Range' enter your date range that Long Backgrounds were performed.
10.8.9.5 Select 'Refresh'
10.8.9.6 Select 'Source Count Summary' under Reports
10.8.9.7 Select 'Print'
10.8.9.8 Select 'Landscape' under Orientation
10.8.9.9 Select 'OK'

10.8.10 **Long Background Criteria:**

10.8.10.1 The CPM for the alpha are <0.2 and the beta < 2.0, the detector may be used.

10.8.10.1.1 The data printout must include initials and date to indicate that has been reviewed.
10.8.10.1.2 If a detector is above this limit, discard planchet.
10.8.10.1.3 Clean the planchet holder with radiac wash, ethyl alcohol or a detergent spray cleaner and dry thoroughly.
10.8.10.1.4 Place a clean planchet in the holder and repeat steps for that detector (s) only.
10.8.10.1.5 Perform a new background.

10.8.10.1.5.1 Note: the detector is tagged out of service until a successful background has been achieved.

11.0 PROCEDURES

11.1 Initial Setup

11.1.1 Check the normal instrument settings for all controls as described below:

11.1.1.1 Tank Flow 8 psi
11.1.1.2 Flow Cells >/= 0.3 SCFH, the flow will vary, the target range is 0.15 to 0.20 SCFH.

11.1.2 The High Voltage is set as indicated in the Manuals for the LB4000/LB4100 located in the count room file cabinet. The Protean remains as set by the manufacturer and does not require adjustment.

11.1.3 If counting gas has just been changed or turned on, allow a minimum purge time of 30 minutes prior to operation. Record gas tank changes on document on separate sheet.

11.2 Record date of Daily Background and Check Source Data in runlog logbook.

11.3 Maintenance

11.3.1 Change out the counting gas when the gauge reads under 500 psi. This usually occurs every 1 to 2 weeks. Record in the instrument maintanence logbook.

11.3.2 Allow gas to purge a minimum of 30 minutes prior to operation.

11.4 Data Acquisition: Daily Background Check and Source Check

11.4.1 **Daily Background Check**:

11.4.1.1 **Red Instrument**:
11.4.1.2 Open the drawer by rotating the knob at the front of the drawer to the ‘DOWN’ position and pull the sample drawer out slowly. Place clean empty planchets in the sample holders.

11.4.1.3 **Before inserting the drawer, confirm that none of the planchets extend above the sample holder. Failure to observe this note can result in damage to the detector.**
11.4.1.4 Slowly insert sample drawer into the instrument and slowly rotate the positioning knob into the 'UP' position.
11.4.1.5 Place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse.
11.4.1.6 Select 'create batch'
11.4.1.7 Select 'daily background check'
11.4.1.8 Select the detectors that are to be loaded by double clicking the mouse on the drawer desired or on each individual detector in the display.
11.4.1.9 Select 'run'
11.4.1.10 Select 'done'
11.4.1.11 Measure the detector background for 200 minutes. The count time is predetermined by the protocol selected. i.e. 'daily background check'.
11.4.1.12 The detector display will be yellow when the detector is counting. The detector display will turn green when the count is complete.
11.4.1.13 When counting is complete, place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse. Select 'data output' and select the data file generated by your background counts for that instrument, "DAY- ###". Select 'ok' to print data.
11.4.1.14 On any work station, i.e. "PC computer in the count room", double click on the IQC icon.
11.4.1.15 Select 'import data'
11.4.1.16 Select 'Red'. Enter the current date. Click on the file list arrow.
11.4.1.17 From the file list select each file generated above individually, and then select import data. i.e. import each "Day" or "DQC" file for that instrument individually.
11.4.1.18 Select 'close'
11.4.1.19 Select 'reporting'. Verfiy the current date in both the 'start' and 'end' date fields. Select 'print' to generate the report.

11.4.2 **Protean Instrument**:

11.4.2.1 Open each detector drawer. Place clean empty planchets into each sample holder and slowly insert each sample drawer into the instrument.
11.4.2.2 Double click detector 0 on the Protean computer screen.
11.4.2.3 Select 'source log'
11.4.2.4 Set the time for 200 minutes.
11.4.2.5 Type 'DB0' in the sample id box. (D for daily. B for background. 0 for detector.)
11.4.2.6 Select 'start'
11.4.2.7 Double click detector 1 on the computer screen. Repeat steps 11.4.2.3 through 11.4.2.5 for each detector, making sure to change the number to coincide with the detector the background is counting for.
11.4.2.8 Remove planchets from detector drawers when counting is complete.
11.4.2.9 On any work station, i.e. "PC computer in the count room", double click on the IQC icon.
11.4.2.10 Select 'import data'
11.4.2.11 Select 'Protean'. Enter the current date. Click on the file list arrow.
11.4.2.12 Select 'close'
11.4.2.13 Select 'reporting'. Verfiy the current date in both the 'start' and 'end' date fields. Select 'print' to generate the report.

11.4.3 **Orange and Purple Instrument**:

11.4.3.1 Open each detector drawer. Place clean empty planchets into each sample holder and slowly insert each sample drawer into the instrument.
11.4.3.2 Select detector 0.
11.4.3.3 Select ‘source log’.
11.4.3.4 Select ‘DB’ by clicking on the file list arrows for orange.
11.4.3.5 Select ‘Daily BKG’ by clicking on the file list arrows for purple.
11.4.3.6 Select ‘start’
11.4.3.7 Repeat these steps with detectors 1-23.

11.4.4 **Daily Background Criteria:**

11.4.4.1 Review the IQC printouts for each detector.
11.4.4.1.1 If a detector fails background criteria (3 sigma), clean the detector with radiac wash or ethyl alcohol and re-run.
11.4.4.1.2 If the detector fails a second time, but the CPM for the alpha are <0.2 and the beta < 2.0, the detector may be used. The data printout must include initials and date to indicate that it was checked.
11.4.4.1.3 Circle any failed detector on the printout.
11.4.4.1.4 Place a planchet upside down in the planchet holder to indicate that the detector is out of service for that day.

11.5 **Daily Source Check**

11.5.1 **Red Instrument**:

11.5.1.1 Open the drawer by rotating the knob at the front of the drawer to the ‘DOWN’ position and pull the sample drawer out slowly.
11.5.1.2 Place alpha sources in the sample holders of the A and B drawer. Place beta sources in the sample holders of the C and D drawer.
11.5.1.3 Place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse.
11.5.1.4 Select ‘create batch’
11.5.1.5 Select ‘daily source check’
11.5.1.6 Select the detectors that are loaded by double clicking the mouse on the desired drawer or on each individual detector in the display.
11.5.1.7 Select ‘run’
11.5.1.8 Select ‘done’
11.5.1.9 Measure the detector source for 2 min. The count time is predetermined by the protocol selected. i.e. ‘daily source check’
11.5.1.10 The detector display will be yellow when the detector is counting. The detector display will turn green when the count is complete.
11.5.1.11 When counting is complete, place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse. Select ‘data output’ and select the data file generated by your background counts for that instrument, “DQC- ###”. Select ‘ok’ to print data.
11.5.1.12 Open the drawer by rotating the knob at the front of the drawer to the ‘DOWN’ position and pull the sample drawer out slowly. Place beta sources in the sample holders of the A and B drawer. Place alpha sources in the sample holders of the C and D drawer.
11.5.1.13 Repeat steps 11.5.1.3 to 11.5.1.11.
11.5.1.14 On any work station, i.e. “PC computer in the count room”, double click on the IQC icon.
11.5.1.15 Select ‘import data’

11.5.1.16 Select ‘Red’. Enter the current date. Click on the file list arrow.

11.5.1.17 From the file list select <u>each</u> file generated above <u>individually</u>, and then select import data. i.e. import each “Day” or “DQC” file for that instrument individually.

11.5.1.18 Select ‘close’

11.5.1.19 Select ‘reporting button’. Verify the current date in both the ‘start’ and ‘end’ date fields. Select ‘print’to generate the report

11.5.2 **Protean Instrument:**

11.5.2.1 Slowly open each detector drawer. Place alpha sources in sample holders of detectors 0-7. Place beta sources in sample holders of detectors 8-15 and slowly insert each drawer into the instrument.

11.5.2.2 Double click detector 0 on the Protean computer screen.

11.5.2.3 Select ‘source log’.

11.5.2.4 Set the time for 2 minutes.

11.5.2.5 Type “SA0” in the sample id box. (S for source. A for alpha. 0 for detector.)

11.5.2.6 Select ‘start’

11.5.2.7 Double click detector 1 on the computer screen. Repeat steps 11.5.2.3 to 11.5.2.6 for each detector, making sure to change A to B when starting the beta sources on detectors 8-15 and changing the number to coincide with the detector the source is on.

11.5.2.8 When the counting is complete, slowly open each detector drawer. Place beta sources in detectors 1-7. Place alpha sources in detectors 8-15.

11.5.2.9 Double click detector 0 on the Protean computer screen.

11.5.2.10 Type “SB0” in the sample id box. (S for source. B for beta. 0 for the detector.)

11.5.2.11 Double click detector 1 on the computer screen. Repeat steps 11.5.2.10 for each detector, making sure B to A when starting the alpha sources on detectors 8-15.

11.5.3 Remove sources from detector drawers when counting is complete.

11.5.4 **Orange and Purple Instrument**:

11.5.4.1 Slowly open each detector drawer. Place alpha sources in sample holders of detectors 0-7. Place beta sources in sample holders of detectors 8-15. Slowly insert each drawer into the instrument.

11.5.4.2 Select detector 0.

11.5.4.3 Select ‘source log’.

11.5.4.4 Select ‘SA0’.

11.5.4.5 Select ‘start’

11.5.4.6 Repeat these steps for detectors 1-7 using the correlating detector number. For detectors 8-15 select ‘SB8’, ‘SB9’, and so on for each correlating detector number.

11.5.4.7 Slowly open each detector drawer when counting is complete. Place beta sources in detectors 1-7 and place alpha sources in detectors 8-15.

11.5.4.8 Select detector 0.

11.5.4.9 Select ‘SB0’.

11.5.4.10 Select ‘start’.

11.5.4.11 Repeat these steps for detectors 1-7 using the correlating detector number. For detectors 8-15, select ‘SB8’, ‘SB9’ and so on for each correlating detector number.

11.5.4.12 Repeat steps 11.5.4.1 to 11.5.4.11 for detectors 16-23.

11.5.4.13 Remove sources from detector drawers when counting is complete.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 Result calculations are performed by TestAmerica St. Louis' Rad Capture software program. These calculations are found in the TestAmerica St. Louis QAM.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank
- 13.2.1 Acceptance Criteria:
  - 13.2.1.1 No target analytes may be present in the method blank above the reporting limit.
  - 13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target anlaytes present above ½ RL), will be noted on the client requirements sheet.
- 13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:
  - 13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.3 Laboratory Control Sample (LCS)
- 13.3.1 Acceptance Criteria:
  - 13.3.1.1 All control analytes must be within the specified control limits for accuracy (%Recovery) and precision (RPD).
- 13.3.2 Corrective Action for LCS not meeting acceptance criteria:
  - 13.3.2.1 <u>LCS Spike Recovery excursion (high)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).
  - 13.3.2.2 <u>LCS Spike Recovery excursion (low)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).
- 13.3.2.3 <u>RPD/RER Duplicate excursion</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)
- 13.4.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).
- 13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:
  - 13.4.2.1 <u>MS/MSD Spike Rec. excursion</u> may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Sample result evaluation
- 13.5.1 Tracer/Carrier recovery must be within specified limits.
- 13.5.2 <u>Tracer/Carrier recovery low</u>– See Clouseau NCM for corrective action.
- 13.5.3 <u>Tracer/Carrier recovery high</u>– See Clouseau NCM for corrective action.

13.5.3.1 A sample tracer recovery outside QC limits may be accepted if the sample results are determined valid:
13.5.3.2 minimum number of tracer counts
13.5.3.3 level of uncertainty
13.5.3.4 client project requirements/approval

13.5.4 These expections will be documented using the NCM process. The NCM will narrate the conditions upon which the sample results were accepted with tracer recovery excursions.

13.6 Insufficient Sample

13.6.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA and DOE methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica ST Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION CONTROL

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 Department of Energy (DOE) Environmental Monitoring Laboratory (EML) HASL-300 Procedures Manual, method Ba-01-R, Beta Radioassay, Sr-02 Strontium 90, Sr-03-RC Strontium 90 in Environmental Samples.

17.2 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 1, Method 900.0 Gross Alpha and Gross Beta Radiochemistry

17.3 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 6, Method 903.0 Alpha-Emitting Radium Isotopes

17.4 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 8, Method 904.0 Radium 228

17.5 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 9, Method 905 Radioactive Strontium in Drinking Water

17.6 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 9310, Gross Alpha and Gross Beta

17.7 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 9315, Alpha-Emitting Radium Isotopes

17.8 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 9320, Radium 228

17.9 TestAmerica St. Louis Quality Assurance Manual, current revision

17.10 Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions

17.11 Associated SOPs:

- 17.11.1 ST-PM-0002 “Sample Receipt and Chain of Custody”
- 17.11.2 ST-QA-0002, “Standards and Reagent Preparation.”
- 17.11.3 ST-QA-0036, “Non-Conformance Memorandum (NCM) Process”
- 17.11.4 ST-RC-0004, “Preparation of Soil, Sludge, Filter, Biota and Oil/Grease Samples for Radiochemical Analysis”.
- 17.11.5 ST-RC-0020, “Determination of Gross Alpha/Beta Activity”
- 17.11.6 ST-RC-0021, “Gross Alpha Radition in Water using Copreciptation”
- 17.11.7 ST-RC-0036, “Determination of Chlorine-36 in Various Matrices by GFPC”
- 17.11.8 ST-RC-0040, ‘Total Alpha Emitting Isotopes of Radium”
- 17.11.9 ST-RC-0041, “Radium 228 in Water”
- 17.11.10 ST-RC-0050, “Preparation of Strontium 89 and 90”
- 17.11.11 ST-RC-0300, “New Jersey 48-hour Gross Alpha Testing for Private Well Testing ACT (PWTA)

18.0 MODIFICATIONS TO THE REFERENCE METHOD

18.1 TestAmerica St. Louis uses Thorium-230 to calibrate the GFPC system for Ra-226. Th-230 has similar alpha energies and a sufficiently long half life to eliminate the need for purification. The laboratory has historically performed well on PE programs for Ra-226, demonstrating the laboratory’s ability to accurately calibrate for this isotope. Calibrating with a Ra-226 source presents a severe bias in the quantitated result. Ra-226 can be purified and separated from all other alpha emitting isotopes, but the moment after separation, alpha emitting daughters begin to grow (i.e. Radon-222, Polonium-28 and Polonium-214). As the daughter’s in-growth alpha activity changes and due to the higher alpha energies of these daughters, the measured efficiency of the GFPC changes as well. After three weeks the alpha activity from purified Ra-226 increases by a factor of four. Due to their short half lives, these daughters can not be isolated long enough to mathematically correct for the bias brought on by them. Calibrating the GFPC with Ra-226 is actually calibrating with a mix of the four isotopes and not a legitimate calibration under the cited regulation.

18.2 Strontium 89's short half life makes it impractical to use as a calibration standard for both Radium 228 analysis, as stated in EPA method 904 and SW method 9310, and Strontium 89 analysis, as stated in EPA method 905. TestAmerica St. Louis uses a mixed Strontium 90/Yittrium 90 standard for its' GFPC beta calibration used in Gross Beta, Strontium 90, Strontium 89, and Radium 228 analyses. TestAmerica St. Louis has selected the Strontium 90/Yittrium 90 standard because it produces a stable beta emission which can be reliably used for initial and continuing calibration. By using this standard mix, we have beta emissions at the lower and upper energetic spectrum whose average is in the middle of the beta range.

18.3 For Radium 228 analysis, TestAmerica St. Louis uses chemical separation techniques to eliminate other potential beta emitters.

18.4 TestAmerica St. Louis does not perform a direct Strontium 89 analysis. TestAmerica St. Louis provides calculated results based on the difference between Total Strontium and Strontium 90.

19.0 CHANGES FROM PREVIOUS REVISION

19.1 Updated Section 10 to address voltage increase per step, plateau slope and QC check count requirements (5000 counts)

19.2 Rev. 11;
- 19.2.1 Added instument Purple throughout section 10 and 11.
- 19.2.2 Adjusted procedure steps throughout section 11.

19.3 Rev. 12,
- 19.3.1 Added Sr-02-RC and Sr-03-RC to sections 1.0 and 17.0.

19.4 Rev. 13:
- 19.4.1 Added Neptunium to scope in section 1.0.
- 19.4.2 Updated the Quality Control Program for counting daily rad checks and daily background checks in section 3.0.
- 19.4.3 Updated background count set-up, printing and entering protean data in section 10.8.

TAL Reference Data Summary

Structured Analysis Code: I-FR-ZA-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	4	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-HZ-ZA-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Dissolved
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6498							Spike List 6533						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5630	Gross Alpha, Dissolved	3	pCi/L			0	C	Y			80	140	40	C	Y			33	150	40
5632	Gross Beta, Dissolved	4	pCi/L			0	C	Y			77	123	40	C	Y			71	146	40

TAL Reference Data Summary

Structured Analysis Code: **I-H6-ZA-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Suspended
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6499							Spike List 6534						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5629	Gross Alpha, Suspended	3	pCi/L			0	C	Y			73	136	40	C	Y			44	150	40
5631	Gross Beta, Suspended	4	pCi/L			0	C	Y			73	122	40	C	Y			66	147	40

TAL Reference Data Summary

Structured Analysis Code: **A-FS-ZA-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			38	138	40	C	Y			43	123	40
4171	Gross Beta	10	pCi/g			0	C	Y			44	124	40	C	Y			55	125	40

TAL Reference Data Summary

Structured Analysis Code: A-HI-ZA-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Total Dissolution
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6527							Spike List 6528						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4171	Gross Beta	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-K2-ZA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Thin Layer on Planchet
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			38	138	40	C	Y			43	123	40
4171	Gross Beta	10	pCi/g			0	C	Y			44	124	40	C	Y			55	125	40

TAL Reference Data Summary

Structured Analysis Code: **I-FR-Y9-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	4	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-HZ-Y9-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Dissolved
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6584							Spike List 6585						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5630	Gross Alpha, Dissolved	3	pCi/L			0	C	Y			63	130	40	C	Y			63	130	40
5632	Gross Beta, Dissolved	4	pCi/L			0	C	Y			80	120	40	C	Y			80	120	40

TAL Reference Data Summary

Structured Analysis Code: I-H6-Y9-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Suspended
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6582							Spike List 6583						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5629	Gross Alpha, Suspended	3	pCi/L			0	C	Y			63	130	40	C	Y			63	130	40
5631	Gross Beta, Suspended	4	pCi/L			0	C	Y			80	120	40	C	Y			80	120	40

TAL Reference Data Summary

Structured Analysis Code: I-J6-Y9-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 HOUR - EVAPORATIVE PREPARATION
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	4	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: I-MH-Y9-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 hour- Evaporative Prep Suspended
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	2	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	2	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-MI-Y9-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 hour- Evaporative Prep Dissolved
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	2	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	2	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-FS-Y9-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			38	138	40	C	Y			43	123	40
4171	Gross Beta	10	pCi/g			0	C	Y			44	124	40	C	Y			55	125	40

TAL Reference Data Summary

Structured Analysis Code: **A-HI-Y9-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Total Dissolution
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6527							Spike List 6528						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4171	Gross Beta	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: I-J6-3Z-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 HOUR - EVAPORATIVE PREPARATION
Method: Gross A/B by NJ EPA 900 PWTA
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	2	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	2	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-FR-ZA-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	4	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

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TAL Reference Data Summary

Structured Analysis Code: **A-FS-ZA-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FR-Y9-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: Gross Alpha/Beta EPA 900
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	4	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FS-Y9-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: Gross Alpha/Beta EPA 900
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZW-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: I-G3-ZW-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-NR-ZW-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth, Dissolved
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5656	Radium (226), Dissolved	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: A-G1-ZW-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: A-G5-ZW-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

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TAL Reference Data Summary

Structured Analysis Code: A-RC-ZW-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Ra-226, ASTM 3987-85/ SW846 9315
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z3-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z3-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-G1-Z3-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: A-G5-Z3-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-K4-Z3-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation - 14 Day Ingro
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZY-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: I-G3-ZY-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-P3-ZY-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth, Dissolved
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6321							Spike List 6322						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5656	Radium (226), Dissolved	1	pCi/L			0	C	Y			45	150	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: A-G1-ZY-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code:	**A-G5-ZY-01-06**	Matrix:	SOLID
Target Analyte List:	All Analytes	Extraction:	Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
		Method:	Radium 226 by EPA 903.0 MOD
		QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: A-S7-ZY-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As received, Digest, Precipitate, Separation 21 day ingrowtl
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZY-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-G5-ZY-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z3-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z3-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: I-G2-ZW-DO-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G5-ZW-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z5-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z5-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40

TAL Reference Data Summary

Structured Analysis Code: I-NR-Z5-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth, Dissolved
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5657	Radium 228, Dissolved	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: A-G1-Z5-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: A-G5-Z5-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: A-RD-Z5-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Ra-228, ASTM 3987-85/ SW846 9320
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: I-G2-Z6-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z6-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40

TAL Reference Data Summary

Structured Analysis Code: A-G1-Z6-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: A-G5-Z6-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: A-K4-Z6-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation - 14 Day Ingro
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: I-G2-Z4-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z4-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40

TAL Reference Data Summary

Structured Analysis Code: I-P3-Z4-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth, Dissolved
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6323							Spike List 6324						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5657	Radium 228, Dissolved	1	pCi/L			0	C	Y			60	149	40	C	Y			62	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G1-Z4-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z4-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: A-S7-Z4-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As received, Digest, Precipitate, Separation 21 day ingrowtl
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: I-G2-Z4-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6884							Spike List 6885						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z4-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6884							Spike List 6885						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-G5-Z6-DO-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z6-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z5-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: A-G5-Z5-DO-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-LP-2Z-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Alpha Radium EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6503							Spike List 6596						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
2261	Radium (total)	1	pCi/L			0	C	Y			70	125	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-LQ-2Z-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Precipitate, Separation
Method: Total Alpha Radium EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6503							Spike List 6596						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/g			0	C	Y			52	114	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-L1-2Z-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Precipitate, Separation
Method: Total Alpha Radium EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6503							Spike List 6596						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/g			0	C	Y			52	114	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-LP-20-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Radium by DOE RA-06-RC
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6890							Spike List 6891						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-LQ-20-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Precipitate, Separation
Method: Total Radium by DOE RA-06-RC
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6890							Spike List 6891						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-0K-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-FW-0K-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-0J-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-FW-0J-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-K3-0J-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: I-FX-0J-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-FW-0J-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: I-FX-0K-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-FW-0K-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZO-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-90 BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			80	130	40	C	Y			19	150	40

TAL Reference Data Summary

Structured Analysis Code: A-FW-ZO-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-90 BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-HL-ZO-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PREP RC-0003 , RC-0004 , SEP RC-0050 , CT SL-13021
Method: SR-90 BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: I-FX-ZK-01-06

Target Analyte List: 'All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			80	130	40	C	Y			19	150	40

TAL Reference Data Summary

Structured Analysis Code: A-FW-ZK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-HL-ZK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PREP RC-0003 , RC-0004 , SEP RC-0050 , CT SL-13021
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-K3-ZK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: I-FX-ZK-DO-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZK-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZK-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-FW-ZK-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: I-FX-ZM-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-FW-ZM-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			72	110	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZM-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZM-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: I-FX-ZJ-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-FW-ZJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			72	110	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-K3-ZJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	10	pCi/sampl‹			0	C	Y			72	110	40	C	Y			70	130	40

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TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZJ-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZJ-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-JE-3S-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Dry, Grind, Leach/Digestion, phos ppt. -> amm. ppt.
Method: Phosphorus-32/33 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6544							Spike List 6568						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5481	Phosphorus-32/33	5	pCi/L			0	C	Y			70	130	5	C	Y			50	150	5

TAL Reference Data Summary

Structured Analysis Code: A-JE-3S-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Leach/Digestion, phos ppt. -> amm. ppt.
Method: Phosphorus-32/33 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6544							Spike List 6568						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5481	Phosphorus-32/33	5	pCi/g			0	C	Y			70	130	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-JG-3U-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Dry, Grind, Leach/digestion,separation -> BaSO4 ppt.
Method: Sulfur-32/35 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6546							Spike List 6570						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5485	Sulfur-32/35	5	pCi/L			0	C	Y			70	130	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: A-JG-3U-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Leach/digestion,separation -> BaSO4 ppt.
Method: Sulfur-32/35 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6546							Spike List 6570						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5485	Sulfur-32/35	5	pCi/g			0	C	Y			70	130	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-JF-3T-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Dry, Grind, Leach/digestion,separation -> AgCl ppt.
Method: Chlorine-36 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6545							Spike List 6569						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5483	Chlorine-36	5	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-JF-3T-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Leach/digestion,separation -> AgCl ppt.
Method: Chlorine-36 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6545							Spike List 6569						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5483	Chlorine-36	5	pCi/g			0	C	Y			68	120	40	C	Y			70	130	40

Title: ALPHA SPECTROSCOPY ANALYSIS

Approvals (Signature/Date):

Chris Hough 3/19/12	Date	Michael Ridenhower 3/19/12	Date
Radiochemistry Manager		Health & Safety Manager / Coordinator	
Marti Ward 3.19.12	Date	Elaine Wild 3/19/12	Date
Quality Assurance Manager		Laboratory Director	

This SOP was previously identified as SOP No. ST-RD-0210 Rev. 9

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Facility Distribution No.: 0 **Distributed To: See Electronic Distribution Sheet**

1.0 SCOPE AND APPLICATION

1.1 This procedure applies to alpha spectroscopy detectors and the computer assisted alpha spectroscopy analysis systems, using AlphaVision software.

1.2 This SOP is based on DOE method A-01-R

1.3 This SOP is applicable to both liquid and solid matrices.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the Appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 This SOP provides detailed instructions for energy calibration, efficiency determination, quality control checks, background and sample counting of the alpha spectroscopy system.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for glossary of common terms and data qualifiers.

3.2 Tracer - A known amount of 232U, 242Pu or 236Pu, 243Am, 209Po or 229Th (depending on analyte(s) required) added to each sample to determine chemical yield. The tracer serves as an internal standard, which is used to calculate the activity of the target isotopes.

3.3 Region of Intrest (ROI): The KeV range through which the target isotope peak signal responds.

3.4 Tailing: Tailing is a delayed return of a peak to chromatographic baseline or continuation of response beyond its normal response window (RT window, ROI) due to high concentration of the analyte or a matrix interference.

3.5 Alpha Vision – the Alpha Spectrometer data collection and processing software.

4.0 INTERFERENCES

4.1 Alpha spectrometry has many potential interferences. These are usually in the form of radionuclides with unresolved alpha emissions. Poorly resolved alpha peaks are often due to high alpha activity rates or attenuation of the alpha emissions.

4.2 Isotope peak responses, when sufficiently high, may tail into other isotope ROIs. Th229 tailing into the Th230 region of interest is a recognized example. This interference is minimized by maintaining low activities of the Th229 tracer and monitoring of the separation of the ROIs for Th229 and Th230. The use of manual integration may be required.

4.3 Some isotopic elements are not distinguishable and are reported as an isotopic pair, unless specifically directed by the client not to do so. These pairs may be reported separately depending on the client's DQOs and the use-ability of the data. When reported separately, the narrative must describe the technical aspects of how the isotopic pair was divided.

4.3.1 Recognized Isotopic Pairs:

4.3.1.1 Plutonium 239/240

4.3.1.2 Uranium 235/236
4.3.1.3 Uranium 233/234
4.3.1.4 Curium 245/246
4.3.1.5 Curium 247/248

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS
None.

5.3 PRIMARY MATERIALS USED
None.

6.0 EQUIPMENT AND SUPPLIES

6.1 Alpha spectroscopy system utilizing a computer based data acquisition system.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Commercially prepared alpha standards for the isotopes Th230, Pu239 and Am243.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

9.0 QUALITY CONTROL

9.1 See actinide preparation SOPs for additional information regarding QC types, frequency and preparation

9.2 **Batch**

9.2.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.2.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.2.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Sample Duplicate (Dup). In the event that there is insufficient sample to analyze a sample duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.2.3.1 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) may be performed upon client request, and are noted in the Client Requirement Sheets and Log-in.

9.3 **Method Blank (MB)**

9.3.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.3.2 A method blank must be prepared with every sample batch.

9.4 **Laboratory Control Sample (LCS)**

9.4.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 An LCS must be prepared with every sample batch.

9.5 **Matrix Spike**

9.5.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.6 **Sample Duplicate**

9.6.1 A Sample Duplicate is an additional aliquot of a field sample taken through the entire analytical process to demonstrate precision.

9.7 **Procedural Variations/ Nonconformance and Corrective Action**

9.7.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.7.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 INSTRUMENT SETUP, CALIBRATION, AND STANDARDIZATION

10.1 Initial instrument setup is performed when instrument is first installed, when a detector or chamber is changed/replaced, when a chamber is returned from the manufacturer after servicing, or other such circumstances. The following steps should be taken to ensure proper setup. Steps may be accomplished either through hardware knobs/potentiometers or through software settings (depending upon the system hardware/software). See the hardware and/or software manual to determine further detailed instructions:

10.1.1 Set the conversion gain to 1024 channels.

10.1.2 Adjust the coarse and fine gain as well as the offset to adjust the location of the three peaks of the alpha source such that the lower energy peak (Th-230 at 4688 keV) falls into channel 176, the mid-energy peak (Pu-239 at 5155 keV) falls into channel 239, and the higher energy peak (Am-241 at 5486 keV) falls into channel 283. Note that this results in 107 channels between the low energy and high energy peaks (about 7.46 keV/channel with offset of approximately 3375 keV). Ensure each peak is within 2 channels of the desired channel before beginning energy and efficiency calibrations.

10.1.2.1 Gain adjustment:

10.1.2.1.1 Turning the knob counter-clockwise decreases the gain (decrease the value in the fine gain for software adjustment), causing the spectrum peaks to move closer to each other (smaller keV/channel slope) and toward the lower energy.

10.1.2.1.2 Turning the knob clockwise increases the gain (increase the value in the fine gain for software adjustment), causing the spectrum peaks to spread apart (larger keV/channel slope) and toward higher energy.

10.1.2.2 Offset adjustment:

10.1.2.2.1 Increasing the offset moves the peak/spectra toward the the left (lower channel number) without altering the keV/channel (slope).

10.1.2.2.2 Decreasing the offset moves the peak/spectra toward the right (higher channel number) without altering the keV/channel (slope).

10.1.3 Adjust the pulser setting such that the pulser peak is centered at about channel 222 (approximately 5 MeV).

10.2 Initial calibrations are performed according to the following schedule

10.2.1 Initial energy calibrations shall be performed for the alpha spectroscopy systems <u>yearly</u>, or when a calibration quality control check indicates an unacceptable change in the energy calibration parameters.

10.1.1.1 Energy Calibrations shall be performed using at least three isotopes within the energy range of 3-6 MeV. Typical isotopes used are Th-230, Pu-239, and Am-241. Final peak energy positions of all observed isotopes shall be within +/- 5 channels (~40 keV) of expected channel/energy (see 10.1.2). The actual energy vs. channel and the equation with the slope is not calculated. Setting the peaks to within 5 channels of expected will ensure calculations utilizing fixed Regions of Interest (ROI) for each isotope will provide accurate results with minimal need for manual adjustment of ROI. Routine pulser checks and continuing calibration verifications (see below) will help control/monitor for drift.

10.2.2 Initial efficiency calibrations shall be established for the alpha spectroscopy systems <u>yearly</u>, or when a calibration quality control check indicates an unacceptable change in the efficiency calibration parameters.

10.2.2.1 Calibrated efficiency should fall between 20% and 32%. Values outside this range do not constitute a failure. However, if the calibrated efficiency does fall outside this range, an evaluation of the suitability of the detector for use should be performed and documented.

10.2.3 Initial calibration verifications (ICV) shall be performed utilizing an independent second source following the initial calibration.

10.2.3.1 The efficiency of the ICV must fall withing 95%-105% of the initial calibration efficiency value.

10.2.3.2 A second level review will be perfomed before detectors are placed into service and will be noted as acceptable in the electronic monthly maintenance log.

10.3 Calibration Quality Control Check (Continuing Calibration Verification/CCV)

10.3.1 A continuing calibration verification shall be performed on a <u>monthly</u> basis.

10.3.1.1 The Final peak energy positions for the isotopes should fall within +/- 5 channels of the expected channel/energy.

10.3.1.2 The efficiency should fall within 95%-105% of the calibrated efficiency.

10.3.1.3 A second level review will be performed before detectors are placed into service and will be noted as accepable in the electronic monthly maintenance log.

10.4 Background subtraction spectrum shall be established for the alpha spectroscopy systems <u>monthly</u>, or when the background quality control check indicates an unacceptable change in the daily background parameters.

10.5 Daily Checks

10.5.1 Routine pulser quality control verifications are performed each day of use.

10.5.1.1 The pulser energy, peak centroid, peak resolution, peak area quality control for a detector shall be checked each day that the alpha spectroscopy system is used.

The limits for pulser centroid and pulser energy will be as below:

10.5.1.1.1 Gross counts must be within 5% of the average (20-point minimum) for each detector.

10.5.1.1.2 The peak resolution (FWHM) must fall within 10-20 keV.

10.5.1.1.3 The pulser centroid must fall within +/- 5 channels of the average (20-point minimum) for each detector.

10.5.1.1.4 The pulser energy must fall within +/- 40 keV of the average (20-point minimum) for each detector.

10.5.2 Routine calibration, background and pulser quality control parameters using the “Boundry” out-of-range test will be found unacceptable if the value is outside parameter tolerance.

10.5.2.1 The routine quality control check should be rerun to determine the statistical significance of the out of control parameter.

10.5.2.2 If the out of control parameter is found acceptable in the rerun, the investigation will be noted in the instrument maintenance log.

10.5.2.3 Check the integrity of the radioactive standard.

10.5.2.4 Check source positioning and all instrument settings.

10.5.2.5 Check all cables for any apparent damage and to confirm that all cables are routed to proper connectors and are in good working order.

10.5.3 If the instrument fails to meet the acceptance criteria, and the corrective actions above do not resolve the problem, the instrument must be “tagged” out of service for the day.

10.5.3.1 This is noted on the Alpa Spec Daily report by marking the report (The report will display FAIL for criteria not met). The detector will be marked out of service with the date and initials of the analyst performing the daily check.

10.5.3.2 If a detector fails three consecutive days for the same criteria, the detector will be taken out of service until the problem is resolved. This is done by clicking on the detector in Alphavision. Right click on the the detector, select detector properties, check the “out of service” box and fill in the description field briefly explaining the problem. Mark the detector with an OOS tag as a visual indicator of its status.

10.5.3.3 The instrument may be returned to service once the malfunction has been corrected and the above acceptance criteria have been met. Note any repairs in the maintenance log.

10.6 Calibration process in the Software

10.6.1 Alpha Detector System Energy and Efficiency Calibration

10.6.1.1 Place the correct source into the detector.

10.6.1.2 In the Alphavision software, click on Calibration Icon.

10.6.1.3 Click on detector to be calibrated.

10.6.1.4 Select Calibration from the Tool Bar.

10.6.1.5 Select Process

10.6.1.5.1 The Calibration Explorer Window will appear.

10.6.1.6 In the General Window, name the Calibration with the month, year_detector format. (JAN2001_AV1)

10.6.1.7 Choose correct template for source to count

10.6.1.8 Click next

10.6.1.9 In the Acquisition window, confirm count time of 140 minutes

10.6.1.10 Click next

10.6.1.11 In the Energy/Efficiency Calibration Window, confirm the correct source is used, and select which shelf the source is on. (This will either be 1 or 2)

10.6.1.12 Click next

10.6.1.13 In the Report Window, select print on completion

10.6.1.14 Click finish

10.6.1.15 When count is complete, the Manual Energy and Efficiency Calibration Window will appear. In this window, select Calibration ROI, select Calibrate, and Save.

10.6.1.16 Repeat for each detector

10.6.1.17 Record the calibration in the Alpha Maintenance Log Book.

10.6.2 **Detector Background Counting**

10.6.2.1 Select the Batch Icon

10.6.2.2 Select backgrounds from the Tool Bar

10.6.2.3 Select Process.

10.6.2.3.1 This will open the General Window in Batch Wizard

10.6.2.4 Name the background with month_year format. (JAN_04)

10.6.2.5 Select correct template (provided by analyst)

10.6.2.6 Click next.

10.6.2.7 In the Sample Window, add all detector names.

10.6.2.8 Click next

10.6.2.9 In the Acquisition Window, confirm count time is set at 960 minutes or 1200 minutes for special projects (or as long as the longest sample count time)

10.6.2.10 Click next

10.6.2.11 In the Analysis Set Up Page, select Background Library and Background ROI, check the Use ROI box.

10.6.2.12 Click next

10.6.2.13 In the Report Window, select print on completion

10.6.2.14 Click finish

10.6.2.15 The Detector Assignment worksheet will appear, assign detectors, and select start now.

10.6.2.16 Record the backgrounds in the instrument maintenance log.

10.6.2.17 The background spectrum will be processed by the software

10.6.2.18 The detectors shall be "categorized" after each monthly background. The detectors will be labelled as follows:

<u>Counts in Region of Interest (i.e. Th230, Th232, U234, U238, Pu238, Pu239</u>):

- 0-2 counts – Blue – Ultra Low Level
- 0-4 counts – Yellow – Intermediate Low Level
- 4-20 counts – Green – Low Level
- Detectors 1-8 –Red – Always designated for Routine analysis when the RL=1 or the activity is from a known radioactive site. Upper count limit of 40 counts
- 20 hour background (Th & U only) – White – Upper limit of 40 counts
- 20 hour background – No Color – Upper count limit of 20 chounds

See Attachment 1 Detector Color Key

10.6.2.19 Detectors with backgrounds above the counts listed above are taken out of service for cleaning.

10.6.2.20 Detectors may also be removed from service when there is a visible peak present or at analyst judgment.

10.6.2.21 Backgrounds will be 2nd reviewed before placing into service and a notation of acceptable will be listed in the electronic monthly maintenance log.

10.6.2.22 Detector Cleaning

10.6.2.22.1 Clean detector surface with ethanol and a clean cotton ball.

10.6.2.22.2 Clean the sample tray and place a clean background planchette on the tray.

10.6.2.22.3 A passing background cont is required before returning the detector to service.

11.0 PROCEDURE

11.1 For sample preparation reference the applicable actinide SOPs: ST-RC-0040, ST-RC-0210, ST-RC-0232, ST-RC-0238, ST-RC-0241, ST-RC-0242 and ST-RC-0246.

11.2 Initial Setup

11.2.1 Establish the normal instrument settings for all controls.

11.2.1.1 Detector specific high voltage settings and required polarity are listed in the method software settings.

11.2.2 Pulser quality controls shall be checked before each use of the instrument.

11.3 Counting Samples

11.3.1 In Radcapture, go to Utilities,export, Alphavision batch data, enter batch #, and ok export to Alphavision.

11.3.2 In Alphavision, go to Process, select Batch to open the Batch Wizard.

11.3.3 Choose Load from LIMS, and pick the batch.

11.3.4 Choose test by clicking on the correct isotope test

11.3.5 Select Next

11.3.6 Click on blank, and then pick blank type (Uu blank, Pu Blank, ect)

11.3.7 Click on LCS, and then pick LCS type with correct spike number. For amount, use the spike aliquot amount (0.1, 0.2mL, 0.1326g, etc).

11.3.8 Select Next

11.3.9 Live time is count time. Enter correct count time for the batch, select next,

11.3.10 Select Nuclide Library, choose correct ROI and tracer

11.3.11 Select next

11.3.12 Change TPU Sigma to 2 (unless otherwise noted in client requirements), select correct activity units (DPM, pCi, etc), select Activity concentration.

11.3.13 Select Next, two times

11.3.14 Select Print on Completion

11.3.15 Select Finish

11.3.16 Click and drag correct detectors to the correct sample id and select Start Now.

11.3.17 The spectrum will be processed by the software.

11.3.18 For DOE: the FWHM of each tracer peak shall be <= 100keV; the tracer peak energy for each sample shall be within +/-50keV of the expected energy.

11.3.19 Backgrounds are checked after high activity samples

11.4 Samples with a count rate of greater than 1 CPS should be removed from the alpha counting system to prevent contamination of detector(s).

11.4.1 Alpha detectors exposed to samples with count rates greater than 1 CPS should be tagged out-of-service until an empty chamber check can be performed. To perform an empty chamber check, place a clean stainless steel disc in the chamber, establish vacuum, turn on bias and start acquisition for the pre-set time (180 minutes). Note this in the instrument and maintenance log.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery, RPD, uncertainty, MDC, tracer recovery) and standard instrument software calculations are given in the TestAmerica St. Louis LQM.

12.1 Isotope ROIs and libraries are derived from the PCNudat master nuclide library in this SOP.

12.1.1 http://www.nndc.bnl.gov/nudat2/indx_dec.jsp

12.2 Any manual integration of a peak or group of peaks must be documented. In all instances where the data system report has been edited or where manual integration has been performed, the operator must clearly identify such edits or manual procedures. Reference SOP ST-QA-0040 for details.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target anlaytes present above ½ RL), will be noted on the client requirements sheet.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are also designated in Clouseau.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes must be within the specified control limits for accuracy (%Recovery) and precision (RPD).

13.3.2 Corrective Action for LCS not meeting acceptance criteria:

13.3.2.1 <u>LCS Spike Recovery excursion (high)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.2.2 <u>LCS Spike Recovery excursion (low)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.2.3 <u>RPD/RER Duplicate excursion</u> – See Clouseau NCM for corrective action (e.g. reanalysis, narration).

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.2.1 <u>MS/MSD Spike Rec. excursion</u> may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Sample result evaluation

13.5.1 Tracer recovery must be within specified limits.

13.5.2 <u>Tracer/Carrier recovery low</u>– See Clouseau NCM for corrective action.

13.5.3 <u>Tracer/Carrier recovery high</u>– See Clouseau NCM for corrective action.

13.5.3.1 A sample tracer recovery outside QC limits may be accepted if the sample results are determined valid:

13.5.3.2 minimum number of tracer counts

13.5.3.3 level of uncertainty

13.5.3.4 client project requirements/approval

13.5.4 These expections will be documented using the NCM process. The NCM will narrate the conditions upon which the sample results were accepted with tracer recovery excursions.

13.5.5 The following occurances require a dilution to be performed:

13.5.5.1 A peak is significantly tailing out side its region of interest

13.5.5.2 The tracer recovery is low due the high activity of the sample
13.5.5.3 A Peak is observed which is identified as an interference
13.5.5.4 Dilution level is determined by taking the highest gross counts divided by the count time multiplied by a factor of 2. (ie: 3580/180*2=1:40)

13.6 Insufficient Sample

13.6.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in QAM

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in QAM.

14.1 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference HASL 300 28th Edition Methods that have been validated by the DOE and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 Department of Energy (DOE) Environmental Measurement Laboratory (EML) HASL 300 28th Edition method A-01-R, Alpha Radioassay

17.2 AlphaVision-32, Alpha Particle Spectrum Acquistion and Analysis for Microsoft Windows and NT, Software Version 5.0 Installation, User Interface and Reference Guide, Ortec (latest version)

17.3 OCTETE Plus, Integrated Alpha-Spectroscopy System Hardware Operating Manual, 777720, Ortec (latest version)

17.4 MAESTRO-32, MCA Emulator for Microsoft Windows, A65-B32 Software User's Manual, 777800, Ortec (latest version)

17.5 U.S. Nuclear Regulatory Commission, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, Regulatory Guide 4.15.

17.6 "Quality Assurance Program Requirements for Nuclear Facilities", ANSI/ASME NQA-1 (latest edition).

17.7 TestAmerica, St. Louis Quality Assurance Manual, current revision

17.8 Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.9 Associated SOPs, current revisions
- 17.9.1 ST-PM-0002, Chain of Custody
- 17.9.2 ST-QA-0002, Standard and Reagent Preparation
- 17.9.3 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
- 17.9.4 ST-QA-0036 Non-Conformance Memorandum (NCM) Procedure
- 17.9.5 ST-QA-0040, Manual Integration Procedure
- 17.9.6 ST-RC-0040, Total Alpha Emitting Isotopes of Radium
- 17.9.7 ST-RC-0238, ISOTOPIC URANIUM BY EICHROM® UTEVA RESIN FOR VARIOUS MATRICES
- 17.9.8 ST-RC-0210, DETERMINATION OF POLONIUM-210 BY ALPHA SPECTROMETRY
- 17.9.9 ST-RC-0232, ISOTOPIC THORIUM AND/OR NEPTUNIUM IN VARIOUS MATRICES BY EICHROM® TEVA SEPARATION RESIN
- 17.9.10 ST-RC-0240, SOTOPIC AMERICIUM, CURIUM, PLUTIONIUM, THORIUM, AND URANIUM IN VARIOUS MATRICES BY EICHROM® SEPARATION RESIN
- 17.9.11 ST-RC-0241, AMERICIUM, PLUTONIUM, CURIUM, AND URANIUM IN VARIOUS MATRICES BY EICHROM® UTEVA AND TRU RESINS (WITH VACUUM BOX SYSTEM)
- 17.9.12 ST-RC-0242, ISOTOPIC THORIUM, PLUTONIUM AND URANIUM IN VARIOUS MATRICES BY EICHROM® SEPARATION RESINS
- 17.9.13 ST-RC-0246, ISOTOPIC AMERICIUM, CURIUM, URANIUM IN VARIOUS MATRICES BY EICHROM® SEPARATION RESINS

18.0 MODIFICATIONS TO REFERENCE METHOD

18.1 Energy calibrations checks are performed monthly. Daily pulsar checks are performed in place of the weekly energy calibration checks.

19.0 CHANGES TO PREVIOUS REVISION

19.1 No Changes- Annual Review
19.2 Rev. 8
19.2.1 Section 10 additions
19.2.1.1 Addition of Instrument setup as §10.1
19.2.1.2 Addition of Calibration Quality Control Check as §10.3
19.2.1.3 Addition of calibration acceptance criteria
19.3 Rev. 9
19.3.1 Section 10.5, addition of limits for pulser centroid and pulser energy
19.4 Rev. 10
19.4.1 Section 10:
19.4.1.1 2nd level review for ICV and CCV added to section 10
19.4.1.2 1200 minute setting for acquisition window for special projects
19.4.1.3 Upper control limits for long backgrounds
19.4.1.4 Detector cleaning
19.4.2 Section 12: addition of ROI and library reference
19.4.3 Section 13: Occurances that require dilution
19.4.4 Addition of Attachement 1

Attachment 1

AlphaVision Detector Key

Red – Routine only (AV1-AV8)

Green – Low Level 4+ counts (varies by month)

Yellow – Intermediate Low Level 0 – 4 counts (varies by month)
Special Projects Only

Blue – Ultra Low Level (for Pu/Am/Np)
Special Projects Only

OOS Tag – Out of Service (OOS)

White – 20 Hour background (Th and U only)

No Color – 20 Hour background

TAL Reference Data Summary

Structured Analysis Code:	**A-88-2I-01-06**	Matrix:	SOLID
Target Analyte List:	All Analytes	Extraction:	NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
		Method:	Iso URANIUM (SHORT CT) DOE A-01-R MOD
		QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3743	Total Uranium		ug/g			0														

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Structured Analysis Code: A-88-2M-01-06	Matrix: SOLID
	Extraction: NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
	Method: Iso URANIUM (LONG CT) DOE A-01-R MOD
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3743	Total Uranium		ug/g			0														
4129	Uranium 234		ug/g			0	C	Y			80	122	40	C	Y			70	130	40
4131	Uranium 235		ug/g			0														
4133	Uranium 238		ug/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code: A-88-2O-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
Method: Iso THORIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513								Spike List 6557							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228		mg/kg			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230		mg/kg			0	C	Y			79	116	40	C	Y			76	115	40
4121	Thorium 232		mg/kg			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: A-88-4B-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
Method: Determination of Isotpic Uranium Percentages
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6543								Spike List 6587							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5575	% Uranium-235		%			0														
5576	% Uranium-234		%			0														
5577	% Uranium-238		%			0														
5929	% Uranium-233		%			0														

Structured Analysis Code:	**A-IB-2I-01-06**	Matrix:	SOLID
		Extraction:	Uranium (ONLY) by Ion Ex and/or Extraction Chromatogra
Target Analyte List:	All Analytes	Method:	Iso URANIUM (SHORT CT) DOE A-01-R MOD
		QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4129	Uranium 234	1	pCi/g			0	C	Y			80	122	40	C	Y			70	130	40
4131	Uranium 235	1	pCi/g			0														
5385	Uranium 236	1	pCi/g			0														
4133	Uranium 238	1	pCi/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code: A-IB-2M-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Uranium (ONLY) by Ion Ex and/or Extraction Chromatogra
Method: Iso URANIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4129	Uranium 234	0.1	pCi/g			0	C	Y			80	122	40	C	Y			70	130	40
4131	Uranium 235	0.1	pCi/g			0														
5385	Uranium 236	0.1	pCi/g			0														
4133	Uranium 238	0.1	pCi/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code: A-J2-2I-01-06	Matrix: SOLID
Target Analyte List: All Analytes	Extraction: Extraction Chromatography - Sequential Actinides
	Method: Iso URANIUM (SHORT CT) DOE A-01-R MOD
	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5789	Uranium 233/234	1	pCi/g			0														
4129	Uranium 234	1	pCi/g			0	C	Y			80	122	40	C	Y			70	130	40
5790	Uranium 235/236	1	pCi/g			0														
4133	Uranium 238	1	pCi/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code: A-J2-2J-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Sequential Actinides
Method: Am241, Cm243/244 (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3984	Americium 241	1.0	pCi/g			0	C	Y			67	120	40	C	Y			76	127	40
5618	Curium 243/244	1.0	pCi/g			0														
3986	Curium 242	1.0	pCi/g			0														

Structured Analysis Code:	**A-J2-2K-01-06**	Matrix:	SOLID
		Extraction:	Extraction Chromatography - Sequential Actinides
		Method:	Iso THORIUM (SHORT CT) DOE A-01-R MOD
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513							Spike List 6557						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	1.0	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	1.0	pCi/g			0	C	Y			79	116	40	C	Y			76	115	40
4121	Thorium 232	1.0	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: A-J2-2L-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Sequential Actinides
Method: Iso PLUTONIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6510							Spike List 6554						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5463	Plutonium 244	0.1	pCi/g			0														
3989	Plutonium 238	0.1	pCi/g			0	C	Y			78	118	40	C	Y			75	110	40
4093	Plutonium 239/40	0.1	pCi/g			0	C	Y			84	117	40	C	Y			82	113	40
4091	Plutonium 242	0.1	pCi/g			0														

Structured Analysis Code: A-J2-2M-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Sequential Actinides
Method: Iso URANIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4119	Thorium 231	0.1	pCi/g			0														
4123	Thorium 234	0.1	pCi/g			0														
5789	Uranium 233/234	0.1	pCi/g			0														
4129	Uranium 234	0.1	pCi/g			0	C	Y			80	122	40	C	Y			70	130	40
5790	Uranium 235/236	0.1	pCi/g			0														
4133	Uranium 238	0.1	pCi/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code: A-J2-2N-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Sequential Actinides
Method: Am241, Cm243/244 (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3984	Americium 241	0.1	pCi/g			0	C	Y			67	120	40	C	Y			76	127	40
5618	Curium 243/244	0.1	pCi/g			0														
3986	Curium 242	0.1	pCi/g			0														

Structured Analysis Code: A-J2-2O-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Sequential Actinides
Method: Iso THORIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513							Spike List 6557						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4115	Thorium 228	0.1	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	0.1	pCi/g			0	C	Y			79	116	40	C	Y			76	115	40
4121	Thorium 232	0.1	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: A-J2-3K-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Sequential Actinides
Method: ISO NEPTUNIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6526							Spike List 6558						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4069	Neptunium 237	1	pCi/g			0	C	Y			39	134	40	C	Y			68	112	40

Structured Analysis Code: A-J2-3L-01-06	Matrix: SOLID
Target Analyte List: All Analytes	Extraction: Extraction Chromatography - Sequential Actinides
	Method: ISO NEPTUNIUM (LONG CT) DOE A-01-R MOD
	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6526								Spike List 6558							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4069	Neptunium 237	0.1	pCi/g			0	C	Y			39	134	40	C	Y			68	112	40

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Structured Analysis Code: A-JB-3P-01-06	Matrix: SOLID
	Extraction: Extraction Chromatography - Pu-242
	Method: Plutonium-242 by DOE A-01-R Mod
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6537							Spike List 6538						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5463	Plutonium 244	1	pCi/g			0														
4091	Plutonium 242	1	pCi/g			0	C	Y			75	128	40	C	Y			75	128	40

Structured Analysis Code: A-JC-3Q-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - IsoCm
Method: Cm245/246, Cm 247/248, Am243 DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6586							Spike List 6542						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3993	Americium 243	1	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
5551	Curium-245/246	1	pCi/g			0														
5619	Curium 247/248	1	pCi/g			0														

Structured Analysis Code: A-JD-3R-01-06	Matrix: SOLID
	Extraction: Extraction Chromatography - U-232
	Method: Iso URANIUM-232 by DOE A-01-R Mod
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6543								Spike List 6587							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4166	Uranium-232	1	pCi/g			0	C	Y			73	115	40	C	Y			74	100	40

Structured Analysis Code: A-JZ-5G-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography - Th-229
Method: Thorium-229 by DOE A-01-R Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6514							Spike List 6515						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	1.0	pCi/g			0														
4392	Thorium 229	1.0	pCi/g			0	C	Y			70	130	0	C	Y			70	130	0
4117	Thorium 230	1.0	pCi/g			0	T	Y			30	108	40	T	Y			30	110	40
4121	Thorium 232	1.0	pCi/g			0														

Structured Analysis Code: A-K7-2I-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Iso URANIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4119	Thorium 231	1	pCi/g			0														
4123	Thorium 234	1	pCi/g			0														
5789	Uranium 233/234	1	pCi/g			0														
4129	Uranium 234	1	pCi/g			0	C	Y			80	122	40	C	Y			70	130	40
4131	Uranium 235	1	pCi/g			0														
5790	Uranium 235/236	1	pCi/g			0														
5385	Uranium 236	1	pCi/g			0														
4133	Uranium 238	1	pCi/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code:	**A-K7-2J-01-06**	Matrix:	SOLID
		Extraction:	As Received, Extraction Chromatography - Seq. Actinides
Target Analyte List:	All Analytes	Method:	Am241, Cm243/244 (SHORT CT) DOE A-01-R MOD
		QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3984	Americium 241	1.0	pCi/g			0	C	Y			67	120	40	C	Y			76	127	40
5618	Curium 243/244	1.0	pCi/g			0														
3986	Curium 242	1.0	pCi/g			0														

Structured Analysis Code:	**A-K7-2K-01-06**	Matrix:	SOLID
		Extraction:	As Received, Extraction Chromatography - Seq. Actinides
		Method:	Iso THORIUM (SHORT CT) DOE A-01-R MOD
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513							Spike List 6557							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	1.0	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	1.0	pCi/g			0	C	Y			79	116	40	C	Y			76	115	40
4121	Thorium 232	1.0	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: A-K7-2L-01-06	Matrix: SOLID
	Extraction: As Received, Extraction Chromatography - Seq. Actinides
Target Analyte List: All Analytes	Method: Iso PLUTONIUM (LONG CT) DOE A-01-R MOD
	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		**Detection Limits**					**Check List 6510**							**Spike List 6554**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3989	Plutonium 238	0.1	pCi/g			0	C	Y			78	118	40	C	Y			75	110	40
4093	Plutonium 239/40	0.1	pCi/g			0	C	Y			84	117	40	C	Y			82	113	40
4091	Plutonium 242	0.1	pCi/g			0														

Structured Analysis Code:	**A-K7-2M-01-06**	Matrix:	SOLID
		Extraction:	As Received, Extraction Chromatography - Seq. Actinides
		Method:	Iso URANIUM (LONG CT) DOE A-01-R MOD
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		**Detection Limits**					**Check List 6511**							**Spike List 6555**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4119	Thorium 231	0.1	pCi/g			0														
4123	Thorium 234	0.1	pCi/g			0														
5789	Uranium 233/234	0.1	pCi/g			0														
4129	Uranium 234	0.1	pCi/g			0	C	Y			80	122	40	C	Y			70	130	40
4131	Uranium 235	0.1	pCi/g			0														
5790	Uranium 235/236	0.1	pCi/g			0														
5385	Uranium 236	0.1	pCi/g			0														
4133	Uranium 238	0.1	pCi/g			0	C	Y			81	120	40	C	Y			70	130	40

Structured Analysis Code: A-K7-2N-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Am241, Cm243/244 (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3984	Americium 241	0.1	pCi/g			0	C	Y			67	120	40	C	Y			76	127	40
5618	Curium 243/244	0.1	pCi/g			0														
3986	Curium 242	0.1	pCi/g			0														

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Structured Analysis Code: A-K7-2O-01-06		Matrix: SOLID
		Extraction: As Received, Extraction Chromatography - Seq. Actinides
		Method: Iso THORIUM (LONG CT) DOE A-01-R MOD
Target Analyte List: All Analytes		QC Program: STANDARD TEST SET
		Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513							Spike List 6557						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	0.1	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	0.1	pCi/g			0	C	Y			79	116	40	C	Y			76	115	40
4121	Thorium 232	0.1	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: A-K7-3K-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: ISO NEPTUNIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6526							Spike List 6558						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4069	Neptunium 237	1	pCi/g			0	C	Y			39	134	40	C	Y			68	112	40

Structured Analysis Code:	**A-K7-3L-01-06**
Target Analyte List:	All Analytes
Matrix:	SOLID
Extraction:	As Received, Extraction Chromatography - Seq. Actinides
Method:	ISO NEPTUNIUM (LONG CT) DOE A-01-R MOD
QC Program:	STANDARD TEST SET
Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6526							Spike List 6558						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4069	Neptunium 237	0.10	pCi/g			0	C	Y			39	134	40	C	Y			68	112	40
4070	Np-237	0.10	pCi/g			0														

Structured Analysis Code: A-K7-3Q-01-06	Matrix: SOLID
Target Analyte List: All Analytes	Extraction: As Received, Extraction Chromatography - Seq. Actinides
	Method: Cm245/246, Cm 247/248, Am243 DOE A-01-R MOD
	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		**Detection Limits**					**Check List 6586**							**Spike List 6542**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3993	Americium 243	1	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
5551	Curium-245/246	1	pCi/g			0														
5619	Curium 247/248	1	pCi/g			0														

Structured Analysis Code: I-88-2I-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
Method: Iso URANIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511								Spike List 6555							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD		
3743	Total Uranium		pCi/L			0																
5780	Total Uranium, dissolved		pCi/L			0																

Structured Analysis Code:	**I-88-2M-01-06**	Matrix:	WATER
		Extraction:	NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
		Method:	Iso URANIUM (LONG CT) DOE A-01-R MOD
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3743	Total Uranium		ug/ml			0														
4129	Uranium 234		ug/ml			0	C	Y			82	118	40	C	Y			65	146	40
4131	Uranium 235		ug/ml			0														
4133	Uranium 238		ug/ml			0	C	Y			80	121	40	C	Y			68	143	40

Structured Analysis Code: I-88-2O-01-06	Matrix: WATER
	Extraction: NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
	Method: Iso THORIUM (LONG CT) DOE A-01-R MOD
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513								Spike List 6557							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228		ug/L			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230		ug/L			0	C	Y			77	116	40	C	Y			82	139	40
4121	Thorium 232		ug/L			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: I-88-4B-01-06	Matrix: WATER
Target Analyte List: All Analytes	Extraction: NO SAMPLE PREPARATION PERFORMED / DIRECT INJI
	Method: Determination of Isotpic Uranium Percentages
	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6543							Spike List 6587						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5575	% Uranium-235		%			0														
5576	% Uranium-234		%			0														
5577	% Uranium-238		%			0														
5929	% Uranium-233		%			0														

Structured Analysis Code: I-J2-2J-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography - Sequential Actinides
Method: Am241, Cm243/244 (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		**Detection Limits**					**Check List 6512**							**Spike List 6556**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3984	Americium 241	1.0	pCi/L			0	C	Y			80	116	40	C	Y			70	130	40
5618	Curium 243/244	1.0	pCi/L			0														
3986	Curium 242	1.0	pCi/L			0														

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Structured Analysis Code: I-J2-2K-01-06	Matrix: WATER
	Extraction: Extraction Chromatography - Sequential Actinides
	Method: Iso THORIUM (SHORT CT) DOE A-01-R MOD
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513								Spike List 6557							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	1.0	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	1.0	pCi/L			0	C	Y			77	116	40	C	Y			82	139	40
4121	Thorium 232	1.0	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: I-J2-2L-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography - Sequential Actinides
Method: Iso PLUTONIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6510							Spike List 6554						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5463	Plutonium 244	0.1	pCi/L			0														
3989	Plutonium 238	0.1	pCi/L			0	C	Y			79	115	40	C	Y			70	130	40
4093	Plutonium 239/40	0.1	pCi/L			0	C	Y			85	120	40	C	Y			70	130	40
4091	Plutonium 242	0.1	pCi/L			0														

Structured Analysis Code: I-J2-2M-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography - Sequential Actinides
Method: Iso URANIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4119	Thorium 231	0.1	pCi/L			0														
4123	Thorium 234	0.1	pCi/L			0														
5779	Uranium 234, dissolved	0.1	pCi/L			0														
5773	Uranium 238, dissolved	0.1	pCi/L			0														
5789	Uranium 233/234	0.1	pCi/L			0														
4129	Uranium 234	0.1	pCi/L			0	C	Y			82	118	40	C	Y			65	146	40
5790	Uranium 235/236	0.1	pCi/L			0														
4133	Uranium 238	0.1	pCi/L			0	C	Y			80	121	40	C	Y			68	143	40

Structured Analysis Code:	**I-J2-2N-01-06**	Matrix:	WATER
		Extraction:	Extraction Chromatography - Sequential Actinides
		Method:	Am241, Cm243/244 (LONG CT) DOE A-01-R MOD
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3984	Americium 241	0.1	pCi/L			0	C	Y			80	116	40	C	Y			70	130	40
5618	Curium 243/244	0.1	pCi/L			0														
3986	Curium 242	0.1	pCi/L			0														

Structured Analysis Code: I-J2-2O-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography - Sequential Actinides
Method: Iso THORIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513								Spike List 6557							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4115	Thorium 228	0.1	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	0.1	pCi/L			0	C	Y			77	116	40	C	Y			82	139	40
4121	Thorium 232	0.1	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code:	**I-J2-3K-01-06**	Matrix:	WATER
		Extraction:	Extraction Chromatography - Sequential Actinides
		Method:	ISO NEPTUNIUM (SHORT CT) DOE A-01-R MOD
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		**Detection Limits**					**Check List 6526**							**Spike List 6558**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4069	Neptunium 237	1	pCi/L			0	C	Y			58	126	40	C	Y			70	130	40

Structured Analysis Code: I-J2-3L-01-06	Matrix: WATER
	Extraction: Extraction Chromatography - Sequential Actinides
	Method: ISO NEPTUNIUM (LONG CT) DOE A-01-R MOD
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		**Detection Limits**					**Check List 6526**							**Spike List 6558**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4069	Neptunium 237	0.10	pCi/L			0	C	Y			58	126	40	C	Y			70	130	40
4070	Np-237	0.10	pCi/L			0														

Structured Analysis Code: I-JB-3P-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography - Pu-242
Method: Plutonium-242 by DOE A-01-R Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6537							Spike List 6538						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5463	Plutonium 244	1	pCi/L			0														
4091	Plutonium 242	1	pCi/L			0	C	Y			90	114	40	C	Y			90	114	40

Structured Analysis Code: I-JC-3Q-01-06	Matrix: WATER
	Extraction: Extraction Chromatography - IsoCm
Target Analyte List: All Analytes	Method: Cm245/246, Cm 247/248, Am243 DOE A-01-R MOD
	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6586							Spike List 6542						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3993	Americium 243	1	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40
5551	Curium-245/246	1	pCi/L			0														
5619	Curium 247/248	1	pCi/L			0														

Structured Analysis Code:	**I-JD-3R-01-06**	Matrix:	WATER
Target Analyte List:	All Analytes	Extraction:	Extraction Chromatography - U-232
		Method:	Iso URANIUM-232 by DOE A-01-R Mod
		QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List			**Detection Limits**				**Check List 6543**							**Spike List 6587**						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4166	Uranium-232	1	pCi/L			0	C	Y			70	130	40	C	Y			70	96	40

Structured Analysis Code:	**I-JZ-5G-01-06**	Matrix:	WATER
		Extraction:	Extraction Chromatography - Th-229
		Method:	Thorium-229 by DOE A-01-R Mod
Target Analyte List:	All Analytes	QC Program:	STANDARD TEST SET
		Location:	TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6514							Spike List 6515							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	1.0	pCi/L			0	C	Y			85	125	40	C	Y			85	125	40
4392	Thorium 229	1.0	pCi/L			0	C	Y			70	130	0	C	Y			70	130	0
4117	Thorium 230	1.0	pCi/L			0	T	Y			30	110	40	T	Y			30	110	40
4121	Thorium 232	1.0	pCi/L			0	C	Y			81	124	40	C	Y			81	124	40

Structured Analysis Code: I-NT-2I-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography - Sequential Actinides, Dissolve
Method: Iso URANIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6600							Spike List 6601						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5781	Uranium 234, Dissolved	1	pCi/L			0	C	Y			84	124	40	C	Y			65	146	40
6204	Uranium 235/236, Dissolved	1	pCi/L			0														
5784	Uranium 238, Dissolved	1	pCi/L			0	C	Y			84	121	40	C	Y			68	143	40

Structured Analysis Code: I-NT-2K-01-06	Matrix: WATER
	Extraction: Extraction Chromatography - Sequential Actinides, Dissolve
	Method: Iso THORIUM (SHORT CT) DOE A-01-R MOD
Target Analyte List: All Analytes	QC Program: STANDARD TEST SET
	Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6517								Spike List 6518							
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
5768	Thorium 228, dissolved	1.0	pCi/L			0	C	Y			70	130	20	C	Y			70	130	20
5769	Thorium 230, dissolved	1.0	pCi/L			0	C	Y			79	123	20	C	Y			82	139	20
5770	Thorium 232, dissolved	1.0	pCi/L			0	C	Y			70	130	20	C	Y			70	130	20

Structured Analysis Code: S-K7-2I-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Iso URANIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4119	Thorium 231	1	pCi/sampl			0														
4123	Thorium 234	1	pCi/sampl			0														
5789	Uranium 233/234	1	pCi/sampl			0														
4129	Uranium 234	1	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40
4131	Uranium 235	1	pCi/sampl			0														
5790	Uranium 235/236	1	pCi/sampl			0														
5385	Uranium 236	1	pCi/sampl			0														
4133	Uranium 238	1	pCi/sampl			0	C	Y			76	125	40	C	Y			70	130	40

Structured Analysis Code: S-K7-2J-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Am241, Cm243/244 (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3984	Americium 241	1.0	pCi/sampl			0	C	Y			70	130	20	C	Y			70	130	40
5618	Curium 243/244	1.0	pCi/sampl			0														
3986	Curium 242	1.0	pCi/sampl			0														

Structured Analysis Code: S-K7-2K-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Iso THORIUM (SHORT CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513							Spike List 6557						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4115	Thorium 228	1.0	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	1.0	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40
4121	Thorium 232	1.0	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40

Structured Analysis Code: S-K7-2L-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Iso PLUTONIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6510								Spike List 6554							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3989	Plutonium 238	0.1	pCi/sampl			0	C	Y			74	113	40	C	Y			50	150	20
4093	Plutonium 239/40	0.1	pCi/sampl			0	C	Y			85	117	40	C	Y			50	150	20
4091	Plutonium 242	0.1	pCi/sampl			0														

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Structured Analysis Code: S-K7-2M-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Iso URANIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6511							Spike List 6555						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4119	Thorium 231	0.1	pCi/sampl			0														
4123	Thorium 234	0.1	pCi/sampl			0														
5789	Uranium 233/234	0.1	pCi/sampl			0														
4129	Uranium 234	0.1	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40
4131	Uranium 235	0.1	pCi/sampl			0														
5790	Uranium 235/236	0.1	pCi/sampl			0														
5385	Uranium 236	0.1	pCi/sampl			0														
4133	Uranium 238	0.1	pCi/sampl			0	C	Y			76	125	40	C	Y			70	130	40

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Structured Analysis Code: S-K7-2N-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Am241, Cm243/244 (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6512							Spike List 6556						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
3984	Americium 241	0.1	pCi/sampl			0	C	Y			70	130	20	C	Y			70	130	40
5618	Curium 243/244	0.1	pCi/sampl			0														
3986	Curium 242	0.1	pCi/sampl			0														

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Structured Analysis Code: S-K7-2O-01-06

Target Analyte List: All Analytes

Matrix: AIR
Extraction: As Received, Extraction Chromatography - Seq. Actinides
Method: Iso THORIUM (LONG CT) DOE A-01-R MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6513							Spike List 6557						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4115	Thorium 228	0.1	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40
4117	Thorium 230	0.1	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40
4121	Thorium 232	0.1	pCi/sampl			0	C	Y			70	130	40	C	Y			70	130	40

Title: LIQUID SCINTILLATION COUNTER ANALYSIS

Approvals (Signature/Date):

3/5/12	3/5/12
Chris Hough Date	Michael Ridenhower Date
Radiochemistry Manager	Health & Safety Manager / Coordinator
3.5.12	3/5/12
Marti Ward Date	Elaine Wild Date
Quality Assurance Manager	Laboratory Director

This SOP was previously identified as SOP No. ST-RD-0302 Rev. 12

Facility Distribution No.: 0 Distributed To: See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This procedure provides instruction for the operation of the Packard Tri-Carb series3170, Packard Tri-Carb series 3180, and Packard Tri-Carb 2550 CA/LL Liquid Scintillation Analyzer.

1.2 This procedure applies to all samples that are analyzed using the liquid scintillation counter, namely:

- Carbon 14
- Iodine 129
- Iron 55
- Lead 210
- Nickel 59 and 63
- Plutonium 241
- Technetium 99
- Tritium
- Iodine 131
- Total Activity

1.3 The reporting limits, method detectable activities and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 The liquid scintillation counter is calibrated with standards containing a known quantity of H^3, Iodine 131, C-14, Fe-55, I-129, Ni-59/63, Pb-210, Pu-241, and Tc-99. Not every instrument is calibrated for every nuclide. However, any instrument used to analyze a given method is calibrated for the nuclide requested.

2.2 Prepared samples are loaded into the sample tray and counted.

3.0 DEFINITIONS

3.1 See the TestAmerica Quality Assurance Manual (QAM) for a glossary of common terms and data reporting qualifiers.

3.2 Quenching - The interference with the conversion of decay energy to electronic signal in the photo multiplier tubes resulting in a reduction in counting efficiency. This can be caused by materials present in the scintillation solution that interfere with the process leading to the production of light as well as materials present that absorb the light before it reaches the photo multiplier tubes.

4.0 INTERFERENCES

4.1 See individual sample preparation SOPs.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS
None.

5.3 PRIMARY MATERIALS USED
The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

6.0 EQUIPMENT AND SUPPLIES

6.1 Packard Tri-Carb Series 3170, Packard 3180, Packard Tri-Carb 2550 CA/LL Liquid Scintillation Analyzers.

6.2 Liquid Scintillation Counter vials

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 DI Water Type obtained from the Milli-Q unit.

7.3 Unquenched standards:
- 7.3.1 Background Standard
- 7.3.2 Unquenched C -14 standard
- 7.3.3 Unquenched I-131 standard
- 7.3.4 Unquenched Fe-55 standard
- 7.3.5 Unquenched I-129 standard
- 7.3.6 Unquenched Ni-59/63 standard
- 7.3.7 Unquenched Pb-210 standard
- 7.3.8 Unquenched Pu-241 standard
- 7.3.9 Unquenched Tc-99 standard
- 7.3.10 Unquenched Tc-99 for Total Activity standard
- 7.3.11 Unquenched H3 standard
- 7.3.11 Unquenched Pm-147 standard

7.4 For Quench curves:
- 7.4.1 Quenched C-14 standard
- 7.4.2 Quenched I-131 standard
- 7.4.3 Quenched Fe-55 standard
- 7.4.4 Quenched I-129 standard
- 7.4.5 Quenched Ni-59/63 standard
- 7.4.6 Quenched Pb-210 standard
- 7.4.7 Quenched Pu-241 standard
- 7.4.8 Quenched Tc-99 standard
- 7.4.9 Quenched Tc-99 for Total Activity standard
- 7.4.10 Quenched H3 standard
- 7.4.11 Quenched Pm-147 standard

7.5 Standards may contain varying activities depending on the supplier and concentration availability of the nuclide of interest. However, all standards in a quench curve are counted until a minimum of 10,000 counts are collected.

7.6 Sample to cocktail ratios: See Attachment 1 of this SOP.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 See individual sample preparation SOP for specific sample handling and storage requirements.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), Matrix Spike (MS) and a sample duplicate (SD). In the event that there is insufficient sample to analyze a sample duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.3.1 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) may be performed upon client request, and are noted in the Client Requirement Sheets and Log-in.

9.2 **Method Blank**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.3 **Laboratory Control Sample**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.4 **Matrix Spike**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Sample Duplicate**

9.5.1 A Sample Duplicate is an additional aliquot of a field sample taken through the entire analytical process to demonstrate precision.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager.

See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Initial Calibration:

10.1.1 Prepare a quench curve for the nuclide of interest.

10.1.1.1 The process for quench curve preparation can be found on the print out of the previous calibration file.

10.1.2 Frequency:

10.1.2.1 Quench curves are performed minimally on an annual basis.

10.1.2.1.1 A new calibration curve is generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include any significant changes in instrument operating parameters, and major instrument maintenance.

10.1.3 Acceptance Criteria:

10.1.3.1 A minimum of 10,000 counts must be obtained for each data point

10.1.3.2 Correlation Coefficient (r^2) > 0.995 or each data point less than 7.5% relative to the calibrated value calculated from the fitted curve.

10.1.3.3 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for meeting criteria. Refer to the TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

10.2 Initial Calibration Verification (ICV)

10.2.1 The initial calibration verification standard is a different standard source than the one used for the initial calibration.

10.2.2 Validate the quench curve by counting at least three second source standards.

10.2.2.1 The process of preparing validation standards is found on the print out of the previous calibration file. The verification standards should contain an unquenched standard as well as quenched standards that represent the quench range of live samples.

10.2.3 Frequency:

10.2.3.1 An ICV is performed with every initial calibration.

10.2.4 Acceptance Criteria:

10.2.4.1 Mean Recovery +/- 10% of the known value.

10.2.4.1.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard.

10.2.4.1.2 Corrective action must be taken (including reanalysis of the ICV or analysis of a different ICV).

10.3 Continuing Calibration:

10.3.1 Load standards and use the appropriate protocol flag as listed on the status page “Daily QC”. The instrument will perform the required tests and the results are printed and saved to the Quality Control Table.

10.3.2 Frequency:

10.3.2.1 Quality control checks are performed for each day of use for the nuclides which measurements are being performed.

10.3.3 Acceptance Criteria:

10.3.3.1 The instruments are set at 2 sigma for a warning and 3 sigma for out of control limits.

10.3.3.2 If a Continuing Check fails and the analyst can document the reason for failure (e.g. carryover from the previous sample, etc.) then a second check may be analyzed without any adjustments to the instrument. If this check meets criteria then sample analysis may continue.

10.3.3.3 If this second check does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require calibration.

11.0 PROCEDURE

11.1 Confirm the following:

11.1.1 Computer software is loaded and operational.

11.1.2 Printer is on-line.

11.2 Load sample vials by lifting the instrument cover and placing samples in tray with flag facing towards the left.

11.3 Samples are counted from left to right. QC checks are run daily. Prior to starting samples, make sure the daily QC has run and is acceptable.

11.4 Position 1 in the sample tray is reserved for the background vial.

11.5 Log the following information into the Run Log:

11.5.1 Date

11.5.2 Batch number

11.5.3 Sample I.D.

11.5.4 Protocol No.

11.5.5 Count length

11.5.6 Type of analysis

11.5.7 Operator's initials

11.6 Close instrument cover and allow sample vials to dark-adapt per the cocktail manufacturer's instructions, typically 30 minutes.

11.7 Spectrum are assessed for interferences, peak shape, etc. against a known source either the LCS or the instruments reference manual.

11.8 For the Packard 2550 LSC:

11.8.1 Press F1 key until Status Page is displayed on monitor. Enter the protocol number and press Enter.

11.8.2 Press F3 Key and verify the desired count time is entered. If needed, use the arrow keys to go to the count time parameter and type in the correct count time. Then press the enter key. Press F1 key to return to the Status Page.

11.8.3 Verify sample tray is in the correct order, starting with the background, blank, LCS, followed by the samples. Label the prep sheet with the correct counting order.

11.8.4 Press F10 key to go to the Worklist page.

11.8.4 Use the arrow keys to go to the beginning of the Worklist. Place the cursor on the second line of the Worklist. Press F3 key repeatedly until all the lot numbers from the previous analysis have been deleted.

11.8.5 Scan current batch in correct sample order. Press enter twice between each sample ID Press F1 to exit worklist. Press F2 to confirm exit.

11.8.6 Press F11 key to start the analysis.

11.8.7 Data is sent to the printer

11.8.8 When the batch is done counting, save the data file and transfer to a disk.

11.8.8.1 To save the data file, select F5 (DOS Exit).

11.8.8.2 Place disk in drive and change directory and save data as follows: Type command *CD\spectrum* (this will change to the spectrum directory where the data is retrieved)

11.8.8.3 Type command *copy s.data X.XXX a:* (X.XXX will be found on the first page of the data printout). (This will copy the data to the disk)

11.8.8.4 Type command rename sdata.X.XXX batch number i.e. *rename sdata1.123 875413.* (this will rename the file in the spectrum directory)

11.8.8.5 Type command *exit* which will return to the status page. (The data is now saved to the disk)

11.8.8.6 Transfer the file the Upload folder, 2550 on SLSVR01.

11.9 For the Packard 3170 LSC and 3180 LSC:

11.9.1 Maximize the instrument window. Double click on the flag icon which has the protocol number that needs to be run. Click on the count conditions tab at the top of the analysis window. Enter the correct count time in the count time field.

11.9.2 Click on the Worklist tab at the top of the analysis window. Scan the samples from the Rad Capture paperwork.

11.9.3 Verify sample tray is in the correct order, starting with the background, blank, LCS, followed by the samples. Check tray order with the order appearing on the screen version of the worklist.

11.9.4 Click on the green start flag in the upper left corner of the instrument window.

11.9.5 Upon completion of counting, results will be sent to printer. The data is sent to the appropriate instrument folder.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Calculations are performed in RadCapture (TestAmerica St. Louis custom software). These calculations are printed directly from the software and are included the TestAmerica St. Louis QAM.

12.2 Commonly used calculations (e.g. % recovery, RPD, uncertainty, MDC, tracer recovery) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target anlaytes present above ½ RL), will be noted on the client requirements sheet.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 Method Blank Contamination – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes must be within the specified control limits for accuracy (%Recovery) and precision (RPD).

13.3.2 Corrective Action for LCS not meeting acceptance criteria:

13.3.2.1 LCS Spike Recovery excursion (high) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.2.2 LCS Spike Recovery excursion (low) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.2.3 RPD/RER Duplicate excursion – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.2.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Sample result evaluation

13.5.1 Tracer recovery must be within specified limits.
Tracer/Carrier recovery low– See Clouseau NCM for corrective action.

13.5.2 Tracer/Carrier recovery high– See Clouseau NCM for corrective action.

13.5.2.1 A sample tracer recovery outside QC limits may be accepted if the sample results are determined valid:

13.5.2.2 Minimum number of tracer counts

13.5.2.3 Level of uncertainty

13.5.2.4 Client project requirements/approval

13.5.3 These expectations will be documented using the NCM process. The NCM will narrate the conditions upon which the sample results were accepted with tracer recovery excursions.

13.6 Insufficient Sample

13.6.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA, DOE, and ASTM methodologies that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in QAM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method

16.0 WASTE MANAGEMENT

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Environmental Health and Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Acidic sample waste generated. All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "A" or "B."

16.2.1.2 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator."

17.0 REFERENCES

17.1 EPA-600/4-80-032. Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Environmental Monitoring and support Laboratory, Section 10, Method 906, "Tritium in Drinking Water", August, 1980

17.2 Standard Methods for the Examination of Water and Wastewater. 19th Edition, Method 7500-1B Mod "Precipitation Method", 1985

17.3 EPA 520/5-84-006, EERF Radiochemistry Procedures Manual, Method C-01-1, "Radiochemical Determination of Carbon-14 in Aqueous Samples", August 1984

17.4 Eichrom Technologies, Inc. Analytical Procedures, TCS01, "TC-99 in Soil", April, 2002

17.5 Eichrom Technologies, Inc. Analytical Procedures,TCW01, TC-99 in Water, April 2002

17.6 Eichrom Technologies, Inc. Analytical Procedures,OTW01, Pb-210 in Water, April 2001

17.7 Eichrom Technologies, Inc. Analytical Procedures,OTS01, Pb-210 in Soil, August, 2002

17.8 TestAmerica Quality Assurance Manual (QAM), current revision

17.9 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.10 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

17.11 Associated SOPs, current revisions

17.11.1 ST-PM-0002, Sample Receipt and Custody
17.11.2 ST-QA-0002, Standard and Reagent Preparation
17.11.3 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.11.4 ST-QA-0036, Non-conformance Memorandum (NCM) Process
17.11.5 ST-RC-0030, The Determination of Tritium in Water (and Other Fluids), Soil and Silica Gels
17.11.6 ST-RC-0031, Tritium Determination by Cryogenic Distillation
17.11.7 ST-RC-0042, Iodine-129 in Water
17.11.8 ST-RC-0055, Determination of Iron-55, Nickel-59 and Nickel-63 by Liquid Scintillation Spectrometry
17.11.9 ST-RC-0056 , Carbon-14 by Liquid Scintillation Spectrometry
17.11.10 ST-RC-0125, Determination of Technetium-99 using Eichrom® Teva Resin
17.11.11 ST-RC-0211, Determination of Lead-210 by Liquid Scintillation Counting
17.11.12 ST-RC-0245 , The Determination of Pu-241 by Liquid Scintillation Counting
17.11.12 ST-RC-0247, Promethium-147 and Samarium-151 analysis Utilizing Lanthide Resin Separation Procedure

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

18.1 EPA method 906 is a drinking water method, and as such formulated its' Tritium calculation to reflect counts per minute (CPM) rather than disintegrations per minute (dpm). In true drinking water samples, it is acceptable to use CPM since drinking water samples should have little effect on efficiencies. However, EPA method 906 is commonly referenced for wastewater samples, and even silica gels and soil matrices. For these matrices, there can be a significant difference in efficiency and thus using dpm provides a more accurate result.

19.0 CHANGES TO PREVIOUS REVISION

19.1 Added Promethium back to the list of standards in section 7.3.11 and 7.3.10.
19.2 Rev 13:
19.2.1 Added Iodine-131 and Total Activity to section 1.2.
19.2.2 Added Iodine-131 to section 2.1.
19.2.3 Added section 7.6 and attachment 1 to document sample to cocktail ratios
19.2.4 Removed redundant section 18.2.

Attachment 1

LIQUID SCINT. SAMPLE TO COCKTAIL RATIOS

ST-RC-0015	Total Activity	
Solid and Semi-solid Samples		
	0.25 - 3 mL	Sample
	15 - 17 mL	Cocktail
	18 mL	Final
Aqueous Samples		
	0.25 - 3 mL	Sample
	15 - 17 mL	Cocktail
	18 mL	Final
Oil Samples		
	3 mL	Sample
	15 mL	Cocktail
	18 mL	Final

ST-RC-0030	Tritium	
Steam Distillation (Water); Silica Gel; Solids (soil, filters/swipes); Direct Method - Water		
	10 mL	Sample
	10 mL	Cocktail
	20 mL	Final
Direct Method - Oil		
	1 - 2 mL	Sample
	18 - 19 mL	Cocktail
	20 mL	Final

ST-RC-0031	Tritium Cryo	
	10 mL	Sample must dilute to 10 mL total if 10 mL of sample not present
	10 mL	Cocktail
	20 mL	Final

ST-RC-0042	I-129	
Carrier Determination by ICP-MS		
	4.9 mL	Sample
	15 mL	Cocktail
	19.9 mL	Final
gravimetric carrier		
	5 mL	Sample
	15 mL	Cocktail
	20 mL	Final

ST-RC-0055	I-55 & Ni-59/63	
Iron		
	4.9 mL	Sample
	15 mL	Cocktail
	19.9 mL	Final
Nickel		
	3.9 mL	Sample
	16 mL	Cocktail
	19.9 mL	Final

ST-RD-0302_LqScint-Sample2CocktailRatio.xls Rev (0)

LIQUID SCINT. SAMPLE TO COCKTAIL RATIOS

ST-RC-0056	C-14		
	10 mL	Sample	
	10 mL	Cocktail	
	20 mL	Final	
ST-RC-0125	**Tc-99**		
	2 mL	TEVA resin	
	5 mL	dI Water	
	10 mL	Cocktail	
	17 mL	Final	
ST-RC-0211	**Pb-210**		
	5 mL	Sample	
	15 mL	Cocktail	
	20 mL	Final	
ST-RC-0245	**Pu-241**		
	4 mL	Sample	0.1 mL dI water rinse used
	16 mL	Cocktail	
	20 mL	Final	
ST-RC-0247	**Pm-147**		
	10 mL	Sample	
	10 mL	Cocktail	
	20 mL	Final	

ST-RD-0302_LqScint-Sample2CocktailRatio.xls Rev (0)

TAL Reference Data Summary

Structured Analysis Code: A-J3-3W-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography-> LSC Prep
Method: Ni-59 & Ni-63 by Liquid Scint. Spec.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6564							Spike List 6565						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4160	Nickel 59	5	pCi/g			0	C	Y			71	114	40	C	Y			70	130	40
4067	Nickel 63	5	pCi/g			0	C	Y			84	123	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-J3-3W-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography-> LSC Prep
Method: Ni-59 & Ni-63 by Liquid Scint. Spec.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6564							Spike List 6565						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4160	Nickel 59	5	pCi/L			0	C	Y			74	124	40	C	Y			70	130	40
4067	Nickel 63	5	pCi/L			0	C	Y			75	125	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: I-G8-1L-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Distillation and Suspended in LSC Cocktail
Method: Tritium by LSC by DOE H3-04-RC MOD.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6507							Spike List 6552						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	500	pCi/L			0	C	Y			75	114	40	C	Y			31	150	40

TAL Reference Data Summary

Structured Analysis Code: A-G8-1L-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Distillation and Suspended in LSC Cocktail
Method: Tritium by LSC by DOE H3-04-RC MOD.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6507							Spike List 6552						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	2	pCi/g			0	C	Y			80	114	40	C	Y			78	122	40

TAL Reference Data Summary

Structured Analysis Code: I-K5-1L-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: As Received, Direct Addition of Sample
Method: Tritium by LSC by DOE H3-04-RC MOD.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6507							Spike List 6552						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4045	Tritium	500	pCi/L			0	C	Y			75	114	40	C	Y			31	150	40

TAL Reference Data Summary

Structured Analysis Code: A-K6-1L-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Distillation and Suspension in LSC Cocktail
Method: Tritium by LSC by DOE H3-04-RC MOD.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6507							Spike List 6552						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	2	pCi/g			0	C	Y			80	114	40	C	Y			78	122	40

TAL Reference Data Summary

Structured Analysis Code: I-G8-ZC-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Distillation and Suspended in LSC Cocktail
Method: TRITIUM (Distill) by EPA 906.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6507							Spike List 6552						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	500	pCi/L			0	C	Y			75	114	40	C	Y			31	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G8-ZC-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Distillation and Suspended in LSC Cocktail
Method: TRITIUM (Distill) by EPA 906.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6507							Spike List 6552						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	1	pCi/g			0	C	Y			80	114	40	C	Y			78	122	40
4046	H3	1	pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: **I-IM-2Q-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TC-99 by Extraction Chromatography Resin (EIChroM)
Method: TC-99 by LSC by DOE TC-02-RC Mod.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6523							Spike List 6559						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4113	Technetium 99	3	pCi/L			0	C	Y			81	113	40	C	Y			68	121	40

TAL Reference Data Summary

Structured Analysis Code: A-IM-2Q-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TC-99 by Extraction Chromatography Resin (EIChroM)
Method: TC-99 by LSC by DOE TC-02-RC Mod.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6523							Spike List 6559						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4113	Technetium 99	1	pCi/g			0	C	Y			77	119	40	C	Y			73	111	40

TAL Reference Data Summary

Structured Analysis Code: A-KY-2Q-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Oil - Muffle/Ext Chromatography Resin
Method: TC-99 by LSC by DOE TC-02-RC Mod.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6523							Spike List 6559						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4113	Technetium 99	1	pCi/g			0	C	Y			77	119	40	C	Y			73	111	40

TAL Reference Data Summary

Structured Analysis Code: **A-HJ-ZC-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Cryogenic Tritium by LSC
Method: TRITIUM (Distill) by EPA 906.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6560							Spike List 6561						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	2	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-LG-2Q-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Recd,TC-99 by Extraction Chromatography Resin (EIChı
Method: TC-99 by LSC by DOE TC-02-RC Mod.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6523							Spike List 6559						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4113	Technetium 99	1	pCi/g			0	C	Y			77	119	40	C	Y			73	111	40

TAL Reference Data Summary

Structured Analysis Code: **A-JA-3O-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography -> LSC PREP
Method: Plutonium-241 by Liquid Scintillation
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6540							Spike List 6541						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4089	Plutonium 241	5	pCi/g			0	C	Y			61	132	40	C	Y			32	146	40

TAL Reference Data Summary

Structured Analysis Code: **I-JA-3O-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography -> LSC PREP
Method: Plutonium-241 by Liquid Scintillation
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6540							Spike List 6541						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4089	Plutonium 241	5	pCi/L			0	C	Y			70	106	40	C	Y			28	157	40

TAL Reference Data Summary

Structured Analysis Code: **A-LH-3W-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Recd,Ion Exchange Resin preconcentration and purificat
Method: Ni-59 & Ni-63 by Liquid Scint. Spec.
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6564							Spike List 6565						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4160	Nickel 59	5	pCi/g			0	C	Y			71	114	40	C	Y			70	130	40
4067	Nickel 63	5	pCi/g			0	C	Y			84	123	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: A-J5-3Y-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Purification as Lead Chloride
Method: Pb-210 by Liquid Scint. Counting
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6567							Spike List 6590						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4156	Lead 210	5	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: I-J5-3Y-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Purification as Lead Chloride
Method: Pb-210 by Liquid Scint. Counting
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6567							Spike List 6590						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4156	Lead 210	5	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-J3-3V-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography-> LSC Prep
Method: Iron-55 by Liquid Scint. Spectrometry
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6562							Spike List 6563						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4158	Iron 55	5	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-G8-4E-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Distillation and Suspended in LSC Cocktail
Method: Carbon 14 by EERF C-01-1
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6579							Spike List 6580						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4007	Carbon 14	20	pCi/L			0	C	Y			38	112	40	C	Y			37	121	40

TAL Reference Data Summary

Structured Analysis Code: **A-G8-4E-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Distillation and Suspended in LSC Cocktail
Method: Carbon 14 by EERF C-01-1
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6579							Spike List 6580						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4007	Carbon 14	5	pCi/g			0	C	Y			61	129	40	C	Y			78	110	40

TAL Reference Data Summary

Structured Analysis Code: **A-K6-4E-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Distillation and Suspension in LSC Cocktail
Method: Carbon 14 by EERF C-01-1
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6579							Spike List 6580						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4007	Carbon 14	5	pCi/g			0	C	Y			61	129	40	C	Y			78	110	40

TAL Reference Data Summary

Structured Analysis Code: **I-G8-1L-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Distillation and Suspended in LSC Cocktail
Method: Tritium by LSC by DOE H3-04-RC MOD.
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6878							Spike List 6879						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	500	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G8-1L-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Distillation and Suspended in LSC Cocktail
Method: Tritium by LSC by DOE H3-04-RC MOD.
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6878							Spike List 6879						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4045	Tritium	2	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G8-ZC-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Distillation and Suspended in LSC Cocktail
Method: TRITIUM (Distill) by EPA 906.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6878							Spike List 6879						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4045	Tritium	500	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-G8-ZC-DO-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Distillation and Suspended in LSC Cocktail
Method: TRITIUM (Distill) by EPA 906.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6878							Spike List 6879						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
4045	Tritium	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4046	H3	1	pCi/g			0														

TAL Reference Data Summary

Structured Analysis Code: A-IM-2Q-DO-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TC-99 by Extraction Chromatography Resin (EIChroM)
Method: TC-99 by LSC by DOE TC-02-RC Mod.
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6876							Spike List 6877						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4113	Technetium 99	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-IM-2Q-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: TC-99 by Extraction Chromatography Resin (EIChroM)
Method: TC-99 by LSC by DOE TC-02-RC Mod.
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6876							Spike List 6877						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4113	Technetium 99	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-J3-3W-DO-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: Extraction Chromatography-> LSC Prep
Method: Ni-59 & Ni-63 by Liquid Scint. Spec.
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6874							Spike List 6875						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4160	Nickel 59	5	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4067	Nickel 63	5	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: A-J3-3W-DO-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Extraction Chromatography-> LSC Prep
Method: Ni-59 & Ni-63 by Liquid Scint. Spec.
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6874							Spike List 6875						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4160	Nickel 59	5	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4067	Nickel 63	5	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G8-4E-DO-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Distillation and Suspended in LSC Cocktail
Method: Carbon 14 by EERF C-01-1
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6872							Spike List 6873						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4007	Carbon 14	5	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: I-G8-4E-DO-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Distillation and Suspended in LSC Cocktail
Method: Carbon 14 by EERF C-01-1
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6872							Spike List 6873						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4007	Carbon 14	20	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

Title: DETERMINATION OF VOLATILE ORGANICS BY GC/MS [SW-846 8260; EPA 624; DW 524.2]

Approvals (Signature/Date):

3/15/12		3/19/12	
Ben Hicks	Date	Michael Ridenhower	Date
Organics Manager		Health & Safety Manager / Coordinator	
3.19.12		3/19/12	
Marti Ward	Date	Elaine Wild	Date
Quality Assurance Manager		Laboratory Director	

This SOP was previously identified as SOP No. ST-MS-0002 Rev. 17

Facility Distribution No.: 0 Distributed To: See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This SOP is applicable to the determination of Volatile Organic Compounds in waters, wastewater, soils, sludges and other solid matrices.

1.2 This SOP is applicable to SW-846 method 8000B, 8000C, 8260B, 8260C, Drinking water method 524.2, and EPA 624.

1.3 This method can be used to quantify most volatile organic compounds that have boiling points below 200°C and are insoluble or slightly soluble in water. Volatile water soluble compounds can be included in this analytical technique; however, for more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency.

1.4 The method is based upon a purge and trap, gas chromatograph/mass spectrometric (GC/MS) procedure. The approximate working range is 1 to 200 μg/L for 5 mL waters, 0.5 to 40 μg/L for 25 mL purge waters, 5 to 200 μg/kg for low-level soils, and 250 to 25,000 μg/kg for high-level soils.

1.5 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

1.5.1 Additional compounds may be amenable to this method. The minimum requirement for non-standard analytes is that the reporting limit be set at the lowest required concentration that can actually be detected by the instrument, and when an MDL study can not be conducted, the MDL be set equal to the reporting limit.

2.0 SUMMARY OF METHOD

2.1 Volatile compounds are introduced into the gas chromatograph by the purge and trap method. The components are separated via the chromatograph and detected using a mass spectrometer, which is used to provide both qualitative and quantitative information.

2.2 In the purge and trap process, an inert gas is bubbled through the solution at ambient temperature or at 40^oC (40^oC required for low level soils) and the volatile components are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbant column where the volatile components are trapped. After purging is completed, the sorbant column (trap) is heated and flushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is then heated to elute the components that are detected with a mass spectrometer.

2.3 Qualitative identification of the parameters in the extract is performed using the retention time and the relative abundance of characteristic ions. Quantitative analysis is performed using the internal standard technique with a single characteristic ion.

2.4 The use of selected ion monitoring (SIM) is acceptable for applications requiring quantitation limits below the normal range of electro impact mass spectrometry. However, SIM may provide a lesser degree of confidence in the compound identification, since less mass spectral information is available. Instead of scanning everything in a retention time range, SIM looks for specific ions (qualitative and quantitative) that are placed in retention time groups. The ions used for qualitative and quantitative purposes are the same for scan and SIM analysis. The laboratory currently only runs a SIM method for 1,4 dioxane. Details are available in Appendix 1 of this SOP.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

3.2 SIM – Single Ion Monitoring

4.0 INTERFERENCES

4.1 Method interferences may be caused by contaminants in solvents, reagents, glassware, and other processing apparatus that lead to discrete artifacts. All of these materials must be routinely demonstrated to be free from interferences under conditions of the analysis by running laboratory method blanks as described in the Quality Control section. The use of ultra high purity gases, pre-purged purified reagent water or purchased HPLC water, and approved lots of purge and trap grade methanol will greatly reduce introduction of contaminants.

4.2 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) into the sample through the septum seal during shipment and storage. A field blank prepared from reagent water and carried through the sampling and handling protocol can serve as a check on such contamination. Trip Blanks, prepared from reagent water, can serve as a check on conditions during transportation from the field to the laboratory.

4.3 Matrix interferences may be caused by non-target contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably from source to source depending upon the nature and diversity of the site being sampled.

4.4 Cross-contamination can occur whenever high-level and low-level samples are analyzed sequentially or in the same purge position on an autosampler. Whenever an unusually concentrated sample is analyzed, it should be followed by one or more blanks to check for cross-contamination. The purge and trap system may require extensive bake-out and cleaning after a high-level sample.

4.5 Some samples may foam when purged due to surfactants present in the sample. When this kind of sample is encountered an antifoaming agent can be used. A blank spiked with this agent must be analyzed with the sample because of the non-target interferences associated with the agent.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 **SPECIFIC SAFETY CONCERNS OR REQUIREMENTS**

5.2.1 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.2 The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

5.2.3 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.3 **PRIMARY MATERIALS USED**

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			

6.0 EQUIPMENT AND SUPPLIES

6.1 Micro syringes- 1.0 µL, 10µL, 25 µL, 50µL, 100 µL, 250µL, 500µL, 1000µL. Hamilton 1700 series

6.2 Volumetric flasks, Class A

6.3 Analytical Balance, capable of weighing ± 0.001 grams

6.4 Syringe: 5 or 25 mL glass with Luerlok tip, if applicable to the purging device.

6.5 Vials: 20 and 40 mL with Teflon lined screw caps

6.6 Spatula: Disposable wooden tongue depressors

6.7 Disposable pipettes

6.8 pH paper: Wide range & 0.3 to 2.3

6.9 Glass beads: Store in a drying oven.

6.10 Gas Chromatograph/Mass Spectrometer System:

6.10.1 Gas Chromatograph: Hewlett Packard GC 5890 and Agilent 6890 system with temperature programming.

6.10.2 Purge and Trap Device: The purge and trap device consists of the sample purger, the trap, and the desorb heater.

6.10.3 Gas Chromatographic Capillary Columns:

6.10.3.1 Mass Spectrometer: Hewlett Packard 5970, 5972 and 5973 mass spectrometers capable of scanning 35-300 AMU every two seconds or less, using 70 volts electron energy in the electron impact mode.

6.10.4 GC/MS interface: In general split/splitless injector are used but any interface (including direct introduction to the mass spectrometer) that achieves all acceptance criteria may be used.

6.10.5 Data System:

6.10.5.1 ChemStation software system that allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program.

6.10.5.2 Target software system allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software allows integrating the abundances in any EICP between for a specified time or scan-number limit. Also, for the non-target compounds, software a mass spectrum that meets the required criteria when 50ng of 4-Bromofluorobenzene (BFB) are must be available that allows for the comparison of sample spectra against reference library spectra. The most recent release of the NIST/EPA mass spectral library should be used as the reference library.

6.10.5.2.1 Data Library: NIST 98

6.11 Carrier gas: Ultra high purity helium

6.12 Make up gas: Ultra high purity helium

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Methanol: Purge and Trap Grade

7.3 Water: HPLC grade or equivalent.

7.4 See recipes for standards and QC samples in the Standards Log program.

7.5 Calibration Standards and Surrogates

7.5.1 Stock Solutions: Stock solutions may be purchased as certified solutions from commercial sources or prepared from pure standard materials as appropriate. These standards are prepared in methanol and stored in Teflon-sealed screw-cap bottles with minimal headspace at 0° to -20°C.

7.5.2 Working standards: A working solution containing the compounds of interest prepared from the stock solution(s) in methanol. These standards are stored in the freezer or as recommended by the manufacturer.

7.5.2.1 See SOP: ST-QA-0002 for expiration date criteria.

7.6 Initial calibration verification (ICV) standards are similar to calibration standards, but are from a completely different source.

7.7 Internal Standards: Internal standards are added to all samples, standards, and blank analyses.

7.8 Tuning Standard: A 25ng/ul 4-Bromofluorobenzene standard is made up that will deliver 50ng (or 25 ng) on column upon injection.

7.9 Sodium Bisulfate, crystal

7.10 Ascorbic Acid, ACS Reagent Grade, granular

7.11 Sodium Thiosulfate, ACS Reagent Grade, granular

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Aromatic volatiles water samples are preserved with 1:1 HCl and stored at 4 ± 2 °C. Analysis hold time is 14 days from collection.

8.3 Aqueous samples are stored in glass containers with Teflon lined septa at 4^{o}C +/- 2^{o}C, with minimum headspace.

8.4 Soil samples are refrigerated at 4 ± 2 °C. Analysis hold time is 14 days from collection.

8.4.1 Medium level solid extracts are aliquoted into 2 - 5 mL glass vials with Teflon lined caps and stored at 4^{o}C +/- 2^{o}C. The extracts are stored with minimum headspace.

8.5 For 5035 analysis

8.5.1 Solid samples, for low level analysis, may be field preserved with sodium bisulfate solution, or collected unpreserved using the Encore (or equivalent)™ sampler and shipped to the laboratory within 48 hours of sampling.

8.5.1.1 Following shipment back to the lab the soil is preserved with sodium bisulfate or the sample is extruded into an empty, clean sealed vial and frozen within 48 hours of sampling.

8.5.1.2 It is recommended that two Encore (or equivalent) samplers be used for each field sample position, to allow for any reruns than may be necessary.

8.5.2 Solid samples, for medium level analysis, may be field extracted with methanol, or collected unpreserved using the Encore (or equivalent)™ sampler and shipped to the laboratory within 48 hours of sampling.

8.5.2.1 It is recommended that two Encore (or equivalent) samplers be used for each field sample position, to allow for any reruns than may be necessary.

8.5.2.2 Solid samples – field extracted with methanol

8.5.2.2.1. Prepare a 2 oz sample container by adding 25 mL purge and trap grade methanol. (If a 5 g sample is to be used, add 5 mL methanol to a 2 oz container or VOA vial).

8.5.2.2.2. Seal the bottle and attach a label.

8.5.2.2.3. Weigh the bottle to the nearest 0.01g and note the weight on the label.

8.5.2.2.4. Ship with appropriate sampling instructions.

8.5.2.2.4.1. At client request, the methanol addition and weighing may also be performed in the field.

8.5.2.2.4.2. When the samples are returned to the lab, obtain the weight of the soil added to the vial and note on the label.

8.5.2.3 Solid samples – field extracted with methanol

8.5.2.3.1. When the samples are returned to the lab, extrude the (nominal) 5g (or 25g) sample into a pre-weighed VOA vial containing 5mL methanol (25mL methanol for the 25g sampler). Obtain the weight of the soil added to the vial and note on the label.

8.6 An additional sample is collected for percent moisture determination.

8.7 EPA 524.2 Sample Dechlorination and Preservation

8.7.1 If specified by the client that actual drinking water samples containing residual chlorine are to be analyzed by the laboratory, the following procedure shall be used:

8.7.1.1 Finished drinking water samples suspected of containing residual chlorine shall have 25 mg of ascorbic acid added to each 40 ml VOA vial prior to filling. If the requested target analytes are not gases at room temperature or are not listed in Table 7 of EPA Method 524.2, sodium thiosulfate is recommended to reduce residual chlorine (3 mg sodium thiosulfate for each 40 ml VOA vial).

8.7.1.2 If the sample containers are prepared by the laboratory for filling by the sample collector, the ascorbic acid or sodium thiosulfate will be placed into unpreserved VOA vials (do not mix the ascorbic acid or sodium thiosulfate with the HCl used for preservation).

8.7.1.3 It will be the sample collector's responsibility to add additional ascorbic acid or sodium thiosulfate if a diethyl-p-phenylenediamine (DPD) test kit indicates residual chlorine in excess of 5 mg/L (25 mg ascorbic acid or 3 mg sodium thiosulfate per each 5 mg/L of residual chlorine).

8.7.1.4 After filling the VOA vial, the sample collector should adjust the sample to pH<2 by carefully adding two drops of 1:1 HCl for each 40 ml of sample. Samples should be sealed and mixed for one minute. (Note: If the sample is to be analyzed for trihalomethanes (THMs) only, the HCl preservation step may be omitted if sodium thiosulfate was used for dechlorination.)

8.7.1.5 If a sample foams vigorously when HCl is added, the sample should be discarded. Fill fresh VOA vials containing ascorbic acid or sodium thiosulfate, but do not acidify. A note should be placed on the chain-of-custody that is submitted with the samples that they were "not acidified". These samples have a 24 hold time if target analytes other than THMs are to be analyzed.

8.7.1.6 Samples should be maintained at $4^oC \pm 2^oC$ until analysis.

8.8 At specific client request, unpreserved soils packed into glass jars or brass tubes may be accepted and sub-sampled in the lab.

8.8.1 This is an older procedure based on method 5030.

9.0 QUALITY CONTROL

9.1 Batch

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of a similar matrix, meeting the above mentioned criteria. Where no preparation method exists (example, volatile organics, water) the batch is defined as environmental samples that are analyzed together with the same process and personnel, using the same lots of reagents, not to exceed 20 environmental samples. An analytical batch is composed of prepared environmental samples, extracts, digestates or concentrates that are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), Matrix Spike (MS) and Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a MS/MSD, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.4 Samples having different QC codes, due to non-standard client specific QC requirements, must be batched separately in the LIMS. A method blank and LCS may be shared across QC codes provided the actual "sample batch" does not exceed 20 environmental samples. MS/MSD must be performed for each separate QC code.

9.1.5 Unless medium level (i.e. an extraction batch) the blank, LCS and MS/MSD MUST run in the same 12 hour clock. The definition of a non-extraction batch is a maximum of 20 samples run in a 12 hr clock.

9.2 **Method Blank**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 For Water analyses, the method blank is comprised of HPLC water.

9.2.3 For Soil analyses, the method blank is comprised of glass beads.

9.2.4 **For water and low soil method 8260 and 524.2 analyses**

9.2.4.1 A method blank must be analyzed with every 12 hour analytical clock and/or with each batch of 20 samples, whichever occurs first.

9.2.5 **For water method 624 analyses**

9.2.5.1 A method blank must be analyzed with every 24 hour analytical clock and with each batch of 20 samples, whichever occurs first..

9.2.6 **For medium level soil method 8260 analyses**

9.2.6.1 A method blank must be prepared with every medium level soil batch (20 or fewer samples of the same matrix). The medium level method blank is tied to an extraction and does not require repeated analysis with each sample analysis batch.

9.2.7 Method blank population studies shall be performed periodically. The data from such studies shall be used to identify systemic contamination issues.

9.3 **Laboratory Control Sample**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 For Water analyses, the LCS is comprised of HPLC water fortified with Volatiles.

9.3.2.1 For water analyses, the LCS and ICV are the identical. If an ICV was already run in the 12 hour analysis clock, the analyst may chose to omit running a second LCS. The ICV is uploaded as the LCS.

9.3.3 For Soil analyses, the LCS is comprised of glass beads fortified with Volatiles.

9.3.4 **For method 8260 and 524.2 analyses**

9.3.4.1 A LCS must be analyzed with every 12 hour analytical clock and with each batch of 20 samples, whichever occurs first..

9.3.5 **For method 624 analyses**

9.3.5.1 A LCS must be analyzed with every 24 hour analytical clock and with each batch of 20 samples.

9.3.5.2 A LCS must be prepared with every high level soil batch (20 or fewer samples of the same matrix).

9.3.6 **For medium level soil method 8260 analyses**

9.3.7 An LCS must be prepared with every medium level soil batch (20 or fewer samples of the same matrix).

9.3.7.1 The medium level LCS is tied to an extraction and does not require repeated analysis with each sample analysis batch.

9.4 **Matrix Spike/Matrix Spike Duplicate**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 **8260** - A MS/MSD must be analyzed with every 12 hour analytical clock and with each batch of 20 samples, whichever occurs first..

9.4.3 **524.2** - Method 524.2 does not require a MS/MSD be performed though it may be requested by the client. In the absence of client QC criteria for this MS/MSD, the laboratory will use 70%-130% recovery limits, and RPD of 20%, as advisory criteria.

9.4.4 **624** - A MS/MSD must be analyzed with every 24 hour analytical clock and with each batch of 20 samples, whichever occurs first..

9.5 **Surrogate**

9.5.1 A surrogate is a non-target analyte similar in chemical composition and behavior, which mimics the target analytes during preparation, extraction and analysis.

9.5.2 Surrogate(s) is added to every field sample, method blank, LCS and MS/MSD for analysis at the beginning of the sample preparation process.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Internal standard calibration is used.

10.1.1 Internal standard calibration is used. The internal standards are listed in this SOP. Target compounds should reference the nearest internal standard. Each calibration standard is analyzed and the response factor (RF) for each compound is calculated using the area response of the characteristic ions against the concentration for each compound and internal standard.

10.2 **Instrument Tuning**

10.2.1 Each GC/MS system must be hardware-tuned to meet the abundance criteria, listed in this SOP, for a maximum of a 50 ng (8260 and 624) and 25ng (524.2) injection or purging of BFB. These criteria must be met

10.2.1.1 **8260** - for each 12-hour time period

10.2.1.2 **524.2** – for each 12-hour time period

10.2.1.3 **624** – for each 24-hour time period

10.2.1.3.1. The time period begins at the moment of injection of BFB.

10.2.2 Inject the method appropriate amount of GC/MS tuning standard into the GC/MS system. Obtain a background-corrected mass spectra of BFB and confirm that all the key m/z criteria in Table 2 are achieved. If all the criteria are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are achieved. The performance criteria must be achieved before any samples, blanks, or standards are analyzed.

10.3 **Initial Calibration**

10.3.1 Prepare a multi-point calibration curve by fortifying 5ml of HPLC water with incrementing concentrations of Volatiles standard.

10.3.2 The initial calibration contains a minimum of 5points, for each target analyte (6 points are required for a quadratic fit.) The low level standard must be at or below the reporting limit. The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.3.2.1 Note 624 requires a minimum 3 point calibration. The low level standard must be at or below the reporting limit. The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.3.3 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance.

10.3.4 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

10.3.5 Sample peak areas are compared to peak areas of the standards. The ratio of the detector response to the amount concentration of analyte in the calibration standard is defined as the response factor (RF) or calibration factor (CF).

10.3.6 **Initial Calibration Criteria (SW 8000B/8260B)**:

10.3.6.1 The % RSD of the calibration check compounds (CCC) must be less than 30%. CCC are as follows:

Vinyl Chloride

1,1-Dichloroethene

Chloroform

1,2-Dichloropropane

Toluene

Ethylbenzene

10.3.6.2 If none of the CCCs are required analytes, project specific calibration specifications must be agreed with the client.

10.3.6.3 The average RF must be calculated for each compound. A system performance check is made prior to using the calibration curve. The five system performance check compounds (SPCC) are checked for a minimum average response factor.

10.3.6.3.1. A **minimum response factor of 0.01** must be achieved for all other volatile target analytes.

Compound	Min. RF
Chloromethane	0.100
1,1-Dichloroethane	0.100
Bromoform	>0.100
1,1,2,2-Tetrachloroethane	0.300
Chlorobenzene	0.300

10.3.6.4 If all %RSDs in the initial calibration are ≤ 15%, then all analytes may use average response factor for calibration.

10.3.6.5 The analyst should evaluate analytes with %RSD > 15%.

10.3.6.5.1. Evaluate whether the problem is related to the analytical range. The low standard or the high standard having a response that is out of line with the others typically expresses this. For criteria regarding the removing calibration points from the curve, refer to STL policy P-T-001, Selection of Calibration Points.

10.3.6.6 For SW846 Method 8000B

10.3.6.6.1. If the average of all %RSDs in the calibration is > 15%, the analyst should consider instrument maintenance to improve the linearity of response.

10.3.6.6.2. When a linear regression curve is used, the intercept of the curve at zero response must be less than + or – the reporting limit for the analyte. Client requirements may be tighter. (see Section 10.3.7.6.1)

10.3.6.6.3. If a linear regression curve is used, r must be ≥ 0.995.

10.3.6.6.4. When a linear model is employed use of 1/Concentration^2 weighting is recommended to improve the accuracy of quantitation at the low end of the curve and to better control the intercept at zero response.

10.3.6.6.5. The regression may be forced through zero when using a linear model. See specific client requirements to determine if this technique is allowed for specific sample groups.

10.3.7 **Initial Calibration criteria (8000C/8260C and 524.2)**:

10.3.7.1 Minimum Response Factors (SW 8260C only)

10.3.7.1.1. See Table 4 in this SOP for recommended minimum response factors prescribed by method 8260. For analytes not given a minimum response factor by the method, TestAmerica St. Louis has established a default of 0.01 and 0.001 depending on the nature of the compound.

10.3.7.2 SW-846 8260C and 524.2 chromatographic methods allow the use of both linear and non-linear models for the calibration data.

10.3.7.3 The first way is to begin with the simplest approach, the linear model through the origin, and then progress through other options until the calibration acceptance criteria are met. The second way is to use technical knowledge of the detector response to the target compound to choose the calibration model.

10.3.7.4 The option for non-linear calibration may be necessary to address specific instrumental techniques. However, it is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance.

10.3.7.5 **Linear calibration using the average response factor**

10.3.7.5.1. The Relative Standard Deviation (RSD) of the calibration points from the curve used must be ≤ 20% for each target analyte.

10.3.7.5.2. If the %RSDs in the initial calibration is > 20%, then calibration using a linear regression may be employed.

10.3.7.6 **Linear calibration using a least squares regression**

10.3.7.6.1. The intercept of a linear calibration at zero response (i.e. the y-intercept) must have an absolute value less than the reporting limit for each analyte. Client requirements may be tighter, please check Client Requirement Memorandum (CRM) if identified in comments. Note, for analyses utilizing an internal standard the Target variable "b" does NOT equal the y-intercept. For analyses utilizing an internal standard, the Target variable "b" must be multiplied by the associated internal standard concentration to derive the concentration at the y-intercept.

10.3.7.6.2. r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.3.7.6.3. When calculating the calibration curves using the linear regression model, a minimum quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration calibration standard back into the curve.

10.3.7.6.4. It is not necessary to re-analyze a low concentration standard, rather the data system can recalculate the concentrations.

10.3.7.6.5. The recalculated concentration of the low calibration point should be within ± 30% of the standard's true concentration.

10.3.7.6.5.1. Analytes which do not meet the minimum quantitation calibration re-fitting criteria should be considered "out of control" and corrective action should be taken.

10.3.7.7 **Linear calibration using a least squares regression, forcing thru zero**

10.3.7.7.1. Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration. In essence, if the curve is forced through zero, the intercept is set to 0 *before* the regression is calculated, thereby setting the bias to favor the low end of the calibration range by "pivoting" the function around the origin to find the best fit and resulting in one less degree of freedom. It may be appropriate to force the regression though zero for some calibrations.

10.3.7.7.2. Curve must still meet criteria in 10.3.7.6.1 and 10.3.7.6.2

10.3.7.8 **Linear calibration using a least squares regression, weighting of data points**

10.3.7.8.1. In a linear model, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. For this reason it may preferable to increase the weighting of the lower concentration points. $1/\text{Concentration}^2$ weighting (often called $1/X^2$ weighting) to improve accuracy at the low end of the curve.

10.3.7.8.2. Curve must still meet criteria in 10.3.7.6.1 and 10.3.7.6.2.

10.3.7.9 **Non-linear calibration**

10.3.7.9.1. In situations where the analyst knows that the instrument response does not follow a linear model over a sufficiently wide working range, or when the other approaches have not met the acceptance criteria, a quadratic model may be employed. All quadratic curves require a minimum of 6 pts.

10.3.7.9.2. It is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance. Thus, non-linear calibrations are not be employed for analytes shown to consistently exhibit linear calibration for the analytes of interest.

10.3.7.9.3. The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte. (Some clients may have tighter criteria; check Client Requirement Memos)

10.3.7.9.4. r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.3.8 **624 Criteria**

10.3.8.1 Method 624 only requires a 3 point calibration. We routinely perform a 5 point calibration; however, 2 points may be removed from the curve if necessary to meet 624 calibration criteria. Refer to the TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

10.3.8.2 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq 35\%$.

10.3.8.3 If the %RSDs in the initial calibration is > 35%, then calibration using a linear regression may be employed.

10.3.8.3.1. If a linear regression curve is used, the intercept of the curve at small zero response must be less than + or – the reporting limit for the analyte. It is recommended that for linear regression curves the line be set through the origin.

10.3.8.4 Use of $1/\text{Concentration}^2$ weighting is recommended to improve the accuracy of quantitation at the low end of the curve. The analyst should consider instrument maintenance to improve the linearity of response.

10.3.8.4.1. Weighting of data points

10.3.8.4.2. The points at the lower end of the calibration curve have less weight in determining the curve generated than points at the high concentration end of the curve. However, in environmental analysis, accuracy at the low end of the curve is very important. For this reason it is preferable to increase the weighting of the lower concentration points. 1/Concentration^2 weighting (often called $1/X^2$ weighting) will improve accuracy at the low end of the curve and should be used if the data system has this capability.

10.4 **Initial Calibration Verification (ICV)**

10.4.1 The initial calibration verification standard is a different standard source than the one used for the initial calibration

10.4.2 An ICV must be performed with each initial calibration.

10.4.3 The ICV performance must be within +/- 30% D criteria for each analyte.

10.4.3.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard.

10.4.4 Corrective action must be taken (including reanalysis of the ICV or analysis of a different ICV).

10.4.4.1 Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.4.4.2 Variance among vendor supplied standards for a few compounds is not atypical for long analyte lists. All ICV failures that cannot be associated to laboratory error will require the immediate analysis of a third standard in an attempt to characterize the bias. If a third standard is not in the laboratory it must be ordered immediately.

10.5 **Continuing Calibration Verification.(CCV)**

10.5.1 At the start of each 12-hour period (8260) or 24-hour period (624) the GC/MS tuning standard must be analyzed. A 50ng injection of BFB must result in a mass spectrum for BFB which meets the criteria. See Table 2 in this SOP.

10.5.2 Following a successful BFB analysis, the continuing calibration standard(s) are analyzed. The standards must contain all volatile analytes, including all required surrogates. A mid level calibration standard is used for the continuing calibration

10.5.3 A CCV standard is analyzed every analysis tune clock immediately following the BFB tune.

10.5.3.1 **8260 and 524.2** - for each 12-hour tune time period

10.5.3.2 **624** – for each 24-hour tune time period

10.5.4 The CCV can be the same source or a second source from the calibration.

10.5.5 The internal standard response must be within -50% to 100% of the response in the mid level of the initial calibration. The internal standard retention times must be within 30 seconds of the retention times in the mid-level of the initial calibration.

10.5.6 8000B/8260B criteria:

10.5.6.1 The SPCC compounds must have a minimum response factor (see Initial Calibration SPCC criteria)

10.5.6.2 The percent difference of the CCC compounds from the initial calibration must be $\leq$ 20%.

10.5.6.3 In addition, the percent difference or drift of all analytes must be $\leq$ 60%, with allowance being made for up to six target compounds to have percent drift greater than 20%. Due to poor responses, the following compounds are allowed to have a %D > 60%, but less than 100%: Cyclohexane, 2-Chloroethyl vinyl ether, 2-Nitropropane, 1,4-Dioxane, Tetrahydrofuran, n-butanol and Isobutanol.

10.5.6.4 In addition, if any target analyte's %D is > 20%, the entire target analyte list must be averaged. The average %D must be ≤ 20%.

10.5.6.5 If none of the identified CCCs are in the special calibration, the project specific target analytes %D must be < 20% or a maximum %D as agreed with the client. If there is a special project/client %D criteria it is noted on the client requirement sheet; otherwise a maximum 20% D is applied.

10.5.6.6 There are instances where a small subset of the routinely calibrated analytes are needed for analysis (e.g. dilutions or project with abbreviated target analyte lists). In cases where the target analytes for analysis constitutes less than half of the total number of analytes in the calibration standard, apply the following:

10.5.6.6.1. The SPCC compounds must have a response factor (see initial calibration SPCC criteria) if the SPCC is a target of interest.

10.5.6.6.2. The percent difference of the CCC compounds from the initial calibration must be $\leq$ 20%, if the CCC is a target of interest. In addition, the percent difference or drift of all analytes of concern must be $\leq$ 60%, with allowance being made for, Cyclohexane, 2-Chloroethyl vinyl ether, 2-Nitropropane, 1,4-Dioxan, Tetrahydrofuran, n-butanol and Isobutanol. These compounds are allowed to have a %D > 60% but less than 100%.

10.5.6.6.3. For target analyte lists with more than 20 compounds: if any target analyte's %D is > 15%, the entire target analyte list must be averaged. The average %D must be ≤ 15%.

10.5.6.6.4. For target analyte lists with less than 20 compounds: each target analyte %D must be < 15% or a maximum %D as agreed with the client.

10.5.7 **8260C criteria:**

10.5.7.1 The CCV performance must be with +/- 20% D criteria.

10.5.7.2 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument. If this CCV meets criteria then sample analysis may continue. If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require re-calibration (i.e. initial calibration)

10.5.8 **624 criteria**

10.5.8.1 Continuing calibration %D criteria is given in Table 5 of the Method. The column "Range for Q" is used to determine if CCV target analytes meet acceptance.

10.5.8.2 All target analytes must be within the limits prescribed.

10.5.9 **524.2 criteria**

10.5.9.1 For each target analyte %D must be less than or equal to 30%.

10.5.10 Calibration excursions are to be documented via a NCM.

10.6 Retention Time (RT) windows

10.6.1 Relative Retention Time (RRT)

10.6.1.1 In addition to normalizing the response (peak area) of the target compound to the response of the internal standard in that sample or extract for that injection, the retention times of the target compound and the internal standard may be used to calculate the relative retention time (RRT) of the target compound.

10.6.1.2 The RRT is expressed as a unit-less quantity:

$$RRT = \frac{\text{Retention time of the analyte}}{\text{Retention time of the internal standard}}$$

10.6.1.3 The RRT of each target analyte in each calibration standard should agree within ± 0.06 RRT units.

10.6.1.4 It is recognized here that with increasing retention times of the internal standard, target analytes will be able to more easily meet this criterion. Thus, care should be exercised when selecting the appropriate internal standards by retention times. The process of selecting internal standards to quantify target analytes should also include consideration of retention times as they should be similar.

10.6.1.5 If this criterion is not met and unless there are no other indicators of a component's identification such as a very unique but a high probability mass spectral match then that component may not be considered as identified by relative retention time.

10.6.1.6 The RRT evaluation allows the analyst to compensate for modest shifts in the chromatographic conditions that can occur due to interferences and simple day-to-day instrument variability. Many methods that employ internal standard calibration use more than one internal standard, and the target compounds are related to the internal standards on the basis of the similarity of their respective chromatographic retention times.

10.6.2 Retention Time Windows

10.6.2.1 The maximum retention time window is +/- 0.45 minutes from the established retention time of the target analyte in the initial calibration.

10.6.2.1.1. Establishing this maximum retention time window, ensures that the RRT criteria of RRT +/- 0.06 is achieved.

10.6.3 Internal standard retention time

10.6.3.1 The retention times of the internal standards in the calibration verification standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 sec from that in the mid-point standard level of the most recent initial calibration sequence, then the chromatographic system must be inspected for malfunctions and corrections must be made, as required. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is required.

10.6.4 Retention Time Criteria

10.6.4.1 The retention times of all compounds in each continuing calibration must be within the retention time windows established.

11.0 PROCEDURE

11.1 Screening

11.1.1 Screening samples is a semi-quantitative determination and is not intended to be use as a reportable analytical result.

11.1.2 Screening may be performed on either a GC-FID or GC/MS instrument. The instrument should be capable of detecting the compounds of concern but does not adhere to any method calibration criteria or analysis tune clock times, nor are there any batch QC (eg method blanks, LCS) requirements for screening samples.

11.1.3 Water samples are screened using a minimum 0.5ml of samples and diluting with target analyte free water to a final volume of 5ml. Greater dilutions may be taken if the sample is suspected to have significantly high concentration of target analytes or interferents.

11.1.4 For soil samples, 1g of sample is place in a 40ml VOA vial with 5ml of target analyte free water. Greater dilutions may be taken if the sample is suspected to have significantly high concentration of target analytes or interferents.

11.1.5 Sample screening may be performed utilizing a heated or non-heated purging vessel.

11.2 Allow standards, samples and sample extracts to reach ambient temperature before analysis.

11.3 All analysis conditions and injection volumes for samples must be the same for the calibration standards. (including purge time and flow, desorb time and temperature, column temperatures, multiplier setting etc.).

11.3.1 Water, soil and medium level extract analyses are routinely performed by heated purge.

11.3.1.1 If desired, water, TCLP and methanol extracts may be performed using a non-heated purge.

11.3.1.2 If non-heated purge is desired, the calibration and all QC samples must also be performed utilizing a non-heated purge.

11.4 **<u>Water Sample Preparation (5030B method)</u>**

11.4.1 Transfer 5ml or 25ml sample to a VOA vial.

11.4.2 Transfer the 5ml sample into an empty labeled 40ml VOA vial.

11.4.3 Add 250 ng of each internal and surrogate standard (10 µL of a 25 µg/mL solution)

11.4.3.1 For routine TCLP samples use 0.5 mL of TCLP sample leachate with 4.5 mL reagent water and spike with surrogate and internal standards.

11.4.3.1.1.1 Note that TCLP reporting limits will be 10 times higher than the corresponding aqueous limits)

11.4.3.2 For low level TCLP samples, use 5ml of TCLP sample leachate and spike with surrogate and internal standard.

11.4.4 Prepare a method blank with 5ml or 25 mlof HPLC water. Add 250 ng of each internal and surrogate standard (10 µL of a 25 µg/mL solution)

11.4.5 Prepare a LCS with 5mlor 25 ml of HPLC water. Add 250 ng of each internal and surrogate standard (10 µL of a 25 µg/mL solution). Add 10µL of 25µg/ml spiking solution

11.4.5.1 For samples designated for MS/MSD analysis, add 10µL of 25µg/ml of spiking solution.

11.4.6 Check and document the pH the remaining sample.

11.4.6.1 Do not check pH prior to taking aliquot for analysis.

11.5 **<u>Low-Level Soil Preparation (5035A method)</u>**

11.5.1 If samples arrive unpreserved, the laboratory must, within 48 hours of collection, preserve samples with sodium bisulfate or extrude sample into a clean, empty, sealed VOA vial and freeze.

11.5.1.1 Check the preparation method code of the SAC to determine preservation.

11.5.1.1.1 Sodium bisulfate code: 4D

11.5.1.1.2 Freezing code: 4P

11.5.2 <u>If samples arrive in the Encore (or equivalent) sampler and require Sodium bisulfate preservation</u>:

11.5.2.1 Pre-weigh a labeled 40ml VOA vial.

11.5.2.1.1 Label with an indelible marker rather than a paper label, since paper labels may cause the autosampler to bind and malfunction.

11.5.2.2 Extrude the soil sample from the Encore (or equivalent) sampler into the VOA vial.

11.5.2.3 Weigh the vial to the nearest 0.01g.

11.5.2.4 Record weight on the label and runlog.

11.5.2.5 Add a magnetic stir bar, approximately 1g of sodium bisulfate and 5 mL of HPLC water.

11.5.2.5.1 Soils containing carbonates may effervesce when adding the sodium bisulfate solution. If this is the case, retrieve a second Encore sample plug, add 5 mL of water instead, and freeze at <10^{o}C until analysis.

11.5.2.6 Seal the vial.

11.5.2.7 Add 10 ul of surrogate through the septum to each sample and QC.

11.5.2.7.1 For samples designated for MS/MSD analysis, add 10µL of spiking solution to the vials.

11.5.2.7.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 10µL of surrogate to the vial.

11.5.2.7.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 10µL of surrogate and 10µL of spiking solution.

11.5.3 <u>If samples arrive 40ml VOA vial already preserved with Sodium bisulfate</u>:

11.5.3.1 Add 5 ul of surrogate through the septum to each sample and QC.

11.5.3.1.1 For samples designated for MS/MSD analysis, add 10µL of spiking solution to the vials.

11.5.3.1.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 5µL of surrogate to the vial.

11.5.3.1.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 10µL of surrogate and 10µL of spiking solution.

11.5.4 <u>If samples arrive in the Encore (or equivalent) sampler and require freezing as preservation:</u>

11.5.4.1 Pre-weigh a labeled 40ml VOA vial.

11.5.4.1.1 Label with an indelible marker rather than a paper label, since paper labels may cause the autosampler to bind and malfunction.

11.5.4.2 Extrude the soil sample from the Encore (or equivalent) sampler into the VOA vial.

11.5.4.3 Weigh the vial to the nearest 0.01g

11.5.4.4 Record weight on the label and runlog.

11.5.4.5 Freeze sample until time of analysis.

11.5.4.6 Seal the vial.

11.5.4.7 Add 10 ul of surrogate through the septum to each sample and QC.

11.5.4.7.1 For samples designated for MS/MSD analysis, add 10µL of spiking solution to the vials.

11.5.4.7.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 10µL of surrogate to the vial.

11.5.4.7.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 10µL of surrogate and 10µL of spiking solution.

11.5.5 <u>If samples arrive in 40ml VOA vial and require freezing as preservation</u>:

11.5.5.1 Freeze sample until time of analysis.

11.5.5.2 Add 5mL of HPLC water

11.5.5.3 Seal the vial.

11.5.5.4 Add 10 ul of surrogate through the septum to each sample and QC.

11.5.5.4.1 For samples designated for MS/MSD analysis, add 10µL of spiking solution to the vials.

11.5.5.4.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 10µL of surrogate to the vial.

11.5.5.4.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 5µL of surrogate and 10µL of spiking solution.

11.6 <u>Low-Level Soil Preparation (superceded 5030 method)</u>

11.6.1 See SOP ST-QA-0038 for the procedure for sub sampling.

11.6.2 Weigh 5 g +/- 0.05 of the sample into a pre-weighed 40mL glass labeled vial.

11.6.2.1 If the sample is suspected or known to have high concentrations of analytes, reduce the sample aliquot to 1.0 g

11.6.3 Record the weight.

11.6.4 Add 5ml HPLC water

11.6.5 Seal the vial.

11.6.6 The above steps should be performed rapidly and without interruption to avoid loss of volatile organics.

11.6.7 Add 10µL of surrogate standard through the septum.

11.6.7.1 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 10µL of surrogate to the vial.

11.6.7.2 Prepare a LCS using 5.0g glass beads, 10µL of surrogate and 10µL of spiking solution.

11.6.7.3 For samples designated as for MS/MSD, add 10µL of spiking solution.

11.7 <u>Methanol Extraction of Soils (5035A method)</u>

11.7.1 Extrude the (nominal) 5g sample into a pre-weighed VOA vial containing 5mL methanol (25mL methanol for the 25g sampler).

11.7.2 Obtain the weight of the soil added to the vial and note in preplog (Attachment 1).

11.7.3 Add 5 ul medium level surrogate to each sample and QC samples.

11.7.3.1 Prepare a Method Blank using 5.0g of glass beads and 5 mL methanol. Add 5 µL of parent surrogate to the vial.

11.7.3.2 Prepare a LCS using 5.0g glass beads, 5 mL of methanol , 5 µL of parent surrogate and 10µL of spiking solution.

11.7.3.3 For the LCS and MS/MSD, add 100 µL medium level spike mix.

11.7.4 Using a vortex mixer, agitate sample for at least half a minute.

11.8 **<u>Methanol Extraction of Soils (superceded 5030 method)</u>**

11.8.1 See SOP ST-QA-0038 for the procedure for sub sampling.

11.8.2 Weigh 5 g +/- 0.05 of the sample into a pre-weighed 40mL glass labeled vial.

11.8.2.1 If the sample is suspected or known to have high concentrations of analytes, reduce the sample aliquot to 1.0 g

11.8.3 Record the weight in prep log (Attachment 1).

11.8.4 Seal the vial.

11.8.5 Add 5 mL of purge and trap methanol.

11.8.6 Add 5 µL medium level surrogate to each sample and QC samples.

11.8.6.1 Prepare a Method Blank using 5.0g of glass beads and 5 mL methanol. Add 5µL of surrogate to the vial.

11.8.6.2 Prepare a LCS using 5.0g glass beads, 5 mL methanol , 5µL of surrogate and 20µL of spiking solution.

11.8.6.3 For the MS/MSD, add 100 µL medium level spike mix.

11.8.7 Using a vortex mixer, agitate sample for at least half a minute.

11.9 **<u>Volatile Analysis</u>**:

11.9.1 Load each 40ml VOA sample vial (and QC) in the purge and trap autosampler.

11.9.1.1 Medium Level Analysis

11.9.1.1.1 Rinse a glass-tight syringe with organic free water and fill the syringe with water. Bring volume to 5 mL add 5 µL of internal standards.

11.9.1.1.2 Add sample methanol extract to the syringe (no more than 100µL for a 5 mL purge).

11.9.1.1.3 If less than 1µL of methanol extract is to be added to the water, dilute the methanol extract using a serial dilution.

11.9.1.1.4 Transfer methanol extract/HPLC water in syringe to a labeled 40ml VOA vial.

11.9.2 Record autosampler sample analysis sequence in logbook.

11.9.3 Start analysis.

11.9.4 After purging is complete, desorb the sample, start the GC temperature program, and begin data acquisition.

11.9.4.1 For method 524.2 the desorb time should be a minimum of 2 minutes.

11.9.5 After desorption, bake the trap for 5-10 minutes to condition it for the next analysis. When the trap is cool, it is ready for the next sample.

11.9.6 When the standards and extracts are not being used, refrigerate them at 4 $\pm$ 2^{o}C, protected from light in screw cap vials equipped with unpierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica QAM.

12.2 Internal Standards

12.2.1 Samples that exhibit low IS recoveries <50% or high IS recoveries >100% are reanalyzed once to confirm matrix effect.

12.3 Manual Integrations

12.3.1 Identified compounds are reviewed for proper integration. Integrations are performed automatically by the data system. If necessary, manual integrations are performed and are documented by the analyst. Manual integrations are denoted with a "M" flag on the Target quantitation report. See TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

12.4 Qualitative identification

12.4.1 An analyte is identified by retention time and by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference may be obtained on the user's GC/MS by analysis of the calibration standards or from the NIST Library. Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC retention time as the standard component; and (2) correspondence of the sample component and the standard component characteristic ions.

12.4.1.1 Note: Care must be taken to ensure that spectral distortion due to co-elution is evaluated.

12.4.2 The sample component retention time must compare to within ± 0.2 min. of the retention time of the standard component. For reference, the standard must be run within the same twelve hours as the sample.

12.4.3 All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) should be present in the sample spectrum.

12.4.4 The relative intensities of ions should agree to within ±30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance should be between 20 and 80 percent.)

12.4.5 If a compound cannot be verified by all the above criteria, but in the technical judgment of the analyst, the identification is correct, then the analyst shall report that identification and proceed with quantitation.

12.5 Retention time criteria for samples

12.5.1 If the retention time for any internal standard changes by more than 0.5 minutes from the last continuing calibration standard, the chromatographic system must be inspected for malfunctions and corrected. Reanalysis of samples analyzed while the system was malfunctioning is required.

12.5.2 If the retention time of any internal standard in any sample varies by more than 0.1 minute from the preceding continuing calibration standard, the data must be carefully evaluated to ensure that no analytes have shifted outside their retention time windows.

12.6 Tentatively Identified Compounds (TICs)

12.6.1 If the client requests components not associated with the calibration standards, a search of the NIST library may be made for the purpose of tentative identification. Guidelines are:

12.6.1.1 Relative intensities of major ions in the reference spectrum (ions > 10% of the most abundant ion) should be present in the sample spectrum.

12.6.1.2 The relative intensities of the major ions should agree to within 20%. (Example: If an ion shows an abundance of 50% in the standard spectrum, the corresponding sample ion abundance should be between 30% and 70%).

12.6.1.3 Molecular ions present in the reference spectrum should be present in the sample spectrum.

12.6.1.4 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

12.6.1.5 Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the spectrum because of background contamination or co-eluting peaks. (Data system reduction programs can sometimes create these discrepancies.)

12.6.1.6 Computer-generated library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual inspection of the sample with the nearest library searches should the analyst assign a tentative identification. Library searches of peaks present in the chromatogram that are not target compounds (Tentatively Identified Compounds, TIC) may be performed if required by the client.

12.6.1.7 The first 20 TICs will be identified in a sample, unless a different number is specified by the client. See client requirement sheet.

12.7 Dilutions

12.7.1 If the concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample must be diluted and reanalyzed.

12.7.1.1 TestAmerica St. Louis has adopted the CLP allowance to report results that are within 10% of the upper level standard without dilution.

12.7.2 A dilution should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the client specific project requirements.

12.7.2.1 Aqueous samples requiring less than a 1:1000 dilution can be diluted directly using a 5-ml syringe

12.7.2.2 Aqueous samples requiring less than a 1:5000 dilution can be diluted directly using a 25-ml syringe

12.7.2.3 Low level soil samples may re-analyzed using a 1g sample aliquot or utilizing the methanol extraction technique.

12.8 Carryover

12.8.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.8.1.1 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

12.8.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analyses, carryover may have occurred.

12.8.1.2.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred

12.8.1.3 If the chromatographic profile resembles the previous sample, the results are questionable.

12.8.1.3.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. A hardcopy of all the data assessment types and descriptions along with their associated corrective actions is included in the SOP. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact “type” line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.1.2 The method blank must have acceptable surrogate recoveries.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 Method Blank Contamination – See Clouseau NCM for corrective action. Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.2.2.2 Method Blank Surrogate excursion – See Clouseau NCM for corrective action.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.3.1.1.1 For long analyte spike list, marginal exceedances (ME) are allowed as follows:

13.3.1.1.2 < 11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

13.3.1.1.3 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit.

13.3.1.1.4 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit.

13.3.1.1.5 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit.

13.3.1.1.6 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit.

13.3.1.1.7 > 90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit.

13.3.1.1.8 No LCS recoveries may be outside the Marginal Exceedance limit.

13.3.1.1.9 Marginal exceedances must be random. If the same LCS analyte exceeds the control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken.

13.3.1.2 The LCS should have acceptable surrogate recoveries.

13.3.2 Corrective Action for LCS not meeting acceptance criteria:

13.3.2.1 LCS Spike Recovery excursion (high) – See Clouseau NCM for corrective action.

13.3.2.2 LCS Spike Recovery excursion (low) – See Clouseau NCM for corrective action.

13.3.2.3 LCS Surrogate Recovery excursion – See Clouseau NCM for corrective action.

13.3.2.4 RPD excursion for MS/MSD or LCS/LCSD – See Clouseau NCM for corrective action.

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.2.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Surrogate

13.5.1 All surrogates should be within established control limits for accuracy (% Recovery).

13.5.2 Corrective Action for Surrogates not meeting acceptance criteria:

13.5.2.1 Surrogate Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.6 Sample result evaluation

13.6.1 Internal Standards

13.6.1.1 Acceptance Criteria:

13.6.1.1.1 See the GC/MS analytical SOPs for acceptance criteria

13.6.1.2 Corrective Action for Internal Standards not meeting acceptance criteria:

13.6.1.2.1 Internal Standard excursion – high– See Clouseau NCM for corrective action.

13.6.1.2.2 Internal Standard excursion - low– See Clouseau NCM for corrective action.

13.6.2 Dilutions

13.6.2.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.6.2.2 Dilution: Sample– See Clouseau NCM for corrective action.

13.6.2.3 Dilution: Surrogate(s) diluted out– See Clouseau NCM for corrective action.

13.6.2.4 Dilution: Surrogates(s) and/or Spike(s) diluted out– See Clouseau NCM for corrective action.

13.6.3 Carryover

13.6.3.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.6.3.2 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.6.3.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.7 Insufficient Sample

13.7.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis a narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method

16.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Acidic sample waste generated. All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "A" or "B".

16.2.1.2 Solvent waste generated. Solvent waste must be accumulated in the appropriate waste accumulation container, labeled as Drum Type "D".

16.2.1.3 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the labware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the labware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 SW846, Test Methods for Evaluating Solid Waste, Third Edition, Gas Chromatography/Mass Spectrometry for Volatile Organics, Method 8000B, 8000C, 8260Band 8260C

17.2 40CFR Part 136: "Guidelines Establishing Test Procedures for the Analysis of Pollutants, Appendix A, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", Code of Federal Regulations, Revised July1, 1995, Method 624

17.3 USEPA Drinking Water method 524.2

17.4 TestAmerica St. Louis Quality Assurance Manual (QAM), current revision.

17.5 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (ST-HS-0002), current revisions

17.6 TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

13.1 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

17.7 Associated SOPs

17.7.1 ST-OP-0001, Organic Labware Cleaning Procedure
17.7.2 ST-PM-0002, Sample Receipt and Chain of Custody
17.7.3 ST-QA-0002, Standard and Reagent Preparation
17.7.4 ST-QA-0005, Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes.
17.7.5 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.7.6 ST-QA-0016, IDL/MDL Determination
17.7.7 ST-QA-0031, VOA Holding Blank Analysis
17.7.8 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 CLARIFICATIONS, MODIFICATIONS OF PREVIOUS REFERENCE METHOD

18.1 Modification to Reference Method 624

18.1.1 Ion 119 is used as the quantitation ion for chlorobenzene-d5 for 25 mL purge tests.

18.1.2 A retention time window of 0.2 minutes is used for all components, since some data systems do not have the capability of using the relative retention time units specified in the reference method.

18.1.3 The quantitation and qualifier ions for some compounds have been changed from those recommended in SW-846 in order to improve the reliability of qualitative identification.

18.1.4 Method 624 Section 5.2.2 of the source method describes the trap packing materials as Tenax GC, Methyl silicone, silica gel and coconut charcoal. TestAmerica routinely employs the Supelco K trap.

18.2 Modifications required for drinking water analysis by method 524.2

18.2.1 Only one internal standard -- Fluorobenzene -- is required for this method. The lab uses 3 ISTDs.

18.2.2 The same analysis run may be used to satisfy the requirements for an LCS (also known as a laboratory fortified blank, LFB) and a continuing calibration verification sample. The LCS/CCV does not need to be a second source standard.

18.2.3 524.2 Section 7.1 of the source method requires that the trap packing materials be Tenax GC, Methyl silicone, silica gel and coconut charcoal. TestAmerica routinely uses Supleco K trap

18.2.4 524.2 Section 7.8.2 of the source method requires that each calibration standard be prepared by diluting the appropriate volume of the working standard with organic-free water adjusted to pH < 2 in a volumetric flask. TestAmerica prepares calibration standards by diluting the appropriate volume of the working standard with organic-free water at neutral pH.

19.0 CHANGES FROM PREVIOUS REVISION

19.1 Section 9.1.5: Blank, LCS & MS/MSD must be run in same clock for non-medium level samples

19.2 Section 10.3.2: The number of calibration points required for curves is clarified

19.3 Section 10.3.6.6: notes added to address client requirements and y-intercept

19.4 Section 10.3.7.9.1: added six point requirement for all quadratic curves

19.5 Section 10.4.4.2: Added corrective action for ICV failure (use of third standard)

19.6 Section 10.3.7.9.3: added note addressing client specific requirements

19.7 Section 12.7.1.1: added CLP allowance for reporting data within 10% of upper standard without dilution

19.8 Table Two: added allowance of other published BFB Tune criteria (i.e. EPA CLP)

19.9 Added Attachment 1 – example page from VOA Medium Level Extraction log.

19.10 Revision 17:

19.10.1 Fixed grammatical errors throughout SOP.

19.10.2 Updated section 9.1 regarding MS/MSD duplicates being performed for separate QC codes.

19.10.3 Updated section 10.5.7 regarding CCV criteria testing.

19.10.4 Removed section 10.5.8.3 regarding passing CCV percentage calibration points in the initial calibration curve.

19.10.5 Updated section 11.7 and 11.8 regarding volumes of medium level surrogate and medium level spike mix used.

19.11 Rev 18:

19.11.1 Added information for Select Ion Monitoring Procedure to Sections 2, 3 and Appendix 1

Table 1
Internal Standards

	Standard Concentration µg/mL	Quantitation ion (5 mL purge)	Quantitation ion (25 mL purge)
Fluorobenzene	25	96	96
Chlorobenzene-d5	25	117	117
1,4-Dichlorobenzene-d4	25	152	152

Notes:
1) 10 µL of the internal standard is added to the sample. This results in a concentration of each internal in the sample of 50µg/L for a 5 mL purge or 10 µg/L for a 25 mL purge.
2) Surrogate and internal standards may be combined in one solution.

Surrogate and Spike concentrations are listed on the Structure and Analysis Codes, which are in the attachment to this SOP.

Table 2
BFB Key Ion Abundance Criteria

Mass	Ion Abundance Criteria
50	15% to 40% of Mass 95
75	30% to 60% of Mass 95
95	Base Peak, 100% Relative Abundance
96	5% to 9% of Mass 95
173	Less Than 2% of Mass 174
174	Greater Than 50% of Mass 95
175	5% to 9% of Mass 174
176	Greater Than 95%, But Less Than 101% of Mass 174
177	5% to 9% of Mass 176

- BFB tuning criteria for mass 75 are 30-80% of mass 95 for method 524.2
- Alternatively, other documented tuning criteria (e.g. EPA CLP) may be used provided method performance is not aversely affected

Table 3
Characteristic ions

Compound	Primary*	Secondary	Tertiary
1,2-Dichloroethane-d_4 (Surrogate)	67*	102*	65
Dichlorodifluoromethane	85	87	50, 101,103
Chloromethane	50	52	49
Vinyl chloride	62	64	61
Bromomethane	94	96	79
Chloroethane	64	66	49
Trichlorofluoromethane	101*	103*	66
1,1-Dichloroethene	96	61	63, 98

Characteristic ions

Compound	Primary*	Secondary	Tertiary
Acrolein	56	55	58
Iodomethane	142	127	141
Carbon disulfide	76	78	
Trichlorotrifluoroethane	151	101	153
Acetone	58	43	
Methylene chloride	84	86	49
tert-Butyl alcohol	59	74	
trans-1,2-Dichloroethene	96	61	98
Acrylonitrile	53	52	51
Methyl *tert* butyl ether	73	57	
Hexane	57	43	
1,1-Dichloroethane	63	65	83
cis-1,2-Dichloroethene	96	61	98
2-Butanone	43*	72*	
Tetrahydrofuran	71	42	72
Chloroform	83	85	47
1,2-Dichloroethane	62	98	64
Dibromomethane	93	95	172, 174, 176
1,4-Dioxane	88	58	43, 57
Vinyl acetate	43	86	
1,1,1-Trichloroethane	97	99	117*
Carbon tetrachloride	117	119	121
Benzene	78	52	77
Trichloroethene	130*	95*	132
Methylcyclohexane	55	83	98
1,2-Dichloropropane	63	41*	
Bromodichloromethane	83	85	129*
2-Chloroethyl vinyl ether	63	65	106
cis-1,3-Dichloropropene	75	77	39
trans-1,3-Dichloropropene	75	77	39
1,1,2-Trichloroethane	97*	83*	85
Chlorodibromomethane	129	127*	131*
Bromoform	173	171*	175*, 254
1,2,3-Trichloropropane	110*	77	75
Toluene-d_8 (Surrogate)	98	100	
4-Bromofluorobenzene (Surrogate)	95	174	176
Toluene	91*	92*	65
4-Methyl-2-pentanone	43*	58*	85, 100
Tetrachloroethene	164	129	131, 166
Ethyl methacrylate	69	41	99, 86, 114
2-Hexanone	43	58	57, 100

Characteristic ions

Compound	Primary*	Secondary	Tertiary
Chlorobenzene	112	114	77
Ethylbenzene	91	106	
Xylenes	106	91	
Styrene	104	78	103
Dibromofluoromethane	113	111	192
Dichlorobenzene (all isomers)	146	111	148
trans 1,4-Dichloro-2-butene	53	88	75
1,1,2,2-Tetrachloroethane	83	85	131,133
Allyl Chloride	76	41	39, 78
Acetonitrile	41	40	39
Dichlorofluoromethane	67	69	
Isopropyl ether	87	59	45
Chloroprene	53	88	90
n-Butanol	56	41	42, 43
Propionitrile	54	52	55
Methacrylonitrile	41	52	39
Isobutanol	43	42	74
Methyl methacrylate	41	69	39
1,1,1,2-Tetrachloroethane	131	133	119
1,2-Dibromo-3-chloropropane	157	155	75
Ethyl ether	59	74	
Ethyl Acetate	43*	61*	88*
2-Nitropropane	46	43	
Cyclohexanone	55	42	98
Isopropylbenzene	105	120	77
1,2-Dichlorobenzene	111	146	148
1,3-Dichlorobenzene	111	146	148
1,4-Dichlorobenzene	111	146	148
Nonanol	57	98	41
t-Butyl alcohol	59	41	
1-Chlorohexane	91	55	43
Ethanol	45	46	
TAME	73	87	43
ETBE	59	87	41
DIPE (Diisopropyl ether)	45	87	59
2,2-Dimethylpentane	45	46	
2,4-Dimethylpentane	57	85	43
2,2,3-Trimethylbutane	57	43	85
3,3-Dimethylpentane	43	71	85
2-Methylhexane	43	57	85
2,3-Dimethylpentane	56	71	43

Characteristic ions

Compound	Primary*	Secondary	Tertiary
3-Methylhexane	43	57	71
3-Ethylpentane	43	71	55
Heptane	43	57	71
Dimethylsulfide	94	79	45
1,3,5-Trichlorbenzene	180	182	145

The primary ion should be used for quantitation unless interferences are present, in which case a secondary ion may be used.
*****Primary/secondary and/or tertiary ions are switched from order in Method based on signal intensity and co-elutions.

TABLE 4

RECOMMENDED MINIMUM RELATIVE RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION VERIFICATION

Volatile Compounds	Minimum Response Factor
Dichlorodifluoromethane	0.100
Chloromethane	0.100
Vinyl chloride	0.100
Bromomethane	0.100
Chloroethane	0.100
Trichlorofluoromethane	0.100
1,1-Dichloroethene	0.100
1,1,2-Trichloro-1,2,2-trifluoroethane	0.100
Acetone	0.100
Carbon disulfide	0.100
Methyl Acetate	0.100
Methylene chloride	0.100
trans-1,2-Dichloroethene	0.100
cis-1,2-Dichloroethene	0.100
Methyl tert-Butyl Ether	0.100
1,1-Dichloroethane	0.200
2-Butanone	0.100
Chloroform	0.200
1,1,1-Trichloroethane	0.100
Cyclohexane	0.100
Carbon tetrachloride	0.100
Benzene	0.500
1,2-Dichloroethane	0.100
Trichloroethene	0.200
Methylcyclohexane	0.100
1,2-Dichloropropane	0.100
Bromodichloromethane	0.200
cis-1,3-Dichloropropene	0.200
trans-1,3-Dichloropropene	0.100
4-Methyl-2-pentanone	0.100
Toluene	0.400
1,1,2-Trichloroethane	0.100
Tetrachloroethene	0.200
2-Hexanone	0.100
Dibromochloromethane	0.100
1,2-Dibromoethane	0.100
Chlorobenzene	0.500
Ethylbenzene	0.100
meta-/para-Xylene	0.100
ortho-Xylene	0.300
Styrene	0.300
Bromoform	0.100
Isopropylbenzene	0.100
1,1,2,2-Tetrachloroethane	0.300
1,3-Dichlorobenzene	0.600
1,4-Dichlorobenzene	0.500
1,2-Dichlorobenzene	0.400
1,2-Dibromo-3-chloropropane	0.050
1,2,4-Trichlorobenzene	0.200

TestAmerica St. Louis has established a default minimum response factor of 0.01 for compounds not identified in this table, except for Acrolein, Acetonitrile, Isobutanol, Tetrahydrofuran, Propionitrile, n-butanol, 1,4-Dioxane, 2-chloroethyl vinyl ether, Cyclohexanone, nonanol (25ml purge) and Acrolein, Acetonitrile, Tetrahydrofuran, Propionitrile, Isobutanoln-butanol, 1,4-Dioxane, Cyclohexanone (5ml purge), which have a minimum response factor of 0.001.

Table 5
Assigned Surrogates/Internal Standards for Instruments using Instrument MSG

Compound	Assigned Surrogate	Assigned Internal Standard
Dichlorodifluoromethane	Dibromofluoromethane	Fluorobenzene
Freon-114	Dibromofluoromethane	Fluorobenzene
Chloromethane	Dibromofluoromethane	Fluorobenzene
Vinyl Chloride	Dibromofluoromethane	Fluorobenzene
Bromomethane	Dibromofluoromethane	Fluorobenzene
Chloroethane	Dibromofluoromethane	Fluorobenzene
Trichlorofluoromethane	Dibromofluoromethane	Fluorobenzene
Diethyl Ether	Dibromofluoromethane	Fluorobenzene
1,1,2-Trichlorofluoroethane	Dibromofluoromethane	Fluorobenzene
Acrolein	Dibromofluoromethane	Fluorobenzene
Acetone	Dibromofluoromethane	Fluorobenzene
1,1-Dichloroethene	Dibromofluoromethane	Fluorobenzene
Acetonitrile	Dibromofluoromethane	Fluorobenzene
Iodomethane	Dibromofluoromethane	Fluorobenzene
Methyl Acetate	Dibromofluoromethane	Fluorobenzene
Allyl chloride	Dibromofluoromethane	Fluorobenzene
Carbon Disulfide	Dibromofluoromethane	Fluorobenzene
Methylene Chloride	Dibromofluoromethane	Fluorobenzene
Acrylonitrile	Dibromofluoromethane	Fluorobenzene
MTBE	Dibromofluoromethane	Fluorobenzene
trans-1,2-Dichloroethene	Dibromofluoromethane	Fluorobenzene
n-Hexane	Dibromofluoromethane	Fluorobenzene
1,1-Dichloroethane	Dibromofluoromethane	Fluorobenzene
1,2-Dichloroethene (total)	Dibromofluoromethane	Fluorobenzene
Vinyl acetate	Dibromofluoromethane	Fluorobenzene
2-Chloro-1,3-butadiene	Dibromofluoromethane	Fluorobenzene
2-Butoxyethanol	Dibromofluoromethane	Fluorobenzene
2-Butanone	Dibromofluoromethane	Fluorobenzene
Propionitrile	Dibromofluoromethane	Fluorobenzene
2,2-Dichloropropane	Dibromofluoromethane	Fluorobenzene
cis-1,2-Dichloroethene	Dibromofluoromethane	Fluorobenzene
Isobutanol	Dibromofluoromethane	Fluorobenzene
Ethyl Acetate	Dibromofluoromethane	Fluorobenzene
Methacrylonitrile	Dibromofluoromethane	Fluorobenzene
Chloroform	Dibromofluoromethane	Fluorobenzene

Bromochloromethane	Dibromofluoromethane	Fluorobenzene
Tetrahydrofuran	Dibromofluoromethane	Fluorobenzene
n-butanol	1,2-Dichloroethane-d4	Fluorobenzene
1,1,1-Trichloroethane	1,2-Dichloroethane-d4	Fluorobenzene
Cyclohexane	1,2-Dichloroethane-d4	Fluorobenzene
1,1-Dichloropropene	1,2-Dichloroethane-d4	Fluorobenzene
Carbon Tetrachloride	1,2-Dichloroethane-d4	Fluorobenzene
Heptane	1,2-Dichloroethane-d4	Fluorobenzene
Benzene	1,2-Dichloroethane-d4	Fluorobenzene
1,2-Dichloroethane	1,2-Dichloroethane-d4	Fluorobenzene
Trichloroethene	1,2-Dichloroethane-d4	Fluorobenzene
Methyl cyclohexane	1,2-Dichloroethane-d4	Fluorobenzene
1,2-Dichloropropane	1,2-Dichloroethane-d4	Fluorobenzene
Methyl methacrylate	1,2-Dichloroethane-d4	Fluorobenzene
Bromodichloromethane	1,2-Dichloroethane-d4	Fluorobenzene
Dibromomethane	1,2-Dichloroethane-d4	Fluorobenzene
1,4-Dioxane	1,2-Dichloroethane-d4	Fluorobenzene
4-Methyl-2-pentanone (MIBK)	1,2-Dichloroethane-d4	Fluorobenzene
2-Chloroethyl vinyl ether	1,2-Dichloroethane-d4	Fluorobenzene
Cis-1,3-Dichloropropene	1,2-Dichloroethane-d4	Fluorobenzene
Dimethyl disulfide	1,2-Dichloroethane-d4	Fluorobenzene
2-Nitropropane	1,2-Dichloroethane-d4	Fluorobenzene
Toluene	Toluene-d8	Chlorobenzene-d5
trans-1,3-Dichloropropene	Toluene-d8	Chlorobenzene-d5
Ethyl methacrylate	Toluene-d8	Chlorobenzene-d5
1,1,2-Trichloroethane	Toluene-d8	Chlorobenzene-d5
2-Hexanone	Toluene-d8	Chlorobenzene-d5
1,3-Dichloropropane	Toluene-d8	Chlorobenzene-d5
Tetrachloroethene	Toluene-d8	Chlorobenzene-d5
Chlorodibromomethane	Toluene-d8	Chlorobenzene-d5
1,2-Dibromoethane	Toluene-d8	Chlorobenzene-d5
Chlorobenzene	Toluene-d8	Chlorobenzene-d5
1,1,1,2-Tetrachloroethane	Toluene-d8	Chlorobenzene-d5
Ethylbenzene	Toluene-d8	Chlorobenzene-d5
m,p-Xylenes	Toluene-d8	Chlorobenzene-d5
o-Xylenes	Toluene-d8	Chlorobenzene-d5
Styrene	Toluene-d8	Chlorobenzene-d5
Bromoform	Toluene-d8	Chlorobenzene-d5
Isopropylbenzene	Toluene-d8	Chlorobenzene-d5
Cyclohexanone	Toluene-d8	Chlorobenzene-d5
1,1,2,2-Tetrachloroethane	Toluene-d8	Chlorobenzene-d5
1,2,3-Trichloropropane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4

Bromobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
n-Propylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
trans-1,4-dichlorobenzene-2-butene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
2-Chlorotoluene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,3,5-Trimethylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
4-Chlorotoluene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
t-Butylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Pentachloroethane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2,4-Trimethylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
sec-Butylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
4-Isopropyltoluene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,3-Dichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,4-Dichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
n-Butylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2-Dichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Nonanal	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2-Dibromo-3-chloropropane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,3,5-trichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2,4-Trichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Hexachlorobutadiene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Naphthalene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2,3-Trichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
4-Chlorophenyl methyl sulfide	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4

Assigned Surrogates/Internal Standards for Instruments using Instruments MSF, MSL, MSM, MSN

Compound	Assigned Surrogate	Assigned Internal Standard
Dichlorodifluoromethane	Dibromofluoromethane	Fluorobenzene
Freon-114	Dibromofluoromethane	Fluorobenzene
Chloromethane	Dibromofluoromethane	Fluorobenzene
Vinyl Chloride	Dibromofluoromethane	Fluorobenzene
Bromomethane	Dibromofluoromethane	Fluorobenzene
Chloroethane	Dibromofluoromethane	Fluorobenzene
Trichlorofluoromethane	Dibromofluoromethane	Fluorobenzene
Diethyl Ether	Dibromofluoromethane	Fluorobenzene
1,1-Dichloroethene	Dibromofluoromethane	Fluorobenzene
1,1,2-Trichlorofluoroethane	Dibromofluoromethane	Fluorobenzene
Carbon Disulfide	Dibromofluoromethane	Fluorobenzene

Iodomethane	Dibromofluoromethane	Fluorobenzene
Acrolein	Dibromofluoromethane	Fluorobenzene
Allyl chloride	Dibromofluoromethane	Fluorobenzene
Methylene Chloride	Dibromofluoromethane	Fluorobenzene
Acetone	Dibromofluoromethane	Fluorobenzene
Methyl Acetate	Dibromofluoromethane	Fluorobenzene
trans-1,2-Dichloroethene	Dibromofluoromethane	Fluorobenzene
n-Hexane	Dibromofluoromethane	Fluorobenzene
Acetonitrile	Dibromofluoromethane	Fluorobenzene
MTBE	Dibromofluoromethane	Fluorobenzene
2-Chloro-1,3-butadiene	Dibromofluoromethane	Fluorobenzene
1,1-Dichloroethane	Dibromofluoromethane	Fluorobenzene
1,2-Dichloroethene (total)	Dibromofluoromethane	Fluorobenzene
Acrylonitrile	Dibromofluoromethane	Fluorobenzene
Vinyl acetate	Dibromofluoromethane	Fluorobenzene
cis-1,2-Dichloroethene	Dibromofluoromethane	Fluorobenzene
2,2-Dichloropropane	Dibromofluoromethane	Fluorobenzene
Bromochloromethane	Dibromofluoromethane	Fluorobenzene
2-Butoxyethanol	Dibromofluoromethane	Fluorobenzene
Cyclohexane	Dibromofluoromethane	Fluorobenzene
Chloroform	Dibromofluoromethane	Fluorobenzene
t-Butyl Alcohol	Dibromofluoromethane	Fluorobenzene
Diisopropyl Ether	Dibromofluoromethane	Fluorobenzene
ETBE	Dibromofluoromethane	Fluorobenzene
Ethanol	Dibromofluoromethane	Fluorobenzene
2,2-Dimethylpentane	Dibromofluoromethane	Fluorobenzene
2,4-Dimethylpentane	Dibromofluoromethane	Fluorobenzene
2,2,3-Trimethylbutane	Dibromofluoromethane	Fluorobenzene
3,3-Dimethylpentane	Dibromofluoromethane	Fluorobenzene
Ethyl Acetate	Dibromofluoromethane	Fluorobenzene
Carbon Tetrachloride	Dibromofluoromethane	Fluorobenzene
Tetrahydrofuran	Dibromofluoromethane	Fluorobenzene
1,1,1-Trichloroethane	1,2-Dichloroethane-d4	Fluorobenzene
2-Butanone	1,2-Dichloroethane-d4	Fluorobenzene
1,1-Dichloropropene	1,2-Dichloroethane-d4	Fluorobenzene
Heptane	1,2-Dichloroethane-d4	Fluorobenzene
Benzene	1,2-Dichloroethane-d4	Fluorobenzene
Propionitrile	1,2-Dichloroethane-d4	Fluorobenzene
Methacrylonitrile	1,2-Dichloroethane-d4	Fluorobenzene
Isobutanol	1,2-Dichloroethane-d4	Fluorobenzene
1,2-Dichloroethane	1,2-Dichloroethane-d4	Fluorobenzene
Trichloroethene	1,2-Dichloroethane-d4	Fluorobenzene

Methyl cyclohexane	1,2-Dichloroethane-d4	Fluorobenzene
n-butanol	1,2-Dichloroethane-d4	Fluorobenzene
Dibromomethane	1,2-Dichloroethane-d4	Fluorobenzene
1,2-Dichloropropane	1,2-Dichloroethane-d4	Fluorobenzene
Bromodichloromethane	1,2-Dichloroethane-d4	Fluorobenzene
Methyl methacrylate	1,2-Dichloroethane-d4	Fluorobenzene
1,4-Dioxane	1,2-Dichloroethane-d4	Fluorobenzene
Cis-1,3-Dichloropropene	1,2-Dichloroethane-d4	Fluorobenzene
2-Chloroethylvinyl ether	1,2-Dichloroethane-d4	Fluorobenzene
TAME	1,2-Dichloroethane-d4	Fluorobenzene
2-Methylhexane	1,2-Dichloroethane-d4	Fluorobenzene
2,3-Dimethylpentane	1,2-Dichloroethane-d4	Fluorobenzene
3-Methylhexane	1,2-Dichloroethane-d4	Fluorobenzene
3-Ethypentane	1,2-Dichloroethane-d4	Fluorobenzene
Heptane	1,2-Dichloroethane-d4	Fluorobenzene
Toluene	Toluene-d8	Chlorobenzene-d5
Dimethyl Disulfide	Toluene-d8	Chlorobenzene-d5
2-Nitropropane	Toluene-d8	Chlorobenzene-d5
4-Methyl-2-pentanone (MEK)	Toluene-d8	Chlorobenzene-d5
trans-1,3-Dichloropropene	Toluene-d8	Chlorobenzene-d5
Tetrachloroethene	Toluene-d8	Chlorobenzene-d5
Ethyl methacrylate	Toluene-d8	Chlorobenzene-d5
1,1,2-Trichloroethane	Toluene-d8	Chlorobenzene-d5
Chlorodibromomethane	Toluene-d8	Chlorobenzene-d5
1,3-Dichloropropane	Toluene-d8	Chlorobenzene-d5
1,2-Dibromoethane	Toluene-d8	Chlorobenzene-d5
2-Hexanone	Toluene-d8	Chlorobenzene-d5
Ethylbenzene	Toluene-d8	Chlorobenzene-d5
Chlorobenzene	Toluene-d8	Chlorobenzene-d5
1,1,1,2-Tetrachloroethane	Toluene-d8	Chlorobenzene-d5
m,p-Xylenes	Toluene-d8	Chlorobenzene-d5
o-Xylenes	Toluene-d8	Chlorobenzene-d5
Styrene	Toluene-d8	Chlorobenzene-d5
1-Chlorohexane	Toluene-d8	Chlorobenzene-d5
Bromoform	Toluene-d8	1,4-Dichlorobenzene-d4
Isopropylbenzene	Toluene-d8	1,4-Dichlorobenzene-d4
n-Propylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,1,2,2-Tetrachloroethane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Bromobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,3,5-Trimethylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
2-Chlorotoluene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
trans-1,4-dichlorobenzene-2-	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4

butene		
1,2,3-Trichloropropane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
4-Chlorotoluene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Cyclohexanone	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
t-Butylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2,4-Trimethylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Pentachloroethane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
sec-Butylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
4-Isopropyltoluene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,3-Dichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,4-Dichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
n-Butylbenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2-Dichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,3,5-trichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2-Dibromo-3-chloropropane	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Hexachlorobutadiene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2,4-Trichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
Naphthalene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
1,2,3-Trichlorobenzene	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4
4-Chlorophenyl methyl sulfide	4-Bromofluorobenzene	1,4-Dichlorobenzene-d4

Attachment 1
Medium Level Soil Extraction Log

Analyst: ______________________ Extraction Date: ____________________

Methanol Lot ID: __________________ Batch # ________________________

Balance ID: ___________________________

The final volume of all extracts is 5 mls of methanol.
All weights are expressed in grams.

Sample ID	Sample Weight	Methanol volume	Sample spiked	Spike verification

QC Standards: LCS/MS/MSD________________________

Surrogate___________________________

Appendix 1

1,4-Dioxane 8260C SIM Method

Standards

Internal Standard Working Mix	1,4-Dioxane-d8	50ppm
Calibration Standard Working Mix	1,4-Dioxane	50ppm
8260 IS Working Mix	8260 IS	1ppm

Calibration Table

Level	1,4-Diox. Mix in 5ml	1,4-Diox. Mix in 20ml	d8-1,4-Diox in 20ml	8260 IS Mix in 20ml
5ppb	0.5uL	2uL	40uL	10uL
10ppb	1.0uL	4uL	40uL	10uL
20ppb	2.0uL	8uL	40uL	10uL
50ppb	5.0uL	20uL	40uL	10uL
100ppb	10uL	40uL	40uL	10uL
200ppb	20uL	80uL	40uL	10uL

d8-1,4-Dioxane IS concentration in sample 100ppb

1,4-Dioxane ICV/LCS/MS/MSD concentration 20ppb

8260 IS concentration in samples 0.5ppb

Need MDL verification after BFB of each clock 2ppb (based on current MDL .74ppb)

Spike d8-1,4-Dioxane **and** 8260 IS in all analyses

GC/MS Method – 8260SIM Concentrator Method – 8260SIM

TAL Reference Data Summary

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	2	ug/L	0.344	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	10	150	20
20	Acetonitrile	10	ug/L	2.039	ug/L	20100106														
39	Acrolein	10	ug/L	2.75	ug/L	20100108														
46	Acrylonitrile	10	ug/L	0.583	ug/L	20100104														
196	Benzene	1	ug/L	0.064	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	115	20
318	Bromobenzene	1	ug/L	0.076	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	69	115	20
321	Bromochloromethane	1	ug/L	0.133	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
325	Dichlorobromomethane	1	ug/L	0.088	ug/L	20100427														
323	Bromodichloromethane	1	ug/L	0.088	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	115	20
340	Bromoform	1	ug/L	0.166	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	116	20
344	Methyl bromide	2	ug/L	0.126	ug/L	20100427														
343	Bromomethane	2	ug/L	0.126	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	47	145	20
363	1-Butanol	40	ug/L	12.3	ug/L	20100106														
2729	n-Butanol	40	ug/L	12.3	ug/L	20100106														
3271	2-Butanone (MEK)	5	ug/L	0.518	ug/L	20100106														
372	2-Butanone	5	ug/L	0.518	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	47	119	20
373	Methyl ethyl ketone	5	ug/L	0.518	ug/L	20100106														
374	MEK	5	ug/L	0.518	ug/L	20100106														
3280	Methyl ethyl ketone (MEK)	5	ug/L	0.518	ug/L	20100106														
364	n-Butyl alcohol	40	ug/L	12.3	ug/L	20100106														
393	n-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	66	116	20
395	sec-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	124	20
398	tert-Butylbenzene	1	ug/L	0.110	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	69	124	20
459	Carbon disulfide	1	ug/L	0.051	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	69	150	20
463	Carbon tetrachloride	1	ug/L	0.125	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	123	20
521	Chlorobenzene	1	ug/L	0.148	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	115	20
322	Chlorobromomethane	1	ug/L	0.133	ug/L	20100427														
2765	Chlorobutadiene	1	ug/L	0.097	ug/L	20100427														
531	Chloroprene	1	ug/L	0.097	ug/L	20100427														
530	2-Chloro-1,3-butadiene	1	ug/L	0.097	ug/L	20100427														
534	Chlorodibromomethane	1	ug/L	0.127	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
535	Dibromochloromethane	1	ug/L	0.127	ug/L	20100427														
3361	Ethyl chloride	2	ug/L	0.099	ug/L	20100427														
550	Chloroethane	2	ug/L	0.099	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	58	139	20
568	2-Chloroethyl vinyl ether	2	ug/L	0.165	ug/L	20100106														
569	Chloroform	1	ug/L	0.102	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	74	115	20
575	Methyl chloride	2	ug/L	0.077	ug/L	20100104														

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	2	ug/L	0.077	ug/L	20100104														
574	Chloromethane	2	ug/L	0.077	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	61	120	20
606	Allyl chloride	2	ug/L	0.111	ug/L	20100427														
2766	Chloropropene	2	ug/L	0.111	ug/L	20100427														
604	3-Chloro-1-propene	2	ug/L	0.111	ug/L	20100427														
614	2-Chlorotoluene	1	ug/L	0.078	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	118	20
615	o-Chlorotoluene	0.5	ug/L	0.078	ug/L	20100427														
617	4-Chlorotoluene	1	ug/L	0.081	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	117	20
618	p-Chlorotoluene	0.5	ug/L	0.081	ug/L	20100427														
669	Cyclohexane	1	ug/L	0.067	ug/L	20100427														
676	Cyclohexanone	20	ug/L	5.78	ug/L	20100106														
3260	1,2-Dibromo-3-chloropropane (DBCP)	1	ug/L	0.4110	ug/L	20100106														
539	1,2-Dibromo-3-chloropropane	1	ug/L	0.4110	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	62	115	20
870	1,2-Dibromoethane	1	ug/L	0.128	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
3261	1,2-Dibromoethane (EDB)	1	ug/L	0.128	ug/L	20100104														
889	Methylene bromide	1	ug/L	0.210	ug/L	20100104														
888	Dibromomethane	1	ug/L	0.210	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	115	20
906	o-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104														
904	1,2-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	75	115	20
909	m-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427														
907	1,3-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
912	p-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104														
910	1,4-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	8	ug/L	70	115	20
922	trans-1,4-Dichloro-2-butene	2	ug/L	0.290	ug/L	20100106														
924	Dichlorodifluoromethane	2	ug/L	0.084	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	39	131	20
3615	Dichlorodifluoromethane (Freon 12)	2	ug/L	0.084	ug/L	20100427														
933	1,1-Dichloroethane	1	ug/L	0.068	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	115	20
3767	Ethylene dichloride	1	ug/L	0.100	ug/L	20100104														
936	1,2-Dichloroethane	1	ug/L	0.100	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	115	20
949	cis-1,2-Dichloroethylene	1	ug/L	0.087	ug/L	20100427														
948	cis-1,2-Dichloroethene	1	ug/L	0.087	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	66	115	20
951	trans-1,2-Dichloroethylene	1	ug/L	0.083	ug/L	20100104														
950	trans-1,2-Dichloroethene	1	ug/L	0.083	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	65	116	20
946	1,1-Dichloroethylene	1	ug/L	0.083	ug/L	20100427														
943	1,1-Dichloroethene	1	ug/L	0.083	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	56	115	20
952	1,2-Dichloroethene (total)	2	ug/L	0.154	ug/L	20100427														
986	1,2-Dichloropropane	1	ug/L	0.097	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	115	20
989	1,3-Dichloropropane	1	ug/L	0.072	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	115	20
990	2,2-Dichloropropane	1	ug/L	0.142	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	58	121	20

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
998	cis-1,3-Dichloropropene	1	ug/L	0.073	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	115	20
2769	trans-1,3-Dichloropropylene	1	ug/L	0.083	ug/L	20100104														
1000	trans-1,3-Dichloropropene	1	ug/L	0.083	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
996	1,1-Dichloropropene	1	ug/L	0.079	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	67	116	20
2788	cis-1,3-Dichloropropylene	1	ug/L	0.073	ug/L	20100104														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	4	ug/L	0.135	ug/L	20100427														
3887	Dimethyl disulfide	5	ug/L	0.224	ug/L	20100108														
1199	1,4-Dioxane	80	ug/L	7.56	ug/L	20100106														
1325	Ethyl acetate	2	ug/L	0.176	ug/L	20100106														
1332	Ethylbenzene	1	ug/L	0.086	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	74	118	20
1349	Ethyl ether	1	ug/L	0.260	ug/L	20100104														
1355	Diethyl ether	1	ug/L	0.260	ug/L	20100104														
1360	Ethyl methacrylate	1	ug/L	0.108	ug/L	20100104														
2790	Freon 113	1	ug/L	0.101	ug/L	20100427														
1489	Hexachlorobutadiene	1	ug/L	0.087	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	59	116	20
3445	Hexane	4	ug/L	0.106	ug/L	20100104														
1514	n-Hexane	4	ug/L	0.106	ug/L	20100104														
1515	2-Hexanone	5	ug/L	0.224	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	40	130	20
1536	Iodomethane	2	ug/L	0.092	ug/L	20100104														
1537	Methyl iodide	2	ug/L	0.092	ug/L	20100104														
1552	Isobutanol	80	ug/L	8.702	ug/L	20100106														
1556	Isobutyl alcohol	80	ug/L	8.702	ug/L	20100106														
1578	Isopropylbenzene	1	ug/L	0.083	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	65	123	20
1587	4-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	123	20
1590	p-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427														
1713	Methacrylonitrile	5	ug/L	0.495	ug/L	20100427														
1774	Methyl acetate	5	ug/L	0.367	ug/L	20100430														
3724	Methyl butyl ketone	5	ug/L	0.224	ug/L	20100106														
1799	Methylcyclohexane	4	ug/L	0.104	ug/L	20100104														
1812	Dichloromethane	1	ug/L	0.108	ug/L	20100104														
1811	Methylene chloride	1	ug/L	0.108	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	66	115	20
1823	Methyl methacrylate	1	ug/L	0.257	ug/L	20100104														
1848	Methyl isobutyl ketone	5	ug/L	0.121	ug/L	20100104														
3283	4-Methyl-2-pentanone (MIBK)	5	ug/L	0.121	ug/L	20100104														
1849	MIBK	5	ug/L	0.121	ug/L	20100104														
1845	4-Methyl-2-pentanone	5	ug/L	0.121	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	46	127	20
2773	MTBE	2	ug/L	0.114	ug/L	20100104														
2772	Methyl tert-butyl ether	2	ug/L	0.114	ug/L	20100104														
3794	Methyl tert-butyl ether (MTBE)	2	ug/L	0.114	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	57	115	20

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1932	Naphthalene	1	ug/L	0.157	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	38	118	20
2005	2-Nitropropane	10	ug/L	0.397	ug/L	20100106														
5350	Nonanal	5	ug/L	0.412	ug/L	20100111														
2108	Pentachloroethane	2	ug/L	0.343	ug/L	20100430														
2238	Propionitrile	5	ug/L	1.35	ug/L	20100427														
2247	n-Propylbenzene	1	ug/L	0.062	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	127	20
2355	Styrene	1	ug/L	0.074	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
2437	1,1,1,2-Tetrachloroethane	1	ug/L	0.090	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	115	20
2439	1,1,2,2-Tetrachloroethane	1	ug/L	0.098	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
2446	Tetrachloroethylene	1	ug/L	0.178	ug/L	20100427														
2445	Tetrachloroethene	1	ug/L	0.178	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	120	20
2469	Tetrahydrofuran	10	ug/L	1.14	ug/L	20100106														
2489	Toluene	1	ug/L	0.072	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	119	20
5524	Total Detected VOCs	5	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.128	ug/L	20100108														
2514	1,2,3-Trichlorobenzene	1	ug/L	0.087	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	59	115	20
2515	1,2,4-Trichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	60	115	20
2518	1,1,1-Trichloroethane	1	ug/L	0.069	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	123	20
2522	1,1,2-Trichloroethane	1	ug/L	0.150	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	115	20
2525	Trichloroethene	1	ug/L	0.212	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	116	20
2526	Trichloroethylene	1	ug/L	0.212	ug/L	20100104														
1427	Fluorotrichloromethane	1	ug/L	0.113	ug/L	20100427														
1428	Trichlorofluoromethane	1	ug/L	0.113	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	75	123	20
2563	1,2,3-Trichloropropane	1	ug/L	0.153	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	116	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/L	0.101	ug/L	20100427														
2764	Trichlorotrifluoroethane	1	ug/L	0.101	ug/L	20100427														
2747	Trihalomethanes (total)	2.0	ug/L	0.61	ug/L	20080924														
2587	1,2,4-Trimethylbenzene	1	ug/L	0.084	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	77	115	20
2592	1,3,5-Trimethylbenzene	1	ug/L	0.081	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	125	20
2610	Vinyl acetate	2	ug/L	0.181	ug/L	20100427														
2613	Vinyl chloride	2	ug/L	0.084	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	50	142	20
2940	m-Xylene & p-Xylene	2	ug/L	0.142	ug/L	20100427														
2623	o-Xylene	1	ug/L	0.063	ug/L	20100427														
2627	Xylenes (total)	3	ug/L	0.200	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	120	20
337	4-Bromofluorobenzene						X	Y	5	ug/L	85	125	0	X	Y	5	ug/L	78	132	0
2855	1,2-Dichlorobenzene-d4						X	Y	10	ug/L	85	116	0	X	Y	10	ug/L	84	118	0

TAL Reference Data Summary

Structured Analysis Code: **I-15-DN-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/L	3.81	ug/L	20060323	C	Y	20	ug/L	47	135	20	C	Y	20	ug/L	16	134	20
20	Acetonitrile	50	ug/L	1.98	ug/L	20060202	C	Y	20	ug/L	58	137	20	C	Y	20	ug/L	30	150	20
39	Acrolein	50	ug/L	3.96	ug/L	20060207	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	50	150	20
46	Acrylonitrile	50	ug/L	4.14	ug/L	20060207	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	23	150	20
196	Benzene	5	ug/L	0.169	ug/L	20060202	C	Y	20	ug/L	74	130	20	C	Y	20	ug/L	57	139	20
220	Benzyl chloride	10	ug/L			0														
318	Bromobenzene	5	ug/L	0.226	ug/L	20060202	C	Y	20	ug/L	77	124	20	C	Y	20	ug/L	52	130	20
321	Bromochloromethane	5	ug/L	0.411	ug/L	20060207	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	27	148	20
325	Dichlorobromomethane	5	ug/L	0.334	ug/L	20060202														
323	Bromodichloromethane	5	ug/L	0.334	ug/L	20060202	C	Y	20	ug/L	74	131	20	C	Y	20	ug/L	38	150	20
340	Bromoform	5	ug/L	0.244	ug/L	20060202	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	45	150	20
344	Methyl bromide	10	ug/L	0.312	ug/L	20060207														
343	Bromomethane	10	ug/L	0.312	ug/L	20060207	C	Y	20	ug/L	48	140	20	C	Y	20	ug/L	31	131	20
363	1-Butanol	100	ug/L	3.39	ug/L	20060323	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
2729	n-Butanol	100	ug/L	3.39	ug/L	20060323														
3271	2-Butanone (MEK)	20	ug/L	1.37	ug/L	20060222														
372	2-Butanone	20	ug/L	1.37	ug/L	20060222	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
373	Methyl ethyl ketone	20	ug/L	1.37	ug/L	20060222														
374	MEK	20	ug/L	1.37	ug/L	20060222														
3280	Methyl ethyl ketone (MEK)	20	ug/L	1.37	ug/L	20060222														
364	n-Butyl alcohol	100	ug/L	3.39	ug/L	20060323														
1772	tert-Butyl alcohol	5	ug/L	5	ug/L	20040505														
393	n-Butylbenzene	5	ug/L	0.531	ug/L	20060207	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	53	130	20
395	sec-Butylbenzene	5	ug/L	0.246	ug/L	20060224	C	Y	20	ug/L	73	135	20	C	Y	20	ug/L	55	131	20
398	tert-Butylbenzene	5	ug/L	0.265	ug/L	20060224	C	Y	20	ug/L	73	134	20	C	Y	20	ug/L	53	133	20
459	Carbon disulfide	5	ug/L	0.55	ug/L	20060202	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	70	140	20
463	Carbon tetrachloride	5	ug/L	0.904	ug/L	20060222	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	70	140	20
521	Chlorobenzene	5	ug/L	0.124	ug/L	20060202	C	Y	20	ug/L	76	122	20	C	Y	20	ug/L	57	131	20
322	Chlorobromomethane	5	ug/L	0.411	ug/L	20060207														
2765	Chlorobutadiene	5	ug/L	0.448	ug/L	20060202														
531	Chloroprene	5	ug/L	0.448	ug/L	20060202														
530	2-Chloro-1,3-butadiene	5	ug/L	0.448	ug/L	20060202	C	Y	20	ug/L	69	136	20	C	Y	20	ug/L	32	150	20
535	Dibromochloromethane	5	ug/L	0.288	ug/L	20060202	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	53	149	20
534	Chlorodibromomethane	5	ug/L	0.288	ug/L	20060202														
550	Chloroethane	10	ug/L	0.351	ug/L	20060207	C	Y	20	ug/L	55	131	20	C	Y	20	ug/L	35	139	20
3361	Ethyl chloride	10	ug/L	0.351	ug/L	20060207														
5816	Chloroethene	5	ug/L	0.237	ug/L	20060202														

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
568	2-Chloroethyl vinyl ether	20	ug/L	0.821	ug/L	20060207	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	70	130	20
569	Chloroform	5	ug/L	0.142	ug/L	20060202	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20
574	Chloromethane	10	ug/L	0.444	ug/L	20060202	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	41	140	20
575	Methyl chloride	10	ug/L	0.444	ug/L	20060202														
4147	Chloromethane (Methyl Chloride)	10	ug/L	0.444	ug/L	20060202														
2766	Chloropropene	10	ug/L	0.300	ug/L	20060207														
606	Allyl chloride	10	ug/L	0.300	ug/L	20060207	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	33	150	20
604	3-Chloro-1-propene	10	ug/L	0.300	ug/L	20060207														
614	2-Chlorotoluene	5	ug/L	0.456	ug/L	20060202	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	52	132	20
617	4-Chlorotoluene	5	ug/L	0.881	ug/L	20060207	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	43	139	20
669	Cyclohexane	10	ug/L	0.4	ug/L	20060202	C	Y	20	ug/L	67	136	20	C	Y	20	ug/L	38	143	20
676	Cyclohexanone	100	ug/L	13.6	ug/L	20060207	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	135	20
539	1,2-Dibromo-3-chloropropane	10	ug/L	0.89	ug/L	20060207														
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/L	0.89	ug/L	20060207	C	Y	20	ug/L	59	129	20	C	Y	20	ug/L	31	139	20
3261	1,2-Dibromoethane (EDB)	5	ug/L	0.507	ug/L	20060207	C	Y	20	ug/L	71	126	20	C	Y	20	ug/L	28	148	20
870	1,2-Dibromoethane	5	ug/L	0.507	ug/L	20060207														
889	Methylene bromide	5	ug/L	0.351	ug/L	20060207														
888	Dibromomethane	5	ug/L	0.351	ug/L	20060207														
906	o-Dichlorobenzene	5	ug/L	0.15	ug/L	20060202														
904	1,2-Dichlorobenzene	5	ug/L	0.15	ug/L	20060202	C	Y	20	ug/L	76	124	20	C	Y	20	ug/L	52	136	20
909	m-Dichlorobenzene	5	ug/L	0.13	ug/L	20060202														
907	1,3-Dichlorobenzene	5	ug/L	0.13	ug/L	20060202	C	Y	20	ug/L	77	126	20	C	Y	20	ug/L	59	134	20
910	1,4-Dichlorobenzene	5	ug/L	0.108	ug/L	20060202	C	Y	20	ug/L	76	118	20	C	Y	20	ug/L	53	128	20
922	trans-1,4-Dichloro-2-butene	10	ug/L	0.606	ug/L	20060207	C	Y	20	ug/L	46	140	20	C	Y	20	ug/L	22	148	20
3615	Dichlorodifluoromethane (Freon 12)	10	ug/L	0.374	ug/L	20060202	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	24	130	20
924	Dichlorodifluoromethane	10	ug/L	0.374	ug/L	20060202														
933	1,1-Dichloroethane	5	ug/L	0.952	ug/L	20060222	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	59	148	20
936	1,2-Dichloroethane	5	ug/L	0.438	ug/L	20060207	C	Y	20	ug/L	68	128	20	C	Y	20	ug/L	49	150	20
3767	Ethylene dichloride	5	ug/L	0.438	ug/L	20060207														
949	cis-1,2-Dichloroethylene	5	ug/L	0.428	ug/L	20060207														
948	cis-1,2-Dichloroethene	5	ug/L	0.428	ug/L	20060207	C	Y	20	ug/L	71	129	20	C	Y	20	ug/L	42	142	20
951	trans-1,2-Dichloroethylene	5	ug/L	0.221	ug/L	20060207														
950	trans-1,2-Dichloroethene	5	ug/L	0.221	ug/L	20060207	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	54	140	20
946	1,1-Dichloroethylene	5	ug/L	0.549	ug/L	20060207														
943	1,1-Dichloroethene	5	ug/L	0.549	ug/L	20060207	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	37	146	20
953	1,2-Dichloroethylene	10	ug/L	0.543	ug/L	20060207														
952	1,2-Dichloroethene (total)	10	ug/L	0.543	ug/L	20060207	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	38	143	20
986	1,2-Dichloropropane	5	ug/L	0.373	ug/L	20060202	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	150	20
989	1,3-Dichloropropane	5	ug/L	0.179	ug/L	20060202	C	Y	20	ug/L	72	127	20	C	Y	20	ug/L	41	144	20

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
990	2,2-Dichloropropane	5	ug/L	0.173	ug/L	20060202	C	Y	20	ug/L	47	140	20	C	Y	20	ug/L	20	150	20
998	cis-1,3-Dichloropropene	5	ug/L	0.728	ug/L	20060207	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	50	150	20
1000	trans-1,3-Dichloropropene	5	ug/L	0.202	ug/L	20060202	C	Y	20	ug/L	64	132	20	C	Y	20	ug/L	28	150	20
2769	trans-1,3-Dichloropropylene	5	ug/L	0.202	ug/L	20060202														
996	1,1-Dichloropropene	5	ug/L	0.291	ug/L	20060202	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	138	20
2788	cis-1,3-Dichloropropylene	5	ug/L	0.728	ug/L	20060207														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/L	0.287	ug/L	20060207	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	33	145	20
3887	Dimethyl disulfide	5	ug/L	0.27	ug/L	20050418														
1199	1,4-Dioxane	400	ug/L	21.02	ug/L	20060323	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	30	150	20
3766	Epichlorohydrin	25	ug/L			0														
1290	Ethanol	20	ug/L	1.69	ug/L	20030212														
1325	Ethyl acetate	20	ug/L	0.884	ug/L	20060207	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	50	145	20
1332	Ethylbenzene	5	ug/L	0.186	ug/L	20060202	C	Y	20	ug/L	75	126	20	C	Y	20	ug/L	53	135	20
1349	Ethyl ether	10	ug/L	0.825	ug/L	20060207	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	37	150	20
1355	Diethyl ether	10	ug/L	0.825	ug/L	20060207														
1360	Ethyl methacrylate	5	ug/L	0.337	ug/L	20060202	C	Y	20	ug/L	62	140	20	C	Y	20	ug/L	26	150	20
2790	Freon 113	5	ug/L	0.535	ug/L	20060222	C	Y	20	ug/L	74	134	20	C	Y	20	ug/L	35	147	20
1489	Hexachlorobutadiene	5	ug/L	0.216	ug/L	20060207	C	Y	20	ug/L	67	114	20	C	Y	20	ug/L	25	127	20
3445	Hexane	10	ug/L	0.452	ug/L	20060207														
1514	n-Hexane	10	ug/L	0.452	ug/L	20060207	C	Y	20	ug/L	72	133	20	C	Y	20	ug/L	31	141	20
1515	2-Hexanone	20	ug/L	0.281	ug/L	20060202	C	Y	20	ug/L	65	130	20	C	Y	20	ug/L	29	150	20
1536	Iodomethane	5	ug/L	0.257	ug/L	20060202	C	Y	20	ug/L	51	140	20	C	Y	20	ug/L	33	138	20
1537	Methyl iodide	5	ug/L	0.257	ug/L	20060202														
1552	Isobutanol	200	ug/L	22.1	ug/L	20060207	C	Y	20	ug/L	49	140	20	C	Y	20	ug/L	14	150	20
1556	Isobutyl alcohol	200	ug/L	22.1	ug/L	20060207														
1578	Isopropylbenzene	5	ug/L	0.177	ug/L	20060224	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	54	132	20
1579	Cumene	5	ug/L	0.177	ug/L	20060224														
1587	4-Isopropyltoluene	5	ug/L	0.238	ug/L	20060224	C	Y	20	ug/L	72	135	20	C	Y	20	ug/L	53	129	20
1590	p-Isopropyltoluene	5	ug/L	0.238	ug/L	20060224														
1713	Methacrylonitrile	25	ug/L	0.585	ug/L	20060202	C	Y	20	ug/L	68	138	20	C	Y	20	ug/L	36	150	20
1774	Methyl acetate	10	ug/L	0.66	ug/L	20060222	C	Y	20	ug/L	56	139	20	C	Y	20	ug/L	26	143	20
3724	Methyl butyl ketone	20	ug/L	0.281	ug/L	20060202														
1799	Methylcyclohexane	10	ug/L	0.711	ug/L	20060222	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	36	142	20
1812	Dichloromethane	5	ug/L	2.5	ug/L	20060207														
1811	Methylene chloride	5	ug/L	2.5	ug/L	20060207	C	Y	20	ug/L	66	130	20	C	Y	20	ug/L	42	143	20
1823	Methyl methacrylate	5	ug/L	0.507	ug/L	20060207	C	Y	20	ug/L	55	138	20	C	Y	20	ug/L	35	145	20
1845	4-Methyl-2-pentanone	20	ug/L	1.61	ug/L	20060207	C	Y	20	ug/L	74	122	20	C	Y	20	ug/L	36	150	20
3283	4-Methyl-2-pentanone (MIBK)	20	ug/L	1.61	ug/L	20060207														
1848	Methyl isobutyl ketone	20	ug/L	1.61	ug/L	20060207														

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1849	MIBK	20	ug/L	1.61	ug/L	20060207														
2773	MTBE	5	ug/L	0.46	ug/L	20060202														
2772	Methyl tert-butyl ether	5	ug/L	0.46	ug/L	20060202														
3794	Methyl tert-butyl ether (MTBE)	5	ug/L	0.46	ug/L	20060202	C	Y	20	ug/L	66	135	20	C	Y	20	ug/L	35	150	20
1932	Naphthalene	5	ug/L	0.35	ug/L	20060207	C	Y	20	ug/L	52	139	20	C	Y	20	ug/L	50	150	20
2005	2-Nitropropane	10	ug/L	1.74	ug/L	20060222	C	Y	20	ug/L	59	128	20	C	Y	20	ug/L	37	134	20
5350	Nonanal	10	ug/L	0.88	ug/L	20011107														
2108	Pentachloroethane	5	ug/L	0.211	ug/L	20060202	C	Y	20	ug/L	32	135	20	C	Y	20	ug/L	53	111	20
2238	Propionitrile	25	ug/L	7.74	ug/L	20060222	C	Y	20	ug/L	58	136	20	C	Y	20	ug/L	37	149	20
2247	n-Propylbenzene	5	ug/L	0.945	ug/L	20060202	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	55	131	20
2355	Styrene	5	ug/L	1.2	ug/L	20060202	C	Y	20	ug/L	75	140	20	C	Y	20	ug/L	32	150	20
2437	1,1,1,2-Tetrachloroethane	5	ug/L	0.224	ug/L	20060224	C	Y	20	ug/L	69	132	20	C	Y	20	ug/L	39	140	20
2439	1,1,2,2-Tetrachloroethane	5	ug/L	0.141	ug/L	20060202	C	Y	20	ug/L	57	135	20	C	Y	20	ug/L	46	150	20
2445	Tetrachloroethene	5	ug/L	0.274	ug/L	20060202	C	Y	20	ug/L	64	140	20	C	Y	20	ug/L	64	148	20
2446	Tetrachloroethylene	5	ug/L	0.274	ug/L	20060202														
2469	Tetrahydrofuran	25	ug/L	6.63	ug/L	20060207	C	Y	20	ug/L	60	131	20	C	Y	20	ug/L	35	149	20
2489	Toluene	5	ug/L	0.131	ug/L	20060202	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	60	130	20
5524	Total Detected VOCs	20	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.733	ug/L	20060202														
2514	1,2,3-Trichlorobenzene	5	ug/L	0.779	ug/L	20060202	C	Y	20	ug/L	44	140	20	C	Y	20	ug/L	50	150	20
2515	1,2,4-Trichlorobenzene	5	ug/L	0.733	ug/L	20060202	C	Y	20	ug/L	62	134	20	C	Y	20	ug/L	26	150	20
2518	1,1,1-Trichloroethane	5	ug/L	0.146	ug/L	20060202	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20
2522	1,1,2-Trichloroethane	5	ug/L	0.283	ug/L	20060202	C	Y	20	ug/L	72	124	20	C	Y	20	ug/L	62	129	20
2526	Trichloroethylene	5	ug/L	0.358	ug/L	20060207														
2525	Trichloroethene	5	ug/L	0.358	ug/L	20060207	C	Y	20	ug/L	71	140	20	C	Y	20	ug/L	71	150	20
1428	Trichlorofluoromethane	5	ug/L	0.503	ug/L	20060202	C	Y	20	ug/L	64	128	20	C	Y	20	ug/L	25	149	20
1427	Fluorotrichloromethane	5	ug/L	0.503	ug/L	20060202														
2563	1,2,3-Trichloropropane	5	ug/L	0.556	ug/L	20060207														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/L	0.535	ug/L	20060222														
2764	Trichlorotrifluoroethane	5	ug/L	0.535	ug/L	20060222														
2587	1,2,4-Trimethylbenzene	5	ug/L	0.218	ug/L	20060207														
2592	1,3,5-Trimethylbenzene	5	ug/L	0.211	ug/L	20060224	C	Y	20	ug/L	73	138	20	C	Y	20	ug/L	52	136	20
2610	Vinyl acetate	5	ug/L	0.177	ug/L	20060202	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	25	150	20
2613	Vinyl chloride	5	ug/L	0.237	ug/L	20060202	C	Y	20	ug/L	57	123	20	C	Y	20	ug/L	40	128	20
2940	m-Xylene & p-Xylene	5	ug/L	0.567	ug/L	20060202	C	Y	20	ug/L	76	132	20	C	Y	20	ug/L	53	138	20
2623	o-Xylene	5	ug/L	0.306	ug/L	20060202	C	Y	20	ug/L	75	129	20	C	Y	20	ug/L	39	145	20
2627	Xylenes (total)	10	ug/L	0.857	ug/L	20060202														
5397	2,2,2-Trifluoroethanol	100	ug/L	44.49	ug/L	20020811														
337	4-Bromofluorobenzene						X	Y	50	ug/L	73	125	0	X	Y	50	ug/L	64	126	0

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	60	124	0	X	Y	50	ug/L	51	137	0
2740	Toluene-d8						X	Y	50	ug/L	74	121	0	X	Y	50	ug/L	67	122	0

TAL Reference Data Summary

Structured Analysis Code: **I-25-DN-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	2	ug/L	0.344	ug/L	20100104	C	Y	20	ug/L	47	135	20	C	Y	20	ug/L	16	134	20
20	Acetonitrile	10	ug/L	2.039	ug/L	20100106	C	Y	20	ug/L	58	137	20	C	Y	20	ug/L	30	150	20
39	Acrolein	10	ug/L	2.75	ug/L	20100108	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	50	150	20
46	Acrylonitrile	10	ug/L	0.583	ug/L	20100104	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	23	150	20
196	Benzene	1	ug/L	0.064	ug/L	20100427	C	Y	20	ug/L	74	130	20	C	Y	20	ug/L	57	139	20
318	Bromobenzene	1	ug/L	0.076	ug/L	20100427	C	Y	20	ug/L	77	124	20	C	Y	20	ug/L	52	130	20
321	Bromochloromethane	1	ug/L	0.133	ug/L	20100427	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	27	148	20
325	Dichlorobromomethane	1	ug/L	0.088	ug/L	20100427														
323	Bromodichloromethane	1	ug/L	0.088	ug/L	20100427	C	Y	20	ug/L	74	131	20	C	Y	20	ug/L	38	150	20
340	Bromoform	1	ug/L	0.166	ug/L	20100427	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	45	150	20
344	Methyl bromide	2	ug/L	0.126	ug/L	20100427														
343	Bromomethane	2	ug/L	0.126	ug/L	20100427	C	Y	20	ug/L	48	140	20	C	Y	20	ug/L	31	131	20
363	1-Butanol	40	ug/L	12.3	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
2729	n-Butanol	40	ug/L	12.3	ug/L	20100106														
3271	2-Butanone (MEK)	5	ug/L	0.518	ug/L	20100106														
372	2-Butanone	5	ug/L	0.518	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
373	Methyl ethyl ketone	5	ug/L	0.518	ug/L	20100106														
374	MEK	5	ug/L	0.518	ug/L	20100106														
3280	Methyl ethyl ketone (MEK)	5	ug/L	0.518	ug/L	20100106														
364	n-Butyl alcohol	40	ug/L	12.3	ug/L	20100106														
1772	tert-Butyl alcohol	50	ug/L	1.080	ug/L	20081204														
393	n-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	53	130	20
395	sec-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	20	ug/L	73	135	20	C	Y	20	ug/L	55	131	20
398	tert-Butylbenzene	1	ug/L	0.110	ug/L	20100427	C	Y	20	ug/L	73	134	20	C	Y	20	ug/L	53	133	20
459	Carbon disulfide	1	ug/L	0.051	ug/L	20100427	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	70	140	20
463	Carbon tetrachloride	1	ug/L	0.125	ug/L	20100427	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	70	140	20
521	Chlorobenzene	1	ug/L	0.148	ug/L	20100104	C	Y	20	ug/L	76	122	20	C	Y	20	ug/L	57	131	20
322	Chlorobromomethane	1	ug/L	0.133	ug/L	20100427														
2765	Chlorobutadiene	1	ug/L	0.097	ug/L	20100427														
531	Chloroprene	1	ug/L	0.097	ug/L	20100427														
530	2-Chloro-1,3-butadiene	1	ug/L	0.097	ug/L	20100427	C	Y	20	ug/L	69	136	20	C	Y	20	ug/L	32	150	20
535	Dibromochloromethane	1	ug/L	0.127	ug/L	20100427	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	53	149	20
534	Chlorodibromomethane	1	ug/L	0.127	ug/L	20100427														
550	Chloroethane	2	ug/L	0.099	ug/L	20100427	C	Y	20	ug/L	55	131	20	C	Y	20	ug/L	35	139	20
3361	Ethyl chloride	2	ug/L	0.099	ug/L	20100427														
568	2-Chloroethyl vinyl ether	2	ug/L	0.165	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	70	130	20
569	Chloroform	1	ug/L	0.102	ug/L	20100104	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20

Structured Analysis Code: I-25-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	2	ug/L	0.077	ug/L	20100104														
574	Chloromethane	2	ug/L	0.077	ug/L	20100104	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	41	140	20
575	Methyl chloride	2	ug/L	0.077	ug/L	20100104														
2766	Chloropropene	2	ug/L	0.111	ug/L	20100427														
606	Allyl chloride	2	ug/L	0.111	ug/L	20100427	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	33	150	20
604	3-Chloro-1-propene	2	ug/L	0.111	ug/L	20100427														
614	2-Chlorotoluene	1	ug/L	0.078	ug/L	20100427	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	52	132	20
617	4-Chlorotoluene	1	ug/L	0.081	ug/L	20100427	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	43	139	20
669	Cyclohexane	1	ug/L	0.067	ug/L	20100427	C	Y	20	ug/L	67	136	20	C	Y	20	ug/L	38	143	20
676	Cyclohexanone	20	ug/L	5.78	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	135	20
539	1,2-Dibromo-3-chloropropane	1	ug/L	0.4110	ug/L	20100106														
3260	1,2-Dibromo-3-chloropropane (DBCP)	1	ug/L	0.4110	ug/L	20100106	C	Y	20	ug/L	59	129	20	C	Y	20	ug/L	31	139	20
3261	1,2-Dibromoethane (EDB)	1	ug/L	0.128	ug/L	20100104	C	Y	20	ug/L	71	126	20	C	Y	20	ug/L	28	148	20
870	1,2-Dibromoethane	1	ug/L	0.128	ug/L	20100104														
888	Dibromomethane	1	ug/L	0.210	ug/L	20100104														
889	Methylene bromide	1	ug/L	0.210	ug/L	20100104														
904	1,2-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104	C	Y	20	ug/L	76	124	20	C	Y	20	ug/L	52	136	20
906	o-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104														
907	1,3-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	20	ug/L	77	126	20	C	Y	20	ug/L	59	134	20
909	m-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427														
910	1,4-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104	C	Y	20	ug/L	76	118	20	C	Y	20	ug/L	53	128	20
912	p-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104														
922	trans-1,4-Dichloro-2-butene	2	ug/L	0.290	ug/L	20100106	C	Y	20	ug/L	46	140	20	C	Y	20	ug/L	22	148	20
3615	Dichlorodifluoromethane (Freon 12)	2	ug/L	0.084	ug/L	20100427	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	24	130	20
924	Dichlorodifluoromethane	2	ug/L	0.084	ug/L	20100427														
933	1,1-Dichloroethane	1	ug/L	0.068	ug/L	20100104	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	59	148	20
936	1,2-Dichloroethane	1	ug/L	0.100	ug/L	20100104	C	Y	20	ug/L	68	128	20	C	Y	20	ug/L	49	150	20
3767	Ethylene dichloride	1	ug/L	0.100	ug/L	20100104														
948	cis-1,2-Dichloroethene	1	ug/L	0.087	ug/L	20100427	C	Y	20	ug/L	71	129	20	C	Y	20	ug/L	42	142	20
949	cis-1,2-Dichloroethylene	1	ug/L	0.087	ug/L	20100427														
950	trans-1,2-Dichloroethene	1	ug/L	0.083	ug/L	20100104	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	54	140	20
951	trans-1,2-Dichloroethylene	1	ug/L	0.083	ug/L	20100104														
943	1,1-Dichloroethene	1	ug/L	0.083	ug/L	20100427	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	37	146	20
946	1,1-Dichloroethylene	1	ug/L	0.083	ug/L	20100427														
952	1,2-Dichloroethene (total)	2	ug/L	0.154	ug/L	20100427	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	38	143	20
986	1,2-Dichloropropane	1	ug/L	0.097	ug/L	20100104	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	150	20
989	1,3-Dichloropropane	1	ug/L	0.072	ug/L	20100104	C	Y	20	ug/L	72	127	20	C	Y	20	ug/L	41	144	20
990	2,2-Dichloropropane	1	ug/L	0.142	ug/L	20100427	C	Y	20	ug/L	47	140	20	C	Y	20	ug/L	20	150	20
998	cis-1,3-Dichloropropene	1	ug/L	0.073	ug/L	20100104	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	50	150	20

Structured Analysis Code: I-25-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1000	trans-1,3-Dichloropropene	1	ug/L	0.083	ug/L	20100104	C	Y	20	ug/L	64	132	20	C	Y	20	ug/L	28	150	20
2769	trans-1,3-Dichloropropylene	1	ug/L	0.083	ug/L	20100104														
996	1,1-Dichloropropene	1	ug/L	0.079	ug/L	20100427	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	138	20
2788	cis-1,3-Dichloropropylene	1	ug/L	0.073	ug/L	20100104														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	4	ug/L	0.135	ug/L	20100427	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	33	145	20
3887	Dimethyl disulfide	5	ug/L	0.224	ug/L	20100108														
1199	1,4-Dioxane	80	ug/L	7.56	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	30	150	20
1290	Ethanol	500	ug/L			0														
1325	Ethyl acetate	2	ug/L	0.176	ug/L	20100106	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	50	145	20
1332	Ethylbenzene	1	ug/L	0.086	ug/L	20100104	C	Y	20	ug/L	75	126	20	C	Y	20	ug/L	53	135	20
1355	Diethyl ether	1	ug/L	0.260	ug/L	20100104														
1349	Ethyl ether	1	ug/L	0.260	ug/L	20100104	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	37	150	20
1360	Ethyl methacrylate	1	ug/L	0.108	ug/L	20100104	C	Y	20	ug/L	62	140	20	C	Y	20	ug/L	26	150	20
2790	Freon 113	1	ug/L	0.101	ug/L	20100427	C	Y	20	ug/L	74	134	20	C	Y	20	ug/L	35	147	20
1489	Hexachlorobutadiene	1	ug/L	0.087	ug/L	20100104	C	Y	20	ug/L	67	114	20	C	Y	20	ug/L	25	127	20
3445	Hexane	4	ug/L	0.106	ug/L	20100104														
1514	n-Hexane	4	ug/L	0.106	ug/L	20100104	C	Y	20	ug/L	72	133	20	C	Y	20	ug/L	31	141	20
1515	2-Hexanone	5	ug/L	0.224	ug/L	20100106	C	Y	20	ug/L	65	130	20	C	Y	20	ug/L	29	150	20
1536	Iodomethane	2	ug/L	0.092	ug/L	20100104	C	Y	20	ug/L	51	140	20	C	Y	20	ug/L	33	138	20
1537	Methyl iodide	2	ug/L	0.092	ug/L	20100104														
1552	Isobutanol	80	ug/L	8.702	ug/L	20100106	C	Y	20	ug/L	49	140	20	C	Y	20	ug/L	14	150	20
1556	Isobutyl alcohol	80	ug/L	8.702	ug/L	20100106														
1578	Isopropylbenzene	1	ug/L	0.083	ug/L	20100427	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	54	132	20
1587	4-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427	C	Y	20	ug/L	72	135	20	C	Y	20	ug/L	53	129	20
1590	p-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427														
1713	Methacrylonitrile	5	ug/L	0.495	ug/L	20100427	C	Y	20	ug/L	68	138	20	C	Y	20	ug/L	36	150	20
1774	Methyl acetate	5	ug/L	0.367	ug/L	20100430	C	Y	20	ug/L	56	139	20	C	Y	20	ug/L	26	143	20
3724	Methyl butyl ketone	5	ug/L	0.224	ug/L	20100106														
1799	Methylcyclohexane	4	ug/L	0.104	ug/L	20100104	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	36	142	20
1812	Dichloromethane	1	ug/L	0.108	ug/L	20100104														
1811	Methylene chloride	1	ug/L	0.108	ug/L	20100104	C	Y	20	ug/L	66	130	20	C	Y	20	ug/L	42	143	20
1823	Methyl methacrylate	1	ug/L	0.257	ug/L	20100104	C	Y	20	ug/L	55	138	20	C	Y	20	ug/L	35	145	20
1848	Methyl isobutyl ketone	5	ug/L	0.121	ug/L	20100104														
3283	4-Methyl-2-pentanone (MIBK)	5	ug/L	0.121	ug/L	20100104														
1849	MIBK	5	ug/L	0.121	ug/L	20100104														
1845	4-Methyl-2-pentanone	5	ug/L	0.121	ug/L	20100104	C	Y	20	ug/L	74	122	20	C	Y	20	ug/L	36	150	20
2773	MTBE	2	ug/L	0.114	ug/L	20100104														
2772	Methyl tert-butyl ether	2	ug/L	0.114	ug/L	20100104														
3794	Methyl tert-butyl ether (MTBE)	2	ug/L	0.114	ug/L	20100104	C	Y	20	ug/L	66	135	20	C	Y	20	ug/L	35	150	20

Structured Analysis Code: I-25-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1932	Naphthalene	1	ug/L	0.157	ug/L	20100106	C	Y	20	ug/L	52	139	20	C	Y	20	ug/L	50	150	20
2005	2-Nitropropane	10	ug/L	0.397	ug/L	20100106	C	Y	20	ug/L	59	128	20	C	Y	20	ug/L	37	134	20
5350	Nonanal	5	ug/L	0.412	ug/L	20100111														
2108	Pentachloroethane	1	ug/L	0.343	ug/L	20100430	C	Y	20	ug/L	32	135	20	C	Y	20	ug/L	53	111	20
2238	Propionitrile	5	ug/L	1.35	ug/L	20100427	C	Y	20	ug/L	58	136	20	C	Y	20	ug/L	37	149	20
2247	n-Propylbenzene	1	ug/L	0.062	ug/L	20100427	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	55	131	20
2355	Styrene	1	ug/L	0.074	ug/L	20100427	C	Y	20	ug/L	75	140	20	C	Y	20	ug/L	32	150	20
2437	1,1,1,2-Tetrachloroethane	1	ug/L	0.090	ug/L	20100104	C	Y	20	ug/L	69	132	20	C	Y	20	ug/L	39	140	20
2439	1,1,2,2-Tetrachloroethane	1	ug/L	0.098	ug/L	20100104	C	Y	20	ug/L	57	135	20	C	Y	20	ug/L	46	150	20
2445	Tetrachloroethene	1	ug/L	0.178	ug/L	20100427	C	Y	20	ug/L	64	140	20	C	Y	20	ug/L	64	148	20
2446	Tetrachloroethylene	1	ug/L	0.178	ug/L	20100427														
2469	Tetrahydrofuran	10	ug/L	1.14	ug/L	20100106	C	Y	20	ug/L	60	131	20	C	Y	20	ug/L	35	149	20
2489	Toluene	1	ug/L	0.072	ug/L	20100427	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	60	130	20
5524	Total Detected VOCs	5	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.128	ug/L	20100108														
2514	1,2,3-Trichlorobenzene	1	ug/L	0.087	ug/L	20100427	C	Y	20	ug/L	44	140	20	C	Y	20	ug/L	50	150	20
2515	1,2,4-Trichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	20	ug/L	62	134	20	C	Y	20	ug/L	26	150	20
2518	1,1,1-Trichloroethane	1	ug/L	0.069	ug/L	20100427	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20
2522	1,1,2-Trichloroethane	1	ug/L	0.150	ug/L	20100427	C	Y	20	ug/L	72	124	20	C	Y	20	ug/L	62	129	20
2526	Trichloroethylene	1	ug/L	0.212	ug/L	20100104														
2525	Trichloroethene	1	ug/L	0.212	ug/L	20100104	C	Y	20	ug/L	71	140	20	C	Y	20	ug/L	71	150	20
1428	Trichlorofluoromethane	1	ug/L	0.113	ug/L	20100427	C	Y	20	ug/L	64	128	20	C	Y	20	ug/L	25	149	20
1427	Fluorotrichloromethane	1	ug/L	0.113	ug/L	20100427														
2563	1,2,3-Trichloropropane	1	ug/L	0.153	ug/L	20100104														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/L	0.101	ug/L	20100427														
2764	Trichlorotrifluoroethane	1	ug/L	0.101	ug/L	20100427														
2587	1,2,4-Trimethylbenzene	1	ug/L	0.084	ug/L	20100427														
2592	1,3,5-Trimethylbenzene	1	ug/L	0.081	ug/L	20100427	C	Y	20	ug/L	73	138	20	C	Y	20	ug/L	52	136	20
2610	Vinyl acetate	2	ug/L	0.181	ug/L	20100427	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	25	150	20
2613	Vinyl chloride	2	ug/L	0.084	ug/L	20100427	C	Y	20	ug/L	57	123	20	C	Y	20	ug/L	40	128	20
2940	m-Xylene & p-Xylene	2	ug/L	0.142	ug/L	20100427	C	Y	20	ug/L	76	132	20	C	Y	20	ug/L	53	138	20
2623	o-Xylene	1	ug/L	0.063	ug/L	20100427	C	Y	20	ug/L	75	129	20	C	Y	20	ug/L	39	145	20
2627	Xylenes (total)	3	ug/L	0.200	ug/L	20100427														
5397	2,2,2-Trifluoroethanol	20	ug/L			0														
337	4-Bromofluorobenzene						X	Y	50	ug/L	73	125	0	X	Y	50	ug/L	64	126	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	60	124	0	X	Y	50	ug/L	51	137	0
2740	Toluene-d8						X	Y	50	ug/L	74	121	0	X	Y	50	ug/L	67	122	0

TAL Reference Data Summary

Structured Analysis Code: I-15-QK-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/L	6.67	ug/L	20110624	C	Y	50	ug/L	40	140	20	C	Y	50	ug/L	30	126	20
20	Acetonitrile	50	ug/L	7.29	ug/L	20110330	C	Y	250	ug/L	50	137	20	C	Y	250	ug/L	55	135	20
39	Acrolein	50	ug/L	3.13	ug/L	20110117	C	Y	250	ug/L	40	140	20	C	Y	250	ug/L	50	150	20
46	Acrylonitrile	50	ug/L	1.66	ug/L	20110117	C	Y	250	ug/L	63	140	20	C	Y	250	ug/L	66	139	20
196	Benzene	5	ug/L	0.253	ug/L	20100113	C	Y	50	ug/L	84	115	20	C	Y	50	ug/L	85	115	20
220	Benzyl chloride	10	ug/L			0														
318	Bromobenzene	5	ug/L	0.334	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	116	20
321	Bromochloromethane	5	ug/L	0.552	ug/L	20100113	C	Y	50	ug/L	80	125	20	C	Y	50	ug/L	76	128	20
325	Dichlorobromomethane	5	ug/L	0.254	ug/L	20100113														
323	Bromodichloromethane	5	ug/L	0.254	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
340	Bromoform	5	ug/L	0.366	ug/L	20100113	C	Y	50	ug/L	82	133	20	C	Y	50	ug/L	78	130	20
344	Methyl bromide	10	ug/L	0.396	ug/L	20090302														
343	Bromomethane	10	ug/L	0.396	ug/L	20090302	C	Y	50	ug/L	59	132	20	C	Y	50	ug/L	68	115	20
363	1-Butanol	100	ug/L	18.7	ug/L	20110117	C	Y	500	ug/L	52	138	20	C	Y	500	ug/L	61	135	20
2729	n-Butanol	100	ug/L	18.7	ug/L	20110117														
3271	2-Butanone (MEK)	20	ug/L	0.389	ug/L	20100113														
372	2-Butanone	20	ug/L	0.389	ug/L	20100113	C	Y	50	ug/L	52	131	20	C	Y	50	ug/L	49	132	20
373	Methyl ethyl ketone	20	ug/L	0.389	ug/L	20100113														
374	MEK	20	ug/L	0.389	ug/L	20100113														
3280	Methyl ethyl ketone (MEK)	20	ug/L	0.389	ug/L	20100113														
364	n-Butyl alcohol	100	ug/L	18.7	ug/L	20110117														
393	n-Butylbenzene	5	ug/L	0.232	ug/L	20100113	C	Y	50	ug/L	79	120	20	C	Y	50	ug/L	82	116	20
395	sec-Butylbenzene	5	ug/L	0.310	ug/L	20100113	C	Y	50	ug/L	82	122	20	C	Y	50	ug/L	81	122	20
398	tert-Butylbenzene	5	ug/L	0.311	ug/L	20100113	C	Y	50	ug/L	82	120	20	C	Y	50	ug/L	80	121	20
459	Carbon disulfide	5	ug/L	0.369	ug/L	20100113	C	Y	50	ug/L	76	125	20	C	Y	50	ug/L	73	131	20
463	Carbon tetrachloride	5	ug/L	0.360	ug/L	20100113	C	Y	50	ug/L	84	122	20	C	Y	50	ug/L	79	121	20
521	Chlorobenzene	5	ug/L	0.382	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
322	Chlorobromomethane	5	ug/L	0.552	ug/L	20100113														
2765	Chlorobutadiene	5	ug/L	0.388	ug/L	20100113														
531	Chloroprene	5	ug/L	0.388	ug/L	20100113														
530	2-Chloro-1,3-butadiene	5	ug/L	0.388	ug/L	20100113	C	Y	50	ug/L	85	118	20	C	Y	50	ug/L	84	120	20
534	Chlorodibromomethane	5	ug/L	0.329	ug/L	20100113														
535	Dibromochloromethane	5	ug/L	0.329	ug/L	20100113	C	Y	50	ug/L	85	118	20	C	Y	50	ug/L	85	117	20
3361	Ethyl chloride	10	ug/L	0.382	ug/L	20100113														
550	Chloroethane	10	ug/L	0.382	ug/L	20100113	C	Y	50	ug/L	54	133	20	C	Y	50	ug/L	74	117	20
568	2-Chloroethyl vinyl ether	20	ug/L	0.523	ug/L	20100113	C	Y	50	ug/L	65	140	20	C	Y	50	ug/L	30	150	20
569	Chloroform	5	ug/L	0.147	ug/L	20110119	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20

Structured Analysis Code: I-15-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
575	Methyl chloride	10	ug/L	0.553	ug/L	20090303														
4147	Chloromethane (Methyl Chloride)	10	ug/L	0.553	ug/L	20090303														
574	Chloromethane	10	ug/L	0.553	ug/L	20090303	C	Y	50	ug/L	65	115	20	C	Y	50	ug/L	60	119	20
606	Allyl chloride	10	ug/L	0.391	ug/L	20110119	C	Y	50	ug/L	77	125	20	C	Y	50	ug/L	79	119	20
2766	Chloropropene	10	ug/L	0.391	ug/L	20110119														
604	3-Chloro-1-propene	10	ug/L	0.391	ug/L	20110119														
614	2-Chlorotoluene	5	ug/L	0.336	ug/L	20100113	C	Y	50	ug/L	82	118	20	C	Y	50	ug/L	84	115	20
617	4-Chlorotoluene	5	ug/L	0.305	ug/L	20100113	C	Y	50	ug/L	83	117	20	C	Y	50	ug/L	85	115	20
669	Cyclohexane	10	ug/L	0.363	ug/L	20100113	C	Y	50	ug/L	85	120	20	C	Y	50	ug/L	85	120	20
676	Cyclohexanone	100	ug/L	17.97	ug/L	20110117	C	Y	50	ug/L	50	134	20	C	Y	50	ug/L	25	136	20
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/L	1.150	ug/L	20100113	C	Y	50	ug/L	72	134	20	C	Y	50	ug/L	70	139	20
539	1,2-Dibromo-3-chloropropane	10	ug/L	1.150	ug/L	20100113														
870	1,2-Dibromoethane	5	ug/L	0.437	ug/L	20100113														
3261	1,2-Dibromoethane (EDB)	5	ug/L	0.437	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
889	Methylene bromide	5	ug/L	0.405	ug/L	20100113														
888	Dibromomethane	5	ug/L	0.405	ug/L	20100113	C	Y	50	ug/L	84	115	20	C	Y	50	ug/L	85	115	20
906	o-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113														
904	1,2-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
909	m-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113														
907	1,3-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
910	1,4-Dichlorobenzene	5	ug/L	0.35	ug/L	20110614	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	10	ug/L	0.946	ug/L	20110117	C	Y	50	ug/L	71	119	20	C	Y	50	ug/L	66	121	20
924	Dichlorodifluoromethane	10	ug/L	0.449	ug/L	20100113														
3615	Dichlorodifluoromethane (Freon 12)	10	ug/L	0.449	ug/L	20100113	C	Y	50	ug/L	40	131	20	C	Y	50	ug/L	49	124	20
933	1,1-Dichloroethane	5	ug/L	0.392	ug/L	20100113	C	Y	50	ug/L	80	115	20	C	Y	50	ug/L	82	116	20
3767	Ethylene dichloride	5	ug/L	0.372	ug/L	20100113														
936	1,2-Dichloroethane	5	ug/L	0.372	ug/L	20100113	C	Y	50	ug/L	82	115	20	C	Y	50	ug/L	83	116	20
948	cis-1,2-Dichloroethene	5	ug/L	0.159	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	84	117	20
950	trans-1,2-Dichloroethene	5	ug/L	0.178	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	82	115	20
943	1,1-Dichloroethene	5	ug/L	0.365	ug/L	20100113	C	Y	50	ug/L	80	119	20	C	Y	50	ug/L	64	135	20
952	1,2-Dichloroethene (total)	10	ug/L	0.237	ug/L	20100113	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	80	117	20
986	1,2-Dichloropropane	5	ug/L	0.317	ug/L	20100113	C	Y	50	ug/L	80	115	20	C	Y	50	ug/L	85	115	20
989	1,3-Dichloropropane	5	ug/L	0.238	ug/L	20100113	C	Y	50	ug/L	81	115	20	C	Y	50	ug/L	80	118	20
990	2,2-Dichloropropane	5	ug/L	0.539	ug/L	20100113	C	Y	50	ug/L	84	119	20	C	Y	50	ug/L	77	119	20
998	cis-1,3-Dichloropropene	5	ug/L	0.339	ug/L	20100113	C	Y	50	ug/L	85	117	20	C	Y	50	ug/L	85	117	20
2769	trans-1,3-Dichloropropylene	5	ug/L	0.349	ug/L	20100113														
1000	trans-1,3-Dichloropropene	5	ug/L	0.349	ug/L	20100113	C	Y	50	ug/L	85	118	20	C	Y	50	ug/L	85	122	20
996	1,1-Dichloropropene	5	ug/L	0.300	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
2788	cis-1,3-Dichloropropylene	5	ug/L	0.339	ug/L	20100113														

Structured Analysis Code: I-15-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/L	0.332	ug/L	20100113	C	Y	50	ug/L	67	140	20	C	Y	50	ug/L	70	150	20
3887	Dimethyl disulfide	5	ug/L	0.476	ug/L	20090305														
1199	1,4-Dioxane	400	ug/L	22.860	ug/L	20100130	C	Y	1000	ug/L	57	135	20	C	Y	1000	ug/L	63	134	20
1290	Ethanol	250	ug/L	61.38	ug/L	20090305														
1325	Ethyl acetate	20	ug/L	5.931	ug/L	20100130	C	Y	100	ug/L	62	126	20	C	Y	100	ug/L	66	125	20
1332	Ethylbenzene	5	ug/L	0.299	ug/L	20100113	C	Y	50	ug/L	82	116	20	C	Y	50	ug/L	85	115	20
1349	Ethyl ether	10	ug/L	1.617	ug/L	20100113	C	Y	100	ug/L	66	130	20	C	Y	100	ug/L	73	132	20
1355	Diethyl ether	10	ug/L	1.617	ug/L	20100113														
1360	Ethyl methacrylate	5	ug/L	0.246	ug/L	20110119	C	Y	50	ug/L	74	123	20	C	Y	50	ug/L	70	130	20
2790	Freon 113	5	ug/L	0.246	ug/L	20090303	C	Y	50	ug/L	72	140	20	C	Y	50	ug/L	69	139	20
1489	Hexachlorobutadiene	5	ug/L	0.254	ug/L	20110119	C	Y	50	ug/L	79	118	20	C	Y	50	ug/L	67	120	20
3445	Hexane	10	ug/L	0.455	ug/L	20100113														
1514	n-Hexane	10	ug/L	0.455	ug/L	20100113	C	Y	50	ug/L	83	121	20	C	Y	50	ug/L	85	117	20
1515	2-Hexanone	20	ug/L	0.593	ug/L	20110117	C	Y	50	ug/L	57	127	20	C	Y	50	ug/L	58	122	20
1536	Iodomethane	5	ug/L	1.511	ug/L	20100113	C	Y	50	ug/L	76	127	20	C	Y	50	ug/L	71	125	20
1537	Methyl iodide	5	ug/L	1.511	ug/L	20100113														
1552	Isobutanol	200	ug/L	7.34	ug/L	20100113	C	Y	1000	ug/L	47	138	20	C	Y	1000	ug/L	54	136	20
1556	Isobutyl alcohol	200	ug/L	7.34	ug/L	20100113														
1578	Isopropylbenzene	5	ug/L	0.258	ug/L	20100113	C	Y	50	ug/L	84	120	20	C	Y	50	ug/L	84	119	20
1587	4-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113	C	Y	50	ug/L	85	119	20	C	Y	50	ug/L	85	118	20
1590	p-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113														
1713	Methacrylonitrile	25	ug/L	2.10	ug/L	20110119	C	Y	250	ug/L	64	131	20	C	Y	250	ug/L	69	132	20
1774	Methyl acetate	5	ug/L	2.29	ug/L	20110330	C	Y	50	ug/L	66	140	20	C	Y	50	ug/L	61	148	20
3724	Methyl butyl ketone	20	ug/L	0.593	ug/L	20110117														
1799	Methylcyclohexane	10	ug/L	0.259	ug/L	20100113	C	Y	50	ug/L	71	122	20	C	Y	50	ug/L	82	115	20
1812	Dichloromethane	5	ug/L	1.67	ug/L	20110624														
1811	Methylene chloride	5	ug/L	1.67	ug/L	20110624	C	Y	50	ug/L	75	115	20	C	Y	50	ug/L	69	115	20
1823	Methyl methacrylate	5	ug/L	0.514	ug/L	20110117	C	Y	50	ug/L	73	123	20	C	Y	50	ug/L	75	120	20
1848	Methyl isobutyl ketone	20	ug/L	0.326	ug/L	20100113														
3283	4-Methyl-2-pentanone (MIBK)	20	ug/L	0.326	ug/L	20100113														
1849	MIBK	20	ug/L	0.326	ug/L	20100113														
1845	4-Methyl-2-pentanone	20	ug/L	0.326	ug/L	20100113	C	Y	50	ug/L	59	122	20	C	Y	50	ug/L	55	129	20
2773	MTBE	5	ug/L	0.401	ug/L	20100113														
2772	Methyl tert-butyl ether	5	ug/L	0.401	ug/L	20100113														
3794	Methyl tert-butyl ether (MTBE)	5	ug/L	0.401	ug/L	20100113	C	Y	50	ug/L	79	122	20	C	Y	50	ug/L	73	129	20
1932	Naphthalene	5	ug/L	0.85	ug/L	20110624	C	Y	50	ug/L	74	127	20	C	Y	50	ug/L	76	119	20
2005	2-Nitropropane	10	ug/L	0.636	ug/L	20100113	C	Y	100	ug/L	66	118	20	C	Y	100	ug/L	57	131	20
5350	Nonanal	10	ug/L	0.715	ug/L	20100113														
2108	Pentachloroethane	5	ug/L	0.423	ug/L	20110303	C	Y	50	ug/L	64	135	20	C	Y	50	ug/L	42	142	20

Structured Analysis Code: I-15-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2238	Propionitrile	25	ug/L	2.43	ug/L	20110117	C	Y	250	ug/L	59	136	20	C	Y	250	ug/L	62	137	20
2247	n-Propylbenzene	5	ug/L	0.298	ug/L	20100113	C	Y	50	ug/L	81	123	20	C	Y	50	ug/L	83	121	20
2355	Styrene	5	ug/L	0.347	ug/L	20100113	C	Y	50	ug/L	81	122	20	C	Y	50	ug/L	82	121	20
2437	1,1,1,2-Tetrachloroethane	5	ug/L	0.254	ug/L	20110119	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	82	117	20
2439	1,1,2,2-Tetrachloroethane	5	ug/L	0.425	ug/L	20110119	C	Y	50	ug/L	79	115	20	C	Y	50	ug/L	74	124	20
2446	Tetrachloroethylene	5	ug/L	0.280	ug/L	20100113														
2445	Tetrachloroethene	5	ug/L	0.280	ug/L	20100113	C	Y	50	ug/L	85	116	20	C	Y	50	ug/L	85	117	20
2469	Tetrahydrofuran	25	ug/L	1.670	ug/L	20100113	C	Y	250	ug/L	66	132	20	C	Y	250	ug/L	65	138	20
2489	Toluene	5	ug/L	1.00	ug/L	20110624	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	82	115	20
5524	Total Detected VOCs	20	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.507	ug/L	20090305														
2514	1,2,3-Trichlorobenzene	5	ug/L	0.65	ug/L	20110624	C	Y	50	ug/L	78	120	20	C	Y	50	ug/L	72	120	20
2515	1,2,4-Trichlorobenzene	5	ug/L	0.55	ug/L	20110624	C	Y	50	ug/L	83	116	20	C	Y	50	ug/L	79	115	20
2518	1,1,1-Trichloroethane	5	ug/L	0.291	ug/L	20100113	C	Y	50	ug/L	85	117	20	C	Y	50	ug/L	82	119	20
2522	1,1,2-Trichloroethane	5	ug/L	0.573	ug/L	20100113	C	Y	50	ug/L	83	115	20	C	Y	50	ug/L	83	115	20
2525	Trichloroethene	5	ug/L	0.290	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
1428	Trichlorofluoromethane	5	ug/L	0.221	ug/L	20110116	C	Y	50	ug/L	68	124	20	C	Y	50	ug/L	69	118	20
1427	Fluorotrichloromethane	5	ug/L	0.221	ug/L	20110116														
2563	1,2,3-Trichloropropane	5	ug/L	0.559	ug/L	20100113	C	Y	50.0	ug/L	75	119	20	C	Y	50	ug/L	69	126	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/L	0.246	ug/L	20090303														
2764	Trichlorotrifluoroethane	5	ug/L	0.246	ug/L	20090303														
2587	1,2,4-Trimethylbenzene	5	ug/L	0.401	ug/L	20100113	C	Y	50	ug/L	85	116	20		Y	50	ug/L	85	115	20
2592	1,3,5-Trimethylbenzene	5	ug/L	0.284	ug/L	20100113	C	Y	50	ug/L	85	119	20	C	Y	50	ug/L	85	118	20
2610	Vinyl acetate	5	ug/L	0.605	ug/L	20110117	C	Y	50	ug/L	62	130	20	C	Y	50	ug/L	73	135	20
2613	Vinyl chloride	5	ug/L	0.428	ug/L	20100113	C	Y	50	ug/L	55	118	20	C	Y	50	ug/L	59	115	20
2940	m-Xylene & p-Xylene	5	ug/L	0.569	ug/L	20100113	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	85	115	20
2623	o-Xylene	5	ug/L	0.318	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
2627	Xylenes (total)	10	ug/L	0.854	ug/L	20100113														
337	4-Bromofluorobenzene						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	83	115	0	X	Y	50	ug/L	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	117	0	X	Y	50	ug/L	80	121	0

TAL Reference Data Summary

Structured Analysis Code: I-25-QK-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	2	ug/L	0.344	ug/L	20100104	C	Y	50	ug/L	34	140	20	C	Y	50	ug/L	30	150	20
20	Acetonitrile	10	ug/L	2.039	ug/L	20100106	C	Y	50	ug/L	47	149	20	C	Y	50	ug/L	13	150	20
39	Acrolein	10	ug/L	2.75	ug/L	20100108	C	Y	50	ug/L	27	140	20	C	Y	50	ug/L	50	150	20
46	Acrylonitrile	10	ug/L	0.583	ug/L	20100104	C	Y	50	ug/L	64	137	20	C	Y	50	ug/L	32	150	20
196	Benzene	1	ug/L	0.064	ug/L	20100427	C	Y	50	ug/L	76	122	20	C	Y	50	ug/L	45	148	20
318	Bromobenzene	1	ug/L	0.076	ug/L	20100427	C	Y	50	ug/L	74	123	20	C	Y	50	ug/L	43	139	20
321	Bromochloromethane	1	ug/L	0.133	ug/L	20100427	C	Y	50	ug/L	69	129	20	C	Y	50	ug/L	45	144	20
325	Dichlorobromomethane	1	ug/L	0.088	ug/L	20100427														
323	Bromodichloromethane	1	ug/L	0.088	ug/L	20100427	C	Y	50	ug/L	73	129	20	C	Y	50	ug/L	43	150	20
340	Bromoform	1	ug/L	0.166	ug/L	20100427	C	Y	50	ug/L	61	142	20	C	Y	50	ug/L	31	150	20
344	Methyl bromide	2	ug/L	0.250	ug/L	20100727								C	Y	50	ug/L	50	150	20
343	Bromomethane	2	ug/L	0.250	ug/L	20100727	C	Y	50	ug/L	35	140	20	C	Y	50	ug/L	50	150	20
363	1-Butanol	40	ug/L	12.3	ug/L	20100106	C	Y	100	ug/L	35	140	20	C	Y	100	ug/L	20	150	20
2729	n-Butanol	40	ug/L	12.3	ug/L	20100106														
3271	2-Butanone (MEK)	5	ug/L	0.518	ug/L	20100106														
372	2-Butanone	5	ug/L	0.518	ug/L	20100106	C	Y	50	ug/L	42	150	20	C	Y	50	ug/L	17	150	20
373	Methyl ethyl ketone	5	ug/L	0.518	ug/L	20100106														
374	MEK	5	ug/L	0.518	ug/L	20100106														
3280	Methyl ethyl ketone (MEK)	5	ug/L	0.518	ug/L	20100106														
364	n-Butyl alcohol	40	ug/L	12.3	ug/L	20100106														
393	n-Butylbenzene	1	ug/L	0.25	ug/L	20100727	C	Y	50	ug/L	70	136	20	C	Y	50	ug/L	35	148	20
395	sec-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	50	ug/L	72	133	20	C	Y	50	ug/L	41	147	20
398	tert-Butylbenzene	1	ug/L	0.110	ug/L	20100427	C	Y	50	ug/L	72	131	20	C	Y	50	ug/L	42	144	20
459	Carbon disulfide	1	ug/L	0.051	ug/L	20100427	C	Y	50	ug/L	63	135	20	C	Y	50	ug/L	44	147	20
463	Carbon tetrachloride	1	ug/L	0.125	ug/L	20100427	C	Y	50	ug/L	71	132	20	C	Y	50	ug/L	42	150	20
521	Chlorobenzene	1	ug/L	0.148	ug/L	20100104	C	Y	50	ug/L	79	119	20	C	Y	50	ug/L	46	140	20
322	Chlorobromomethane	1	ug/L	0.133	ug/L	20100427														
2765	Chlorobutadiene	1	ug/L	0.097	ug/L	20100427														
531	Chloroprene	1	ug/L	0.097	ug/L	20100427														
530	2-Chloro-1,3-butadiene	1	ug/L	0.097	ug/L	20100427	C	Y	10	ug/L	74	132	20	C	Y	10	ug/L	34	150	20
534	Chlorodibromomethane	1	ug/L	0.127	ug/L	20100427								C	Y	50	ug/L	35	150	20
535	Dibromochloromethane	1	ug/L	0.127	ug/L	20100427	C	Y	50	ug/L	75	128	20	C	Y	50	ug/L	35	150	20
3361	Ethyl chloride	2	ug/L	0.099	ug/L	20100427														
550	Chloroethane	2	ug/L	0.099	ug/L	20100427	C	Y	50	ug/L	55	135	20	C	Y	50	ug/L	33	146	20
568	2-Chloroethyl vinyl ether	2	ug/L	0.165	ug/L	20100106	C	Y	10	ug/L	31	147	20	C	Y	10	ug/L	20	150	20
569	Chloroform	1	ug/L	0.102	ug/L	20100104	C	Y	50	ug/L	76	121	20	C	Y	50	ug/L	47	146	20
575	Methyl chloride	2	ug/L	0.077	ug/L	20100104														

Structured Analysis Code: I-25-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	2	ug/L	0.077	ug/L	20100104														
574	Chloromethane	2	ug/L	0.077	ug/L	20100104	C	Y	50	ug/L	59	128	20	C	Y	50	ug/L	30	144	20
606	Allyl chloride	2	ug/L	0.111	ug/L	20100427	C	Y	50	ug/L	66	141	20	C	Y	50	ug/L	31	150	20
2766	Chloropropene	2	ug/L	0.111	ug/L	20100427														
604	3-Chloro-1-propene	2	ug/L	0.111	ug/L	20100427														
614	2-Chlorotoluene	1	ug/L	0.078	ug/L	20100427	C	Y	50	ug/L	71	129	20	C	Y	50	ug/L	41	145	20
617	4-Chlorotoluene	1	ug/L	0.081	ug/L	20100427	C	Y	50	ug/L	71	132	20	C	Y	50	ug/L	41	147	20
669	Cyclohexane	1	ug/L	0.067	ug/L	20100427	C	Y	10	ug/L	76	128	20	C	Y	10	ug/L	35	150	20
676	Cyclohexanone	20	ug/L	5.78	ug/L	20100106	C	Y	50	ug/L	41	140	20	C	Y	50	ug/L	10	149	20
3260	1,2-Dibromo-3-chloropropane (DBCP)	1	ug/L	0.4110	ug/L	20100106	C	Y	50	ug/L	63	129	20	C	Y	50	ug/L	30	146	20
539	1,2-Dibromo-3-chloropropane	1	ug/L	0.4110	ug/L	20100106								C	Y	50	ug/L	30	146	20
870	1,2-Dibromoethane	1	ug/L	0.128	ug/L	20100104								C	Y	50	ug/L	38	149	20
3261	1,2-Dibromoethane (EDB)	1	ug/L	0.128	ug/L	20100104	C	Y	50	ug/L	73	128	20	C	Y	50	ug/L	38	149	20
889	Methylene bromide	1	ug/L	0.210	ug/L	20100104														
888	Dibromomethane	1	ug/L	0.210	ug/L	20100104	C	Y			70	130	20	C	Y			50	150	20
906	o-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104														
904	1,2-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104	C	Y	50	ug/L	74	123	20	C	Y	50	ug/L	47	137	20
909	m-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427														
907	1,3-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	50	ug/L	74	126	20	C	Y	50	ug/L	47	137	20
912	p-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104														
910	1,4-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104	C	Y	50	ug/L	75	118	20	C	Y	50	ug/L	45	134	20
922	trans-1,4-Dichloro-2-butene	2	ug/L	0.290	ug/L	20100106	C	Y	50	ug/L	50	140	20	C	Y	50	ug/L	20	146	20
924	Dichlorodifluoromethane	2	ug/L	0.084	ug/L	20100427														
3615	Dichlorodifluoromethane (Freon 12)	2	ug/L	0.084	ug/L	20100427	C	Y	50	ug/L	44	140	20	C	Y	50	ug/L	14	150	20
933	1,1-Dichloroethane	1	ug/L	0.068	ug/L	20100104	C	Y	50	ug/L	74	122	20	C	Y	50	ug/L	48	143	20
3767	Ethylene dichloride	1	ug/L	0.100	ug/L	20100104														
936	1,2-Dichloroethane	1	ug/L	0.100	ug/L	20100104	C	Y	50	ug/L	68	128	20	C	Y	50	ug/L	44	149	20
949	cis-1,2-Dichloroethylene	1	ug/L	0.087	ug/L	20100427								C	Y	50	ug/L	39	150	20
948	cis-1,2-Dichloroethene	1	ug/L	0.087	ug/L	20100427	C	Y	50	ug/L	76	122	20	C	Y	50	ug/L	39	150	20
951	trans-1,2-Dichloroethylene	1	ug/L	0.083	ug/L	20100104								C	Y	50	ug/L	42	142	20
950	trans-1,2-Dichloroethene	1	ug/L	0.083	ug/L	20100104	C	Y	50	ug/L	74	120	20	C	Y	50	ug/L	42	142	20
946	1,1-Dichloroethylene	1	ug/L	0.083	ug/L	20100427								C	Y	50	ug/L	38	146	20
943	1,1-Dichloroethene	1	ug/L	0.083	ug/L	20100427	C	Y	50	ug/L	71	123	20	C	Y	50	ug/L	38	146	20
952	1,2-Dichloroethene (total)	2	ug/L	0.154	ug/L	20100427	C	Y	100	ug/L	76	120	20	C	Y	100	ug/L	41	147	20
986	1,2-Dichloropropane	1	ug/L	0.097	ug/L	20100104	C	Y	50	ug/L	74	125	20	C	Y	50	ug/L	44	150	20
989	1,3-Dichloropropane	1	ug/L	0.072	ug/L	20100104	C	Y	50	ug/L	72	126	20	C	Y	50	ug/L	42	148	20
990	2,2-Dichloropropane	1	ug/L	0.142	ug/L	20100427	C	Y	50	ug/L	54	140	20	C	Y	50	ug/L	17	150	20
998	cis-1,3-Dichloropropene	1	ug/L	0.073	ug/L	20100104	C	Y	50	ug/L	65	139	20	C	Y	50	ug/L	30	150	20
2769	trans-1,3-Dichloropropylene	1	ug/L	0.083	ug/L	20100104														

Structured Analysis Code: I-25-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1000	trans-1,3-Dichloropropene	1	ug/L	0.083	ug/L	20100104	C	Y	50	ug/L	65	140	20	C	Y	50	ug/L	30	150	20
996	1,1-Dichloropropene	1	ug/L	0.079	ug/L	20100427	C	Y	50	ug/L	77	123	20	C	Y	50	ug/L	41	150	20
2788	cis-1,3-Dichloropropylene	1	ug/L	0.073	ug/L	20100104														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	4	ug/L	0.135	ug/L	20100427														
3887	Dimethyl disulfide	5	ug/L	0.224	ug/L	20100108														
1199	1,4-Dioxane	80	ug/L	7.56	ug/L	20100106	C	Y	200	ug/L	40	140	20	C	Y	200	ug/L	20	150	20
1325	Ethyl acetate	2	ug/L	0.176	ug/L	20100106	C	Y	20	ug/L	61	136	20	C	Y	20	ug/L	25	150	20
1332	Ethylbenzene	1	ug/L	0.086	ug/L	20100104	C	Y	50	ug/L	78	124	20	C	Y	50	ug/kg	43	143	20
1349	Ethyl ether	1	ug/L	0.260	ug/L	20100104	C	Y	20	ug/L	66	134	20	C	Y	20	ug/L	32	150	20
1355	Diethyl ether	1	ug/L	0.260	ug/L	20100104														
1360	Ethyl methacrylate	1	ug/L	0.108	ug/L	20100104	C	Y	50	ug/L	64	140	20	C	Y	50	ug/L	27	150	20
2790	Freon 113	1	ug/L	0.101	ug/L	20100427	C	Y	50	ug/L	74	127	20	C	Y	50	ug/L	29	150	20
1489	Hexachlorobutadiene	1	ug/L	0.087	ug/L	20100104	C	Y	50	ug/L	62	129	20	C	Y	50	ug/L	30	131	20
3445	Hexane	4	ug/L	0.106	ug/L	20100104														
1514	n-Hexane	4	ug/L	0.106	ug/L	20100104	C	Y	50	ug/L	74	135	20	C	Y	50	ug/L	26	150	20
1515	2-Hexanone	5	ug/L	0.224	ug/L	20100106	C	Y	50	ug/L	46	150	20	C	Y	50	ug/L	19	150	20
1536	Iodomethane	2	ug/L	0.092	ug/L	20100104	C	Y	10	ug/L	29	140	20	C	Y	10	ug/L	50	150	20
1537	Methyl iodide	2	ug/L	0.092	ug/L	20100104														
1552	Isobutanol	80	ug/L	8.702	ug/L	20100106	C	Y	200	ug/L	45	140	20	C	Y	200	ug/L	14	150	20
1556	Isobutyl alcohol	80	ug/L	8.702	ug/L	20100106														
1578	Isopropylbenzene	1	ug/L	0.083	ug/L	20100427	C	Y	50	ug/L	71	132	20	C	Y	50	ug/L	40	147	20
1587	4-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427	C	Y	50	ug/L	72	132	20	C	Y	50	ug/L	41	143	20
1590	p-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427														
1713	Methacrylonitrile	5	ug/L	0.495	ug/L	20100427	C	Y	50	ug/L	63	141	20	C	Y	50	ug/L	32	150	20
1774	Methyl acetate	5	ug/L	0.367	ug/L	20100430	C	Y	10	ug/L	50	140	20	C	Y	10	ug/L	23	150	20
3724	Methyl butyl ketone	5	ug/L	0.224	ug/L	20100106														
1799	Methylcyclohexane	4	ug/L	0.104	ug/L	20100104	C	Y	10	ug/L	75	127	20	C	Y	10	ug/L	28	150	20
1812	Dichloromethane	1	ug/L	0.27	ug/L	20110624														
1811	Methylene chloride	1	ug/L	0.27	ug/L	20110624	C	Y	50	ug/L	67	124	20	C	Y	50	ug/L	37	150	20
1823	Methyl methacrylate	1	ug/L	0.257	ug/L	20100104	C	Y	50	ug/L	57	128	20	C	Y	50	ug/L	28	149	20
1848	Methyl isobutyl ketone	5	ug/L	0.121	ug/L	20100104														
3283	4-Methyl-2-pentanone (MIBK)	5	ug/L	0.121	ug/L	20100104														
1849	MIBK	5	ug/L	0.121	ug/L	20100104														
1845	4-Methyl-2-pentanone	5	ug/L	0.121	ug/L	20100104	C	Y	50	ug/L	60	137	20	C	Y	50	ug/L	31	150	20
2773	MTBE	2	ug/L	0.114	ug/L	20100104														
2772	Methyl tert-butyl ether	2	ug/L	0.114	ug/L	20100104														
3794	Methyl tert-butyl ether (MTBE)	2	ug/L	0.114	ug/L	20100104	C	Y	50	ug/L	48	140	20	C	Y	50	ug/L	20	150	20
1932	Naphthalene	1	ug/L	0.157	ug/L	20100106	C	Y	50	ug/L	40	140	20	C	Y	50	ug/L	40	150	20
2005	2-Nitropropane	10	ug/L	0.397	ug/L	20100106	C	Y	20	ug/L	57	135	20	C	Y	20	ug/L	36	140	20

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Structured Analysis Code: I-25-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5350	Nonanal	5	ug/L	0.412	ug/L	20100111														
2108	Pentachloroethane	2	ug/L	0.343	ug/L	20100430	C	Y	10	ug/L	18	140	20	C	Y	10	ug/L	50	150	20
2238	Propionitrile	5	ug/L	1.35	ug/L	20100427	C	Y	50	ug/L	61	136	20	C	Y	50	ug/L	30	150	20
2247	n-Propylbenzene	1	ug/L	0.062	ug/L	20100427	C	Y	50	ug/L	71	136	20	C	Y	50	ug/L	41	149	20
2355	Styrene	1	ug/L	0.074	ug/L	20100427	C	Y	50	ug/L	78	140	20	C	Y	50	ug/L	34	150	20
2437	1,1,1,2-Tetrachloroethane	1	ug/L	0.090	ug/L	20100104	C	Y	50	ug/L	71	129	20	C	Y	50	ug/L	38	150	20
2439	1,1,2,2-Tetrachloroethane	1	ug/L	0.098	ug/L	20100104	C	Y	50	ug/L	59	131	20	C	Y	50	ug/L	35	150	20
2445	Tetrachloroethene	1	ug/L	0.178	ug/L	20100427	C	Y	50	ug/L	66	133	20	C	Y	50	ug/L	33	143	20
2446	Tetrachloroethylene	1	ug/L	0.178	ug/L	20100427	C	Y	50	ug/L	70	130	20	C	Y	50	ug/L	33	143	20
2469	Tetrahydrofuran	10	ug/L	1.14	ug/L	20100106	C	Y	50	ug/L	61	135	20	C	Y	50	ug/L	25	150	20
2489	Toluene	1	ug/L	0.072	ug/L	20100427	C	Y	50	ug/L	78	126	20	C	Y	50	ug/L	43	148	20
5524	Total Detected VOCs	5	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.128	ug/L	20100108														
2514	1,2,3-Trichlorobenzene	1	ug/L	0.087	ug/L	20100427	C	Y	50	ug/L	41	140	20	C	Y	50	ug/L	20	149	20
2515	1,2,4-Trichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	50	ug/L	54	140	20	C	Y	50	ug/L	26	144	20
2518	1,1,1-Trichloroethane	1	ug/L	0.069	ug/L	20100427	C	Y	50	ug/L	77	125	20	C	Y	50	ug/L	44	148	20
2522	1,1,2-Trichloroethane	1	ug/L	0.150	ug/L	20100427	C	Y	50	ug/L	74	124	20	C	Y	50	ug/L	45	146	20
2526	Trichloroethylene	1	ug/L	0.25	ug/L	20100727								C	Y	50	ug/L	32	150	20
2525	Trichloroethene	1	ug/L	0.25	ug/L	20100727	C	Y	50	ug/L	67	123	20	C	Y	50	ug/L	32	150	20
1428	Trichlorofluoromethane	1	ug/L	0.113	ug/L	20100427	C	Y	50	ug/L	58	134	20	C	Y	50	ug/L	27	142	20
1427	Fluorotrichloromethane	1	ug/L	0.113	ug/L	20100427														
2563	1,2,3-Trichloropropane	1	ug/L	0.153	ug/L	20100104	C	Y			70	130	20	C	Y			50	150	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/L	0.101	ug/L	20100427	C	Y			70	130	20	C	Y			50	150	20
2764	Trichlorotrifluoroethane	1	ug/L	0.101	ug/L	20100427														
2587	1,2,4-Trimethylbenzene	1	ug/L	0.084	ug/L	20100427	C	Y			70	130	20	C	Y			50	150	20
2592	1,3,5-Trimethylbenzene	1	ug/L	0.081	ug/L	20100427	C	Y	50	ug/L	72	135	20	C	Y	50	ug/L	37	150	20
2610	Vinyl acetate	2	ug/L	0.181	ug/L	20100427	C	Y	10	ug/L	55	140	20	C	Y	10	ug/L	24	150	20
2613	Vinyl chloride	2	ug/L	0.084	ug/L	20100427	C	Y	50	ug/L	58	129	20	C	Y	50	ug/L	31	143	20
2940	m-Xylene & p-Xylene	2	ug/L	0.142	ug/L	20100427	C	Y	100	ug/L	80	127	20	C	Y	100	ug/L	44	146	20
2623	o-Xylene	1	ug/L	0.063	ug/L	20100427	C	Y	50	ug/L	78	129	20	C	Y	50	ug/L	41	150	20
2627	Xylenes (total)	3	ug/L	0.200	ug/L	20100427														
337	4-Bromofluorobenzene						X	Y	50	ug/L	74	120	0	X	Y	50	ug/L	68	122	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	66	125	0	X	Y	50	ug/L	69	121	0
2740	Toluene-d8						X	Y	50	ug/L	76	123	0	X	Y	50	ug/L	68	123	0
2863	Dibromofluoromethane						X	Y	50	ug/L	77	118	0	X	Y	50	ug/L	71	123	0

TAL Reference Data Summary

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	1000	ug/L	85.0	ug/L	20080402	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
20	Acetonitrile	2500	ug/L	81.27	ug/L	20100108														
39	Acrolein	2500	ug/L	93.68	ug/L	20100108														
46	Acrylonitrile	2500	ug/L	75.18	ug/L	20100108														
196	Benzene	250	ug/L	9.890	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	61	126	30
318	Bromobenzene	250	ug/L	15.51	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
321	Bromochloromethane	250	ug/L	27.59	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	66	125	20
323	Bromodichloromethane	250	ug/L	10.78	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	68	124	20
340	Bromoform	250	ug/L	16.25	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	67	138	20
343	Bromomethane	500	ug/L	24.16	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	138	30
363	1-Butanol	5000	ug/L	1017.31	ug/L	20100131														
2729	n-Butanol	5000	ug/L	1017.31	ug/L	20100131														
3271	2-Butanone (MEK)	500	ug/L	66.32	ug/L	20100131														
3280	Methyl ethyl ketone (MEK)	500	ug/L	66.32	ug/L	20100131														
372	2-Butanone	500	ug/L	66.32	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	61	140	20
373	Methyl ethyl ketone	500	ug/L	66.32	ug/L	20100131														
374	MEK	500	ug/L	66.32	ug/L	20100131														
365	Butyl alcohol	5000	ug/L	1017.31	ug/L	20100131														
364	n-Butyl alcohol	5000	ug/L	1017.31	ug/L	20100131														
1772	tert-Butyl alcohol	250	ug/L	250	ug/L	20040505														
393	n-Butylbenzene	250	ug/L	11.32	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
395	sec-Butylbenzene	250	ug/L	11.81	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
398	tert-Butylbenzene	250	ug/L	9.192	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
459	Carbon disulfide	250	ug/L	12.31	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	147	20
463	Carbon tetrachloride	250	ug/L	17.45	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	53	136	20
521	Chlorobenzene	250	ug/L	10.34	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	65	126	20
322	Chlorobromomethane	250	ug/L	27.59	ug/L	20100108														
2765	Chlorobutadiene	250	ug/L	8.829	ug/L	20100108														
531	Chloroprene	250	ug/L	8.829	ug/L	20100108														
530	2-Chloro-1,3-butadiene	250	ug/L	8.829	ug/L	20100108														
535	Dibromochloromethane	250	ug/L	10.12	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	67	134	20
534	Chlorodibromomethane	250	ug/L	10.12	ug/L	20100108														
550	Chloroethane	500	ug/L	13.37	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
3361	Ethyl chloride	500	ug/L	13.37	ug/L	20100108														
568	2-Chloroethyl vinyl ether	1000	ug/L	41.39	ug/L	20100108														
569	Chloroform	250	ug/L	10.51	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	132	20
4147	Chloromethane (Methyl Chloride)	500	ug/L	25.00	ug/L	20100131														

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
574	Chloromethane	500	ug/L	25.00	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	43	133	20
2766	Chloropropene	500	ug/L	30.26	ug/L	20100108														
606	Allyl chloride	500	ug/L	30.26	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
604	3-Chloro-1-propene	500	ug/L	30.26	ug/L	20100108														
614	2-Chlorotoluene	250	ug/L	10.17	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
617	4-Chlorotoluene	250	ug/L	5.000	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
669	Cyclohexane	500	ug/L	12.21	ug/L	20100108														
676	Cyclohexanone	5000	ug/L	266.65	ug/L	20100108														
539	1,2-Dibromo-3-chloropropane	500	ug/L	65.31	ug/L	20100131														
3260	1,2-Dibromo-3-chloropropane (DBCP)	500	ug/L	65.31	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
3261	1,2-Dibromoethane (EDB)	250	ug/L	17.01	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
870	1,2-Dibromoethane	250	ug/L	17.01	ug/L	20100108														
888	Dibromomethane	250	ug/L	23.13	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
904	1,2-Dichlorobenzene	250	ug/L	13.36	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	65	133	20
907	1,3-Dichlorobenzene	250	ug/L	7.572	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	63	131	20
910	1,4-Dichlorobenzene	250	ug/L	15.04	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	128	20
922	trans-1,4-Dichloro-2-butene	500	ug/L	31.95	ug/L	20100108														
3615	Dichlorodifluoromethane (Freon 12)	500	ug/L	28.60	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
924	Dichlorodifluoromethane	500	ug/L	28.60	ug/L	20100131														
933	1,1-Dichloroethane	250	ug/L	10.11	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	58	129	20
936	1,2-Dichloroethane	250	ug/L	11.07	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	59	128	20
3767	Ethylene dichloride	250	ug/L	11.07	ug/L	20100108														
948	cis-1,2-Dichloroethene	250	ug/L	10.43	ug/L	20100108														
950	trans-1,2-Dichloroethene	250	ug/L	8.122	ug/L	20100108														
943	1,1-Dichloroethene	250	ug/L	24.21	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	139	20
952	1,2-Dichloroethene (total)	500	ug/L	17.65	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	134	20
986	1,2-Dichloropropane	250	ug/L	15.67	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	57	130	20
989	1,3-Dichloropropane	250	ug/L	7.310	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
990	2,2-Dichloropropane	250	ug/L	24.14	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
998	cis-1,3-Dichloropropene	500	ug/L	6.397	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	65	128	20
1000	trans-1,3-Dichloropropene	250	ug/L	9.66	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	74	132	20
2769	trans-1,3-Dichloropropylene	250	ug/L	9.66	ug/L	20100108														
996	1,1-Dichloropropene	250	ug/L	11.20	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2788	cis-1,3-Dichloropropylene	500	ug/L	6.397	ug/L	20100108														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	250	ug/L	11.32	ug/L	20100108														
3887	Dimethyl disulfide	250	ug/L	8.8	ug/L	20080108														
1199	1,4-Dioxane	20000	ug/L	1937.63	ug/L	20100131														
1325	Ethyl acetate	1000	ug/L	202.15	ug/L	20100108														
1332	Ethylbenzene	250	ug/L	8.298	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	128	20

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1355	Diethyl ether	500	ug/L	117.75	ug/L	20100108														
1349	Ethyl ether	500	ug/L	117.75	ug/L	20100108														
1360	Ethyl methacrylate	250	ug/L	11.84	ug/L	20100108														
2790	Freon 113	250	ug/L	28.30	ug/L	20100108														
1489	Hexachlorobutadiene	250	ug/L	16.92	ug/L	20100108														
3445	Hexane	2500	ug/L	36.42	ug/L	20100108														
1514	n-Hexane	2500	ug/L	36.42	ug/L	20100108														
1515	2-Hexanone	1000	ug/L	12.59	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	43	150	20
1536	Iodomethane	250	ug/L	20.23	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1537	Methyl iodide	250	ug/L	20.23	ug/L	20100108														
1552	Isobutanol	10000	ug/L	434.38	ug/L	20100108														
1556	Isobutyl alcohol	10000	ug/L	434.38	ug/L	20100108														
1578	Isopropylbenzene	250	ug/L	9.717	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1587	4-Isopropyltoluene	250	ug/L	9.151	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1590	p-Isopropyltoluene	250	ug/L	9.151	ug/L	20100108														
1713	Methacrylonitrile	1250	ug/L	59.31	ug/L	20100108														
1774	Methyl acetate	500	ug/L	53.97	ug/L	20100108														
3724	Methyl butyl ketone	1000	ug/L	12.59	ug/L	20100108														
1799	Methylcyclohexane	500	ug/L	12.56	ug/L	20100108														
1812	Dichloromethane	250	ug/L	50.58	ug/L	20100108														
1811	Methylene chloride	250	ug/L	50.58	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
1823	Methyl methacrylate	250	ug/L	49.22	ug/L	20100108														
1848	Methyl isobutyl ketone	1000	ug/L	20.36	ug/L	20100108														
3283	4-Methyl-2-pentanone (MIBK)	1000	ug/L	20.36	ug/L	20100108														
1849	MIBK	1000	ug/L	20.36	ug/L	20100108														
1845	4-Methyl-2-pentanone	1000	ug/L	20.36	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	51	150	20
3794	Methyl tert-butyl ether (MTBE)	250	ug/L	9.878	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1932	Naphthalene	250	ug/L	10.20	ug/L	20100108														
2005	2-Nitropropane	500	ug/L	24.20	ug/L	20100108														
5350	Nonanal	500	ug/L	32.41	ug/L	20100108														
2108	Pentachloroethane	250	ug/L	15.09	ug/L	20100108														
2238	Propionitrile	1250	ug/L	140.38	ug/L	20100108														
2247	n-Propylbenzene	250	ug/L	10.25	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2355	Styrene	250	ug/L	14.38	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	137	20
2437	1,1,1,2-Tetrachloroethane	250	ug/L	14.06	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2439	1,1,2,2-Tetrachloroethane	250	ug/L	15.17	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	141	20
2445	Tetrachloroethene	250	ug/L	20.05	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	41	150	20
2469	Tetrahydrofuran	1250	ug/L	206.00	ug/L	20100108														
2489	Toluene	250	ug/L	12.78	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	64	128	20

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5524	Total Detected VOCs	1000	ug/L			0														
3090	1,3,5-Trichlorobenzene	250	ug/L	18.5	ug/L	20080107														
2514	1,2,3-Trichlorobenzene	250	ug/L	15.70	ug/L	20100108														
2515	1,2,4-Trichlorobenzene	250	ug/L	14.61	ug/L	20100108														
2518	1,1,1-Trichloroethane	250	ug/L	9.984	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	129	20
2522	1,1,2-Trichloroethane	250	ug/L	29.73	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	67	124	20
2525	Trichloroethene	250	ug/L	17.60	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	48	132	20
1428	Trichlorofluoromethane	250	ug/L	13.65	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1427	Fluorotrichloromethane	250	ug/L	13.65	ug/L	20100108														
2564	Trichloropropane	250	ug/L	51.80	ug/L	20100108														
2563	1,2,3-Trichloropropane	250	ug/L	51.80	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	250	ug/L	28.30	ug/L	20100108														
2764	Trichlorotrifluoroethane	250	ug/L	28.30	ug/L	20100108														
2587	1,2,4-Trimethylbenzene	250	ug/L	13.46	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	70	130	20
2592	1,3,5-Trimethylbenzene	250	ug/L	12.47	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2610	Vinyl acetate	250	ug/L	9.782	ug/L	20100108														
2613	Vinyl chloride	250	ug/L	27.60	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
2940	m-Xylene & p-Xylene	500	ug/L	15.08	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	134	20
2621	m-Xylene	125	ug/L	8.29	ug/L	20071226														
2623	o-Xylene	250	ug/L	16.48	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	45	144	20
2627	Xylenes (total)	750	ug/L	29.05	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	52	140	20
337	4-Bromofluorobenzene						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	30	150	0
2735	1,2-Dichloroethane-d4						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	51	141	0
2740	Toluene-d8						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	57	139	0
2863	Dibromofluoromethane						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	30	150	0

TAL Reference Data Summary

Structured Analysis Code: I-5A-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20

Structured Analysis Code: I-5A-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2740	Toluene-d8						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2863	Dibromofluoromethane						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0

TAL Reference Data Summary

Structured Analysis Code: I-58-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
20	Acetonitrile	500	ug/L	39.42	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														

Structured Analysis Code: I-58-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2740	Toluene-d8						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2863	Dibromofluoromethane						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0

TAL Reference Data Summary

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/L	6.47	ug/L	20090306														
20	Acetonitrile	50	ug/L	3.942	ug/L	20100130														
39	Acrolein	50	ug/L	2.901	ug/L	20100113														
46	Acrylonitrile	50	ug/L	1.126	ug/L	20100113														
196	Benzene	5	ug/L	0.253	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
220	Benzyl chloride	10	ug/L			0														
318	Bromobenzene	5	ug/L	0.334	ug/L	20100113														
321	Bromochloromethane	5	ug/L	0.552	ug/L	20100113														
325	Dichlorobromomethane	5	ug/L	0.254	ug/L	20100113														
323	Bromodichloromethane	5	ug/L	0.254	ug/L	20100113														
340	Bromoform	5	ug/L	0.366	ug/L	20100113														
344	Methyl bromide	10	ug/L	0.396	ug/L	20090302														
343	Bromomethane	10	ug/L	0.396	ug/L	20090302														
363	1-Butanol	100	ug/L	4.907	ug/L	20100113														
2729	n-Butanol	100	ug/L	4.907	ug/L	20100113														
3271	2-Butanone (MEK)	20	ug/L	0.389	ug/L	20100113														
372	2-Butanone	20	ug/L	0.389	ug/L	20100113	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	20	ug/L	0.389	ug/L	20100113														
374	MEK	20	ug/L	0.389	ug/L	20100113														
3280	Methyl ethyl ketone (MEK)	20	ug/L	0.389	ug/L	20100113														
364	n-Butyl alcohol	100	ug/L	4.907	ug/L	20100113														
393	n-Butylbenzene	5	ug/L	0.232	ug/L	20100113														
395	sec-Butylbenzene	5	ug/L	0.310	ug/L	20100113														
398	tert-Butylbenzene	5	ug/L	0.311	ug/L	20100113														
459	Carbon disulfide	5	ug/L	0.369	ug/L	20100113														
463	Carbon tetrachloride	5	ug/L	0.360	ug/L	20100113	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	5	ug/L	0.382	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
322	Chlorobromomethane	5	ug/L	0.552	ug/L	20100113														
2765	Chlorobutadiene	5	ug/L	0.388	ug/L	20100113														
531	Chloroprene	5	ug/L	0.388	ug/L	20100113														
530	2-Chloro-1,3-butadiene	5	ug/L	0.388	ug/L	20100113														
534	Chlorodibromomethane	5	ug/L	0.329	ug/L	20100113														
535	Dibromochloromethane	5	ug/L	0.329	ug/L	20100113														
3361	Ethyl chloride	10	ug/L	0.382	ug/L	20100113														
550	Chloroethane	10	ug/L	0.382	ug/L	20100113														
568	2-Chloroethyl vinyl ether	20	ug/L	0.523	ug/L	20100113														
569	Chloroform	5	ug/L	0.092	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
575	Methyl chloride	10	ug/L	0.553	ug/L	20090303														
4147	Chloromethane (Methyl Chloride)	10	ug/L	0.553	ug/L	20090303														
574	Chloromethane	10	ug/L	0.553	ug/L	20090303														
606	Allyl chloride	10	ug/L	0.352	ug/L	20100113														
2766	Chloropropene	10	ug/L	0.352	ug/L	20100113														
604	3-Chloro-1-propene	10	ug/L	0.352	ug/L	20100113														
614	2-Chlorotoluene	5	ug/L	0.336	ug/L	20100113														
617	4-Chlorotoluene	5	ug/L	0.305	ug/L	20100113														
669	Cyclohexane	10	ug/L	0.363	ug/L	20100113														
676	Cyclohexanone	100	ug/L	5.313	ug/L	20100113														
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/L	1.150	ug/L	20100113														
539	1,2-Dibromo-3-chloropropane	10	ug/L	1.150	ug/L	20100113														
870	1,2-Dibromoethane	5	ug/L	0.437	ug/L	20100113														
3261	1,2-Dibromoethane (EDB)	5	ug/L	0.437	ug/L	20100113														
889	Methylene bromide	5	ug/L	0.405	ug/L	20100113														
888	Dibromomethane	5	ug/L	0.405	ug/L	20100113														
906	o-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113														
904	1,2-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113														
909	m-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113														
907	1,3-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113														
910	1,4-Dichlorobenzene	5	ug/L	0.260	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	10	ug/L	0.397	ug/L	20100113														
924	Dichlorodifluoromethane	10	ug/L	0.449	ug/L	20100113														
3615	Dichlorodifluoromethane (Freon 12)	10	ug/L	0.449	ug/L	20100113														
933	1,1-Dichloroethane	5	ug/L	0.392	ug/L	20100113														
3767	Ethylene dichloride	5	ug/L	0.372	ug/L	20100113														
936	1,2-Dichloroethane	5	ug/L	0.372	ug/L	20100113	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
948	cis-1,2-Dichloroethene	5	ug/L	0.159	ug/L	20100113														
950	trans-1,2-Dichloroethene	5	ug/L	0.178	ug/L	20100113														
943	1,1-Dichloroethene	5	ug/L	0.365	ug/L	20100113	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20
952	1,2-Dichloroethene (total)	10	ug/L	0.237	ug/L	20100113														
986	1,2-Dichloropropane	5	ug/L	0.317	ug/L	20100113														
989	1,3-Dichloropropane	5	ug/L	0.238	ug/L	20100113														
990	2,2-Dichloropropane	5	ug/L	0.539	ug/L	20100113														
998	cis-1,3-Dichloropropene	5	ug/L	0.339	ug/L	20100113														
2769	trans-1,3-Dichloropropylene	5	ug/L	0.349	ug/L	20100113														
1000	trans-1,3-Dichloropropene	5	ug/L	0.349	ug/L	20100113														
996	1,1-Dichloropropene	5	ug/L	0.300	ug/L	20100113														
2788	cis-1,3-Dichloropropylene	5	ug/L	0.339	ug/L	20100113														

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/L	0.332	ug/L	20100113														
3887	Dimethyl disulfide	5	ug/L	0.476	ug/L	20090305														
1199	1,4-Dioxane	400	ug/L	22.860	ug/L	20100130														
3766	Epichlorohydrin	25	ug/L			0														
1290	Ethanol	20	ug/L	61.38	ug/L	20090305														
1325	Ethyl acetate	20	ug/L	5.931	ug/L	20100130														
1332	Ethylbenzene	5	ug/L	0.299	ug/L	20100113														
1355	Diethyl ether	10	ug/L	1.617	ug/L	20100113														
1349	Ethyl ether	10	ug/L	1.617	ug/L	20100113														
1360	Ethyl methacrylate	5	ug/L	0.240	ug/L	20100113														
2790	Freon 113	5	ug/L	0.246	ug/L	20090303														
1489	Hexachlorobutadiene	5	ug/L	0.179	ug/L	20100113														
3445	Hexane	10	ug/L	0.455	ug/L	20100113														
1514	n-Hexane	10	ug/L	0.455	ug/L	20100113														
1515	2-Hexanone	20	ug/L	0.261	ug/L	20100113														
1537	Methyl iodide	5	ug/L	1.511	ug/L	20100113														
1536	Iodomethane	5	ug/L	1.511	ug/L	20100113														
1552	Isobutanol	200	ug/L	7.34	ug/L	20100113														
1556	Isobutyl alcohol	200	ug/L	7.34	ug/L	20100113														
1578	Isopropylbenzene	5	ug/L	0.258	ug/L	20100113														
1587	4-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113														
1588	p-Cymene	5	ug/L	0.319	ug/L	20100113														
1590	p-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113														
1713	Methacrylonitrile	25	ug/L	1.497	ug/L	20100113														
1774	Methyl acetate	10	ug/L	0.611	ug/L	20090302														
3724	Methyl butyl ketone	20	ug/L	0.261	ug/L	20100113														
1799	Methylcyclohexane	10	ug/L	0.259	ug/L	20100113														
1811	Methylene chloride	5	ug/L	0.801	ug/L	20100113														
1812	Dichloromethane	5	ug/L	0.801	ug/L	20100113														
1823	Methyl methacrylate	5	ug/L	0.499	ug/L	20100113														
1849	MIBK	20	ug/L	0.326	ug/L	20100113														
3283	4-Methyl-2-pentanone (MIBK)	20	ug/L	0.326	ug/L	20100113														
1845	4-Methyl-2-pentanone	20	ug/L	0.326	ug/L	20100113														
1848	Methyl isobutyl ketone	20	ug/L	0.326	ug/L	20100113														
2773	MTBE	5	ug/L	0.401	ug/L	20100113														
2772	Methyl tert-butyl ether	5	ug/L	0.401	ug/L	20100113														
3794	Methyl tert-butyl ether (MTBE)	5	ug/L	0.401	ug/L	20100113														
1932	Naphthalene	5	ug/L	0.492	ug/L	20100113														
2005	2-Nitropropane	10	ug/L	0.636	ug/L	20100113														

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5350	Nonanal	10	ug/L	0.715	ug/L	20100113														
2108	Pentachloroethane	5	ug/L	0.239	ug/L	20100113														
2238	Propionitrile	50	ug/L	1.143	ug/L	20100113														
2247	n-Propylbenzene	5	ug/L	0.298	ug/L	20100113														
2355	Styrene	5	ug/L	0.347	ug/L	20100113														
2437	1,1,1,2-Tetrachloroethane	5	ug/L	0.238	ug/L	20100113														
2439	1,1,2,2-Tetrachloroethane	5	ug/L	0.272	ug/L	20100113														
2445	Tetrachloroethene	5	ug/L	0.280	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	5	ug/L	0.280	ug/L	20100113														
2469	Tetrahydrofuran	50	ug/L	1.670	ug/L	20100113														
2489	Toluene	5	ug/L	0.303	ug/L	20100113														
5524	Total Detected VOCs	20	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.507	ug/L	20090305														
2514	1,2,3-Trichlorobenzene	5	ug/L	0.326	ug/L	20100113														
2515	1,2,4-Trichlorobenzene	5	ug/L	0.264	ug/L	20100113														
2518	1,1,1-Trichloroethane	5	ug/L	0.291	ug/L	20100113														
2522	1,1,2-Trichloroethane	5	ug/L	0.573	ug/L	20100113														
2526	Trichloroethylene	5	ug/L	0.290	ug/L	20100113														
2525	Trichloroethene	5	ug/L	0.290	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
1428	Trichlorofluoromethane	5	ug/L	0.167	ug/L	20100113														
1427	Fluorotrichloromethane	5	ug/L	0.167	ug/L	20100113														
2563	1,2,3-Trichloropropane	5	ug/L	0.559	ug/L	20100113														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/L	0.246	ug/L	20090303														
2764	Trichlorotrifluoroethane	5	ug/L	0.246	ug/L	20090303														
2587	1,2,4-Trimethylbenzene	5	ug/L	0.401	ug/L	20100113														
2592	1,3,5-Trimethylbenzene	5	ug/L	0.284	ug/L	20100113														
2610	Vinyl acetate	5	ug/L	0.305	ug/L	20100113														
2613	Vinyl chloride	5	ug/L	0.428	ug/L	20100113	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	10	ug/L	0.569	ug/L	20100113														
2623	o-Xylene	5	ug/L	0.318	ug/L	20100113														
2627	Xylenes (total)	10	ug/L	0.854	ug/L	20100113														
5397	2,2,2-Trifluoroethanol	100	ug/L	44.49	ug/L	20020811														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

TAL Reference Data Summary

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/kg	6.47	ug/kg	20090306	C	Y	50	ug/kg	49	140	20	C	Y	50	ug/kg	40	150	30
20	Acetonitrile	50	ug/kg	20.4	ug/kg	20110216	C	Y	250	ug/kg	70	123	20	C	Y	250	ug/kg	30	150	30
39	Acrolein	50	ug/kg	12.2	ug/kg	20110216	C	Y	250	ug/kg	40	140	20	C	Y	250	ug/kg	10	150	30
46	Acrylonitrile	50	ug/kg	3.85	ug/kg	20100719	C	Y	250	ug/kg	77	125	20	C	Y	250	ug/kg	30	150	30
196	Benzene	5	ug/kg	0.253	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	81	123	30
318	Bromobenzene	5	ug/kg	0.368	ug/kg	20110216	C	Y	50	ug/kg	85	117	20	C	Y	50	ug/kg	47	150	30
321	Bromochloromethane	5	ug/kg	0.823	ug/kg	20110222	C	Y	50	ug/kg	85	118	20	C	Y	50	ug/kg	68	144	30
325	Dichlorobromomethane	5	ug/kg	0.254	ug/kg	20100113														
323	Bromodichloromethane	5	ug/kg	0.254	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	65	135	30
340	Bromoform	5	ug/kg	0.366	ug/kg	20100113	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	35	150	30
344	Methyl bromide	10	ug/kg	1.10	ug/kg	20110216														
343	Bromomethane	10	ug/kg	1.10	ug/kg	20110216	C	Y	50	ug/kg	60	133	20	C	Y	50	ug/kg	30	150	30
363	1-Butanol	100	ug/kg	16.4	ug/kg	20110216	C	Y	500	ug/kg	56	129	20	C	Y	500	ug/kg	35	150	30
2729	n-Butanol	100	ug/kg	16.4	ug/kg	20110216														
3271	2-Butanone (MEK)	20	ug/kg	1.92	ug/kg	20110222														
372	2-Butanone	20	ug/kg	1.92	ug/kg	20110222	C	Y	50	ug/kg	65	124	20	C	Y	50	ug/kg	20	150	30
373	Methyl ethyl ketone	20	ug/kg	1.92	ug/kg	20110222														
374	MEK	20	ug/kg	1.92	ug/kg	20110222														
3280	Methyl ethyl ketone (MEK)	20	ug/kg	1.92	ug/kg	20110222														
364	n-Butyl alcohol	100	ug/kg	16.4	ug/kg	20110216														
393	n-Butylbenzene	5	ug/kg	0.600	ug/kg	20100727	C	Y	50	ug/kg	84	126	20	C	Y	50	ug/kg	19	150	30
395	sec-Butylbenzene	5	ug/kg	0.310	ug/kg	20100113	C	Y	50	ug/kg	85	128	20	C	Y	50	ug/kg	28	150	30
398	tert-Butylbenzene	5	ug/kg	0.311	ug/kg	20100113	C	Y	50	ug/kg	85	127	20	C	Y	50	ug/kg	34	150	30
459	Carbon disulfide	5	ug/kg	0.685	ug/kg	20100719	C	Y	50	ug/kg	78	128	20	C	Y	50	ug/kg	21	150	30
463	Carbon tetrachloride	5	ug/kg	0.513	ug/kg	20100719	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	47	143	30
521	Chlorobenzene	5	ug/kg	0.382	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	71	128	30
322	Chlorobromomethane	5	ug/kg	0.823	ug/kg	20110222														
2765	Chlorobutadiene	5	ug/kg	0.388	ug/kg	20100113														
531	Chloroprene	5	ug/kg	0.388	ug/kg	20100113														
530	2-Chloro-1,3-butadiene	5	ug/kg	0.388	ug/kg	20100113	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	73	130	30
534	Chlorodibromomethane	5	ug/kg	0.406	ug/kg	20110216														
535	Dibromochloromethane	5	ug/kg	0.406	ug/kg	20110216	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	50	150	30
3361	Ethyl chloride	10	ug/kg	0.516	ug/kg	20100719														
550	Chloroethane	10	ug/kg	0.516	ug/kg	20100719	C	Y	50	ug/kg	63	130	20	C	Y	50	ug/kg	40	150	30
568	2-Chloroethyl vinyl ether	20	ug/kg	1.37	ug/kg	20100719	C	Y	50	ug/kg	60	136	20	C	Y	50	ug/kg	46	150	30
569	Chloroform	5	ug/kg	0.376	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	77	132	30
575	Methyl chloride	10	ug/kg	0.650	ug/kg	20110222														

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	10	ug/kg	0.650	ug/kg	20110222														
574	Chloromethane	10	ug/kg	0.650	ug/kg	20110222	C	Y	50	ug/kg	64	123	20	C	Y	50	ug/kg	29	150	30
606	Allyl chloride	10	ug/kg	2.67	ug/kg	20110222	C	Y	50	ug/kg	81	123	20	C	Y	50	ug/kg	31	150	30
2766	Chloropropene	10	ug/kg	2.67	ug/kg	20110222														
604	3-Chloro-1-propene	10	ug/kg	2.67	ug/kg	20110222														
614	2-Chlorotoluene	5	ug/kg	0.336	ug/kg	20100113	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	39	150	30
617	4-Chlorotoluene	5	ug/kg	0.375	ug/kg	20100719	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	39	150	30
669	Cyclohexane	10	ug/kg	0.363	ug/kg	20100113	C	Y	50	ug/kg	85	122	20	C	Y	50	ug/kg	19	150	30
676	Cyclohexanone	100	ug/kg	17.8	ug/kg	20110222	C	Y	50	ug/kg	62	130	20	C	Y	50	ug/kg	40	150	30
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/kg	1.45	ug/kg	20110222	C	Y	50	ug/kg	79	124	20	C	Y	50	ug/kg	23	150	30
539	1,2-Dibromo-3-chloropropane	10	ug/kg	1.45	ug/kg	20110222														
870	1,2-Dibromoethane	5	ug/kg	0.699	ug/kg	20110222														
3261	1,2-Dibromoethane (EDB)	5	ug/kg	0.699	ug/kg	20110222	C	Y	50	ug/kg	85	116	20	C	Y	50	ug/kg	50	150	30
889	Methylene bromide	5	ug/kg	0.966	ug/kg	20110222														
888	Dibromomethane	5	ug/kg	0.966	ug/kg	20110222	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	65	141	30
906	o-Dichlorobenzene	5	ug/kg	0.282	ug/kg	20100719														
904	1,2-Dichlorobenzene	5	ug/kg	0.282	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	55	143	30
909	m-Dichlorobenzene	5	ug/kg	0.280	ug/kg	20110216														
907	1,3-Dichlorobenzene	5	ug/kg	0.280	ug/kg	20110216	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	57	141	30
910	1,4-Dichlorobenzene	5	ug/kg	0.600	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	55	141	30
922	trans-1,4-Dichloro-2-butene	10	ug/kg	1.78	ug/kg	20110222	C	Y	50	ug/kg	76	121	20	C	Y	50	ug/kg	32	150	30
924	Dichlorodifluoromethane	10	ug/kg	1.31	ug/kg	20100719														
3615	Dichlorodifluoromethane (Freon 12)	10	ug/kg	1.31	ug/kg	20100719	C	Y	50	ug/kg	40	136	20	C	Y	50	ug/kg	35	150	30
933	1,1-Dichloroethane	5	ug/kg	0.392	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	70	143	30
3767	Ethylene dichloride	5	ug/kg	0.867	ug/kg	20100719														
936	1,2-Dichloroethane	5	ug/kg	0.867	ug/kg	20100719	C	Y	50	ug/kg	80	119	20	C	Y	50	ug/kg	65	146	30
948	cis-1,2-Dichloroethene	5	ug/kg	0.597	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	74	135	30
950	trans-1,2-Dichloroethene	5	ug/kg	0.943	ug/kg	20110216	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	63	145	30
943	1,1-Dichloroethene	5	ug/kg	1.61	ug/kg	20100719	C	Y	50	ug/kg	83	117	20	C	Y	50	ug/kg	70	143	30
952	1,2-Dichloroethene (total)	10	ug/kg	0.958	ug/kg	20110216	C	Y	100	ug/kg	85	115	20	C	Y	100	ug/kg	70	137	30
986	1,2-Dichloropropane	5	ug/kg	0.383	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	72	132	30
989	1,3-Dichloropropane	5	ug/kg	0.322	ug/kg	20110216	C	Y	50	ug/kg	83	117	20	C	Y	50	ug/kg	46	150	30
990	2,2-Dichloropropane	5	ug/kg	0.539	ug/kg	20100113	C	Y	50	ug/kg	77	132	20	C	Y	50	ug/kg	46	150	30
998	cis-1,3-Dichloropropene	5	ug/kg	0.595	ug/kg	20100719	C	Y	50	ug/kg	85	118	20	C	Y	50	ug/kg	51	146	30
2769	trans-1,3-Dichloropropylene	5	ug/kg	0.349	ug/kg	20100113														
1000	trans-1,3-Dichloropropene	5	ug/kg	0.349	ug/kg	20100113	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	47	150	30
996	1,1-Dichloropropene	5	ug/kg	0.300	ug/kg	20100113	C	Y	50	ug/kg	85	116	20	C	Y	50	ug/kg	64	128	30
2788	cis-1,3-Dichloropropylene	5	ug/kg	0.595	ug/kg	20100719														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/kg	0.741	ug/kg	20110216	C	Y	50	ug/kg	62	140	20	C	Y	50	ug/kg	45	150	30

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3887	Dimethyl disulfide	5	ug/kg	0.476	ug/kg	20090305														
1199	1,4-Dioxane	400	ug/kg	35.8	ug/kg	20110216	C	Y	1000	ug/L	62	132	20	C	Y	1000	ug/kg	23	150	30
1290	Ethanol	250	ug/kg	61.38	ug/kg	20090305														
1325	Ethyl acetate	20	ug/kg	8.86	ug/kg	20100719	C	Y	100	ug/kg	78	122	20	C	Y	100	ug/kg	30	150	30
1332	Ethylbenzene	5	ug/kg	0.299	ug/kg	20100113	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	55	141	30
1349	Ethyl ether	10	ug/kg	2.21	ug/kg	20110216	C	Y	100	ug/kg	77	129	20	C	Y	100	ug/kg	43	150	30
1355	Diethyl ether	10	ug/kg	2.21	ug/kg	20110216														
1360	Ethyl methacrylate	5	ug/kg	0.994	ug/kg	20110222	C	Y	50	ug/kg	68	123	20	C	Y	50	ug/kg	30	150	30
2790	Freon 113	5	ug/kg	1.682	ug/kg	20100719	C	Y	50	ug/kg	85	123	20	C	Y	50	ug/kg	45	150	30
1489	Hexachlorobutadiene	5	ug/kg	0.682	ug/kg	20110216	C	Y	50	ug/kg	78	126	20	C	Y	50	ug/kg	10	150	30
3445	Hexane	10	ug/kg	0.455	ug/kg	20100113														
1514	n-Hexane	10	ug/kg	0.455	ug/kg	20100113	C	Y	50	ug/kg	85	127	20	C	Y	50	ug/kg	30	150	30
1515	2-Hexanone	20	ug/kg	1.77	ug/kg	20110222	C	Y	50	ug/kg	58	133	20	C	Y	50	ug/kg	28	150	30
1536	Iodomethane	5	ug/kg	1.511	ug/kg	20100113	C	Y	50	ug/kg	74	122	20	C	Y	50	ug/kg	46	150	30
1537	Methyl iodide	5	ug/kg	1.511	ug/kg	20100113														
1552	Isobutanol	200	ug/kg	25.4	ug/kg	20110222	C	Y	1000	ug/kg	62	128	20	C	Y	1000	ug/kg	40	150	30
1556	Isobutyl alcohol	200	ug/kg	25.4	ug/kg	20110222														
1578	Isopropylbenzene	5	ug/kg	0.258	ug/kg	20100113	C	Y	50	ug/kg	85	128	20	C	Y	50	ug/kg	36	150	30
1590	p-Isopropyltoluene	5	ug/kg	0.319	ug/kg	20100113														
1587	4-Isopropyltoluene	5	ug/kg	0.319	ug/kg	20100113	C	Y	50	ug/kg	85	124	20	C	Y	50	ug/kg	21	150	30
1588	p-Cymene	5	ug/kg	0.319	ug/kg	20100113														
1713	Methacrylonitrile	25	ug/kg	3.73	ug/kg	20100719	C	Y	250	ug/kg	78	124	20	C	Y	250	ug/kg	38	150	30
1774	Methyl acetate	5	ug/kg	1.38	ug/kg	20110222	C	Y	50	ug/kg	63	140	20	C	Y	50	ug/kg	46	150	30
3724	Methyl butyl ketone	20	ug/kg	1.77	ug/kg	20110222														
1799	Methylcyclohexane	10	ug/kg	0.260	ug/kg	20100719	C	Y	50	ug/kg	85	117	20	C	Y	50	ug/kg	30	150	30
1812	Dichloromethane	5	ug/kg	1.58	ug/kg	20100719														
1811	Methylene chloride	5	ug/kg	1.58	ug/kg	20100719	C	Y	50	ug/kg	81	115	20	C	Y	50	ug/kg	39	150	30
1823	Methyl methacrylate	5	ug/kg	1.80	ug/kg	20110222	C	Y	50	ug/kg	70	123	20	C	Y	50	ug/kg	24	150	30
1848	Methyl isobutyl ketone	20	ug/kg	0.732	ug/kg	20100719														
3283	4-Methyl-2-pentanone (MIBK)	20	ug/kg	0.732	ug/kg	20100719														
1849	MIBK	20	ug/kg	0.732	ug/kg	20100719														
1845	4-Methyl-2-pentanone	20	ug/kg	0.732	ug/kg	20100719	C	Y	50	ug/kg	73	125	20	C	Y	50	ug/kg	34	150	30
2773	MTBE	5	ug/kg	0.476	ug/kg	20100719														
2772	Methyl tert-butyl ether	5	ug/kg	0.476	ug/kg	20100719														
3794	Methyl tert-butyl ether (MTBE)	5	ug/kg	0.476	ug/kg	20100719	C	Y	50	ug/kg	82	121	20	C	Y	50	ug/kg	46	150	30
1932	Naphthalene	5	ug/kg	0.492	ug/kg	20100113	C	Y	50	ug/kg	75	129	20	C	Y	50	ug/kg	24	150	30
2005	2-Nitropropane	10	ug/kg	1.80	ug/kg	20110222	C	Y	100	ug/kg	50	140	20	C	Y	100	ug/kg	30	150	30
5350	Nonanal	10	ug/kg	1.98	ug/kg	20110222														
2108	Pentachloroethane	5	ug/kg	0.270	ug/kg	20110303	C	Y	50	ug/kg	40	140	20	C	Y	50	ug/kg	10	150	30

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2238	Propionitrile	25	ug/kg	6.58	ug/kg	20110216	C	Y	250	ug/kg	77	122	20	C	Y	250	ug/kg	21	150	30
2247	n-Propylbenzene	5	ug/kg	0.320	ug/kg	20100719	C	Y	50	ug/kg	85	128	20	C	Y	50	ug/kg	41	150	30
2355	Styrene	5	ug/kg	0.347	ug/kg	20100113	C	Y	50	ug/kg	85	124	20	C	Y	50	ug/kg	58	140	30
2437	1,1,1,2-Tetrachloroethane	5	ug/kg	0.346	ug/kg	20110216	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	68	144	30
2439	1,1,2,2-Tetrachloroethane	5	ug/kg	0.401	ug/kg	20100719	C	Y	50	ug/L	78	119	20	C	Y	50	ug/kg	27	150	30
2446	Tetrachloroethylene	5	ug/kg	0.322	ug/kg	20110216														
2445	Tetrachloroethene	5	ug/kg	0.322	ug/kg	20110216	C	Y	50	ug/kg	85	119	20	C	Y	50	ug/kg	47	146	30
2469	Tetrahydrofuran	25	ug/kg	6.54	ug/kg	20100719	C	Y	250	ug/kg	73	128	20	C	Y	250	ug/kg	22	150	30
2489	Toluene	5	ug/kg	0.700	ug/kg	20110624	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	62	148	30
5524	Total Detected VOCs	20	ug/kg			0														
3090	1,3,5-Trichlorobenzene	5	ug/kg	0.507	ug/kg	20090305														
2514	1,2,3-Trichlorobenzene	5	ug/kg	0.444	ug/kg	20110216	C	Y	50	ug/kg	81	123	20	C	Y	50	ug/kg	30	150	30
2515	1,2,4-Trichlorobenzene	5	ug/kg	0.425	ug/kg	20110216	C	Y	50	ug/kg	84	122	20	C	Y	50	ug/kg	30	148	30
2518	1,1,1-Trichloroethane	5	ug/kg	0.431	ug/kg	20100719	C	Y	50	ug/kg	85	118	20	C	Y	50	ug/kg	37	139	30
2522	1,1,2-Trichloroethane	5	ug/kg	0.573	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	29	150	30
2525	Trichloroethene	5	ug/kg	0.385	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	29	150	30
1428	Trichlorofluoromethane	5	ug/kg	0.50	ug/kg	20110222	C	Y	50	ug/kg	72	128	20	C	Y	50	ug/kg	49	150	30
1427	Fluorotrichloromethane	5	ug/kg	0.50	ug/kg	20110222														
2563	1,2,3-Trichloropropane	5	ug/kg	0.559	ug/kg	20100113	C	Y	50	ug/kg	75	118	20	C	Y	50	ug/kg	32	150	30
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/kg	1.682	ug/kg	20100719														
2764	Trichlorotrifluoroethane	5	ug/kg	1.682	ug/kg	20100719														
2587	1,2,4-Trimethylbenzene	5	ug/kg	0.600	ug/kg	20100727	C	Y	50	ug/kg	85	125	20		Y	50	ug/kg	50	150	30
2592	1,3,5-Trimethylbenzene	5	ug/kg	0.313	ug/kg	20100719	C	Y	50	ug/kg	85	129	20	C	Y	50	ug/kg	42	150	30
2610	Vinyl acetate	5	ug/kg	0.784	ug/kg	20100719	C	Y	50	ug/kg	68	131	20	C	Y	50	ug/kg	10	150	30
2613	Vinyl chloride	5	ug/kg	0.428	ug/kg	20100113	C	Y	50	ug/kg	63	125	20	C	Y	50	ug/kg	31	150	30
2940	m-Xylene & p-Xylene	5	ug/kg	0.569	ug/kg	20100113	C	Y	100	ug/kg	85	120	20	C	Y	100	ug/kg	53	140	30
2623	o-Xylene	5	ug/kg	0.336	ug/kg	20100719	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	52	143	30
2627	Xylenes (total)	10	ug/kg	0.854	ug/kg	20100113														
337	4-Bromofluorobenzene						X	Y	50	ug/kg	85	116	0	X	Y	50	ug/kg	44	150	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	81	117	0	X	Y	50	ug/kg	69	142	0
2740	Toluene-d8						X	Y	50	ug/kg	85	119	0	X	Y	50	ug/kg	62	150	0
2863	Dibromofluoromethane						X	Y	50	ug/kg	85	115	0	X	Y	50	ug/kg	49	150	0

TAL Reference Data Summary

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	1000	ug/kg	85.0	ug/kg	20080402	C	Y	2500	ug/kg	44	150	20	C	Y	2500	ug/kg	30	150	30
20	Acetonitrile	2500	ug/kg	81.27	ug/kg	20100108														
39	Acrolein	2500	ug/kg	93.68	ug/kg	20100108														
46	Acrylonitrile	2500	ug/kg	75.18	ug/kg	20100108														
196	Benzene	250	ug/kg	9.890	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	85	115	30
318	Bromobenzene	250	ug/kg	15.51	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	250	ug/kg	50	150	30
321	Bromochloromethane	250	ug/kg	27.59	ug/kg	20100108	C	Y	2500	ug/kg	83	117	20	C	Y	2500	ug/kg	85	115	30
323	Bromodichloromethane	250	ug/kg	10.78	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	85	115	30
340	Bromoform	250	ug/kg	16.25	ug/kg	20100108	C	Y	2500	ug/kg	71	128	20	C	Y	2500	ug/kg	79	129	30
343	Bromomethane	500	ug/kg	24.16	ug/kg	20100108	C	Y	2500	ug/kg	58	150	20	C	Y	2500	ug/kg	69	127	30
363	1-Butanol	5000	ug/kg	1017.31	ug/kg	20100131														
2729	n-Butanol	5000	ug/kg	1017.31	ug/kg	20100131														
3271	2-Butanone (MEK)	500	ug/kg	66.32	ug/kg	20100131														
3280	Methyl ethyl ketone (MEK)	500	ug/kg	66.32	ug/kg	20100131														
372	2-Butanone	500	ug/kg	66.32	ug/kg	20100131	C	Y	2500	ug/kg	76	137	20	C	Y	2500	ug/kg	77	143	30
373	Methyl ethyl ketone	500	ug/kg	66.32	ug/kg	20100131														
374	MEK	500	ug/kg	66.32	ug/kg	20100131														
365	Butyl alcohol	5000	ug/kg	1017.31	ug/kg	20100131														
364	n-Butyl alcohol	5000	ug/kg	1017.31	ug/kg	20100131														
393	n-Butylbenzene	250	ug/kg	11.32	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
395	sec-Butylbenzene	250	ug/kg	11.81	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
398	tert-Butylbenzene	250	ug/kg	9.192	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
459	Carbon disulfide	250	ug/kg	12.31	ug/kg	20100108	C	Y	2500	ug/kg	78	120	20	C	Y	2500	ug/kg	76	129	30
463	Carbon tetrachloride	250	ug/kg	17.45	ug/kg	20100108	C	Y	2500	ug/kg	73	129	20	C	Y	2500	ug/kg	77	123	30
521	Chlorobenzene	250	ug/kg	10.34	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	81	115	30
322	Chlorobromomethane	250	ug/kg	27.59	ug/kg	20100108														
2765	Chlorobutadiene	250	ug/kg	8.829	ug/kg	20100108														
531	Chloroprene	250	ug/kg	8.829	ug/kg	20100108														
530	2-Chloro-1,3-butadiene	250	ug/kg	8.829	ug/kg	20100108														
534	Chlorodibromomethane	250	ug/kg	10.12	ug/kg	20100108														
535	Dibromochloromethane	250	ug/kg	10.12	ug/kg	20100108	C	Y	2500	ug/kg	69	119	20	C	Y	2500	ug/kg	81	125	30
3361	Ethyl chloride	500	ug/kg	13.37	ug/kg	20100108														
550	Chloroethane	500	ug/kg	13.37	ug/kg	20100108	C	Y	2500	ug/kg	41	150	20	C	Y	2500	ug/kg	77	115	30
568	2-Chloroethyl vinyl ether	1000	ug/kg	41.39	ug/kg	20100108														
569	Chloroform	250	ug/kg	10.51	ug/kg	20100108	C	Y	2500	ug/kg	81	117	20	C	Y	2500	ug/kg	85	115	30
574	Chloromethane	500	ug/kg	25.00	ug/kg	20100131	C	Y	2500	ug/kg	67	147	20	C	Y	2500	ug/kg	66	120	30
4147	Chloromethane (Methyl Chloride)	500	ug/kg	25.00	ug/kg	20100131														

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
606	Allyl chloride	500	ug/kg	30.26	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2766	Chloropropene	500	ug/kg	30.26	ug/kg	20100108														
604	3-Chloro-1-propene	500	ug/kg	30.26	ug/kg	20100108														
614	2-Chlorotoluene	250	ug/kg	10.17	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
617	4-Chlorotoluene	250	ug/kg	5.000	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
669	Cyclohexane	500	ug/kg	12.21	ug/kg	20100108														
676	Cyclohexanone	5000	ug/kg	266.65	ug/kg	20100108														
3260	1,2-Dibromo-3-chloropropane (DBCP)	500	ug/kg	65.31	ug/kg	20100131	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
539	1,2-Dibromo-3-chloropropane	500	ug/kg	65.31	ug/kg	20100131														
870	1,2-Dibromoethane	250	ug/kg	17.01	ug/kg	20100108														
3261	1,2-Dibromoethane (EDB)	250	ug/kg	17.01	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
888	Dibromomethane	250	ug/kg	23.13	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
904	1,2-Dichlorobenzene	250	ug/kg	13.36	ug/kg	20100108	C	Y	2500	ug/kg	79	115	20	C	Y	2500	ug/kg	65	134	30
907	1,3-Dichlorobenzene	250	ug/kg	7.572	ug/kg	20100108	C	Y	2500	ug/kg	81	115	20	C	Y	2500	ug/kg	84	115	30
910	1,4-Dichlorobenzene	250	ug/kg	15.04	ug/kg	20100108	C	Y	2500	ug/kg	81	115	20	C	Y	2500	ug/kg	85	115	30
922	trans-1,4-Dichloro-2-butene	500	ug/kg	31.95	ug/kg	20100108														
924	Dichlorodifluoromethane	500	ug/kg	28.60	ug/kg	20100131														
3615	Dichlorodifluoromethane (Freon 12)	500	ug/kg	28.60	ug/kg	20100131	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
933	1,1-Dichloroethane	250	ug/kg	10.11	ug/kg	20100108	C	Y	2500	ug/kg	82	121	20	C	Y	2500	ug/kg	83	121	30
3767	Ethylene dichloride	250	ug/kg	11.07	ug/kg	20100108														
936	1,2-Dichloroethane	250	ug/kg	11.07	ug/kg	20100108	C	Y	2500	ug/kg	72	126	20	C	Y	2500	ug/kg	85	115	30
948	cis-1,2-Dichloroethene	250	ug/kg	10.43	ug/kg	20100108														
950	trans-1,2-Dichloroethene	250	ug/kg	8.122	ug/kg	20100108														
943	1,1-Dichloroethene	250	ug/kg	24.21	ug/kg	20100108	C	Y	2500	ug/kg	71	125	20	C	Y	2500	ug/kg	79	127	30
952	1,2-Dichloroethene (total)	500	ug/kg	17.65	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	83	126	30
986	1,2-Dichloropropane	250	ug/kg	15.67	ug/kg	20100108	C	Y	2500	ug/kg	85	115	20	C	Y	2500	ug/kg	83	115	30
989	1,3-Dichloropropane	250	ug/kg	7.310	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
990	2,2-Dichloropropane	250	ug/kg	24.14	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
998	cis-1,3-Dichloropropene	500	ug/kg	6.397	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	85	121	30
2769	trans-1,3-Dichloropropylene	250	ug/kg	9.66	ug/kg	20100108														
1000	trans-1,3-Dichloropropene	250	ug/kg	9.66	ug/kg	20100108	C	Y	2500	ug/kg	79	123	20	C	Y	2500	ug/kg	76	128	30
996	1,1-Dichloropropene	250	ug/kg	11.20	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2788	cis-1,3-Dichloropropylene	500	ug/kg	6.397	ug/kg	20100108														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	250	ug/kg	11.32	ug/kg	20100108														
3887	Dimethyl disulfide	250	ug/kg	8.8	ug/kg	20080108														
1199	1,4-Dioxane	20000	ug/kg	1937.63	ug/kg	20100131														
1325	Ethyl acetate	1000	ug/kg	202.15	ug/kg	20100108														
1332	Ethylbenzene	250	ug/kg	8.298	ug/kg	20100108	C	Y	2500	ug/kg	85	115	20	C	Y	2500	ug/kg	65	147	30
1349	Ethyl ether	500	ug/kg	117.75	ug/kg	20100108														

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1355	Diethyl ether	500	ug/kg	117.75	ug/kg	20100108														
1360	Ethyl methacrylate	250	ug/kg	11.84	ug/kg	20100108														
2790	Freon 113	250	ug/kg	28.30	ug/kg	20100108														
1489	Hexachlorobutadiene	250	ug/kg	16.92	ug/kg	20100108														
1514	n-Hexane	2500	ug/kg	36.42	ug/kg	20100108														
1515	2-Hexanone	1000	ug/kg	12.59	ug/kg	20100108	C	Y	2500	ug/kg	66	124	20	C	Y	2500	ug/kg	55	150	30
1536	Iodomethane	250	ug/kg	20.23	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1552	Isobutanol	10000	ug/kg	434.38	ug/kg	20100108														
1556	Isobutyl alcohol	10000	ug/kg	434.38	ug/kg	20100108														
1578	Isopropylbenzene	250	ug/kg	9.717	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1588	p-Cymene	250	ug/kg	9.151	ug/kg	20100108														
1590	p-Isopropyltoluene	250	ug/kg	9.151	ug/kg	20100108														
1587	4-Isopropyltoluene	250	ug/kg	9.151	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1713	Methacrylonitrile	1250	ug/kg	59.31	ug/kg	20100108														
1774	Methyl acetate	500	ug/kg	53.97	ug/kg	20100108														
3724	Methyl butyl ketone	1000	ug/kg	12.59	ug/kg	20100108														
1799	Methylcyclohexane	500	ug/kg	12.56	ug/kg	20100108														
1811	Methylene chloride	250	ug/kg	50.58	ug/kg	20100108	C	Y	2500	ug/kg	68	123	20	C	Y	2500	ug/kg	71	133	30
1812	Dichloromethane	250	ug/kg	50.58	ug/kg	20100108														
1823	Methyl methacrylate	250	ug/kg	49.22	ug/kg	20100108														
1849	MIBK	1000	ug/kg	20.36	ug/kg	20100108														
1845	4-Methyl-2-pentanone	1000	ug/kg	20.36	ug/kg	20100108	C	Y	2500	ug/kg	62	125	20	C	Y	2500	ug/kg	59	150	30
1848	Methyl isobutyl ketone	1000	ug/kg	20.36	ug/kg	20100108														
3794	Methyl tert-butyl ether (MTBE)	250	ug/kg	9.878	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1932	Naphthalene	250	ug/kg	10.20	ug/kg	20100108														
2005	2-Nitropropane	500	ug/kg	24.20	ug/kg	20100108														
5350	Nonanal	500	ug/kg	32.41	ug/kg	20100108														
2108	Pentachloroethane	250	ug/kg	15.09	ug/kg	20100108														
2238	Propionitrile	1250	ug/kg	140.38	ug/kg	20100108														
2247	n-Propylbenzene	250	ug/kg	10.25	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2355	Styrene	250	ug/kg	14.38	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	81	121	30
2437	1,1,1,2-Tetrachloroethane	250	ug/kg	14.06	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2439	1,1,2,2-Tetrachloroethane	250	ug/kg	15.17	ug/kg	20100108	C	Y	2500	ug/kg	80	115	20	C	Y	2500	ug/kg	63	133	30
2445	Tetrachloroethene	250	ug/kg	20.05	ug/kg	20100108	C	Y	2500	ug/kg	58	137	20	C	Y	2500	ug/kg	35	150	30
2469	Tetrahydrofuran	1250	ug/kg	206.00	ug/kg	20100108														
2489	Toluene	250	ug/kg	12.78	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	81	124	30
5524	Total Detected VOCs	1000	ug/kg			0														
3090	1,3,5-Trichlorobenzene	250	ug/kg	18.5	ug/kg	20080107														
2514	1,2,3-Trichlorobenzene	250	ug/kg	15.70	ug/kg	20100108														

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2515	1,2,4-Trichlorobenzene	250	ug/kg	14.61	ug/kg	20100108														
2518	1,1,1-Trichloroethane	250	ug/kg	9.984	ug/kg	20100108	C	Y	2500	ug/kg	78	126	20	C	Y	2500	ug/kg	81	128	30
2522	1,1,2-Trichloroethane	250	ug/kg	29.73	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	78	123	30
2525	Trichloroethene	250	ug/kg	17.60	ug/kg	20100108	C	Y	2500	ug/kg	81	115	20	C	Y	2500	ug/kg	32	150	30
1428	Trichlorofluoromethane	250	ug/kg	13.65	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1427	Fluorotrichloromethane	250	ug/kg	13.65	ug/kg	20100108														
2563	1,2,3-Trichloropropane	250	ug/kg	51.80	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	250	ug/kg	28.30	ug/kg	20100108														
2764	Trichlorotrifluoroethane	250	ug/kg	28.30	ug/kg	20100108														
2587	1,2,4-Trimethylbenzene	250	ug/kg	13.46	ug/kg	20100108	C	Y	2500	ug/kg	66	124	20	C	Y	2500	ug/kg	70	130	30
2592	1,3,5-Trimethylbenzene	250	ug/kg	12.47	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2610	Vinyl acetate	250	ug/kg	9.782	ug/kg	20100108														
2613	Vinyl chloride	250	ug/kg	27.60	ug/kg	20100108	C	Y	2500	ug/kg	49	150	20	C	Y	2500	ug/kg	57	117	30
2940	m-Xylene & p-Xylene	500	ug/kg	15.08	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	75	136	30
2623	o-Xylene	250	ug/kg	16.48	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	71	138	30
2627	Xylenes (total)	750	ug/kg	29.05	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	74	137	30
337	4-Bromofluorobenzene						X	Y	2500	ug/kg	73	124	0	X	Y	2500	ug/kg	70	115	0
2735	1,2-Dichloroethane-d4						X	Y	2500	ug/kg	71	128	0	X	Y	2500	ug/kg	38	128	0
2740	Toluene-d8						X	Y	2500	ug/kg	76	128	0	X	Y	2500	ug/kg	66	115	0
2863	Dibromofluoromethane						X	Y	2500	ug/kg	79	119	0	X	Y	2500	ug/kg	30	135	0

TAL Reference Data Summary

Structured Analysis Code: A-5A-QK-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20

Structured Analysis Code: A-5A-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

TAL Reference Data Summary

Structured Analysis Code: A-58-QK-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
20	Acetonitrile	500	ug/L	39.42	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
321	Bromochloromethane	50	ug/L	5.52	ug/L	20100326														
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														

Structured Analysis Code: A-58-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1489	Hexachlorobutadiene	50	ug/L	1.79	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2515	1,2,4-Trichlorobenzene	50	ug/L	2.64	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

TAL Reference Data Summary

Structured Analysis Code: A-67-QK-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312 - ZHE) -> PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
20	Acetonitrile	200	ug/L	39.42	ug/L	20100326														
39	Acrolein	200	ug/L	29.01	ug/L	20100326														
46	Acrylonitrile	200	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	100	ug/L	3.96	ug/L	20100326														
372	2-Butanone	200	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	200	ug/L	3.89	ug/L	20100326														
374	MEK	200	ug/L	3.89	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	200	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	200	ug/L	3.89	ug/L	20100326														
393	n-Butylbenzene	50	ug/L	2.32	ug/L	20100326														
395	sec-Butylbenzene	50	ug/L	3.1	ug/L	20100326														
398	tert-Butylbenzene	50	ug/L	3.11	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	100	ug/L	3.82	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
574	Chloromethane	100	ug/L	5.53	ug/L	20100326														
614	2-Chlorotoluene	50	ug/L	3.36	ug/L	20100326														
617	4-Chlorotoluene	50	ug/L	3.05	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20

Structured Analysis Code: A-67-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312 - ZHE) -> PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
2788	cis-1,3-Dichloropropylene	50	ug/L	3.39	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1489	Hexachlorobutadiene	50	ug/L	1.79	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1578	Isopropylbenzene	50	ug/L	2.58	ug/L	20100326														
1587	4-Isopropyltoluene	50	ug/L	3.19	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
2772	Methyl tert-butyl ether	50	ug/L	4.01	ug/L	20100326														
1932	Naphthalene	50	ug/L	4.92	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2247	n-Propylbenzene	50	ug/L	2.98	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2515	1,2,4-Trichlorobenzene	50	ug/L	2.64	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2587	1,2,4-Trimethylbenzene	50	ug/L	4.01	ug/L	20100326														
2592	1,3,5-Trimethylbenzene	50	ug/L	2.84	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	100	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	100	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

Title: GC/MS SEMIVOLATILES ANALYSIS [SW-846 8270D; EPA 625]

Approvals (Signature/Date):

Ben Hicks 12/31/12 Ben Hicks — Date Organics Manager	Michael Ridenhower 12/31/12 Michael Ridenhower — Date Health & Safety Manager / Coordinator
Marti Ward 12-31-12 Marti Ward — Date Quality Assurance Manager	Elaine Wild 12/31/12 Elaine Wild — Date Laboratory Director

This SOP was previously identified as SOP No. ST-MS-0001 Rev. 13

Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This SOP is applicable to the determination of the concentration of semivolatile organic compounds in extracts prepared from solid and aqueous matrices

1.2 This SOP is based on SW-846 Method 8000B, 8000C and 8270D and EPA method 625.

1.3 The following compounds are documented in the method as problematic:

1.3.1 Benzidine can be subject to oxidative losses during solvent concentration and exhibits poor chromatography. Neutral extraction should be performed if this compound is expected.

1.3.2 Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph, chemical reaction in acetone solution, and photochemical decomposition.

1.3.3 Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, benzoic acid, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

1.3.4 Hexachlorophene may not be amenable to analysis by this method.

1.4 N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from Diphenylamine.

1.5 3-Methylphenol cannot be separated from 4-Methylphenol by the conditions specified in this method.

1.6 Phthalic acid decomposes in the gas chromatographic inlet and cannot be distinguished from Phthalic anhydride.

1.7 Azobenzene is formed by decomposition of 1,2-diphenlyhydrazine. If 1,2-diphenylhydrazine is requested, it will be reported as Azobenzene.

1.8 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Laboratory Information Management System (LIMS).

1.8.1 Additional compounds may be amendable to this method. The minimum requirement for non-standard analytes is that the reporting limit be set at the lowest required concentration that can actually be detected by the instrument, and when an MDL study can not be conducted, the MDL be set equal to the reporting limit.

2.0 SUMMARY OF METHOD

2.1 Aqueous samples are extracted with methylene chloride using a separatory funnel. Solid samples are extracted with methylene chloride / acetone using sonication. Waste dilution is used for organic or unusual matrix samples. The sample extract is concentrated to a volume of 1 mL or 10 mL, and analyzed by GC/MS. Qualitative identification of the parameters in the extract is performed using the retention time and the relative abundance of characteristic ions. Quantitative analysis is performed using the internal standard technique with a single characteristic ion.

2.2 The use of selected ion monitoring (SIM) is acceptable for applications requiring quantitation limits below the normal range of electro impact mass spectrometry. However, SIM may provide a lesser degree of confidence in the compound identification, since less mass spectral information is available. Instead of scanning everything in a retention time range, SIM looks for specific ions (qualitative and quantitative) that are placed in retention time groups. The ions used for qualitative and quantitative purposes are the same for scan and SIM analysis.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

3.2 SIM – Single Ion Monitoring

4.0 INTERFERENCES

4.1 Method interferences may be caused by contaminants in solvents, reagents, glassware, and other processing apparatus that lead to discrete artifacts. All of these materials must be routinely demonstrated to be free from interferences under conditions of the analysis by running laboratory method blanks as described in the Quality Control section. Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. If an interference is detected it is necessary to determine if the source of interference is in the preparation and/or cleanup of the samples; then take corrective action to eliminate the problem.

4.2 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the sample.

4.3 Contamination by carryover can occur whenever high-level and low-level samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed with solvent between samples. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross contamination.

4.4 Phthalate contamination is commonly observed in this analysis and its occurrence should be carefully evaluated as an indicator of a contamination problem in the sample preparation step of the analysis.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 **SPECIFIC SAFETY CONCERNS OR REQUIREMENTS**

5.2.1 Latex and vinyl gloves provide no protection against the organic solvents used in this method. Nitrile, Silver Shield, or similar gloves must be used.

5.2.2 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.3 The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

5.2.4 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen Irritant	25 ppm (TWA) 125 ppm (STEL)	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			
STEL – Short Term Exposure Limit			

6.0 EQUIPMENT AND SUPPLIES

6.1 Gas Chromatograph/Mass Spectrometer System: HP 6890/5973 - An analytical system complete with a temperature-programmable gas chromatograph suitable for split/splitless injection and all required accessories, including syringes, analytical columns, and gases. The capillary column should be directly coupled to the source. Capable of scanning from 35 to 500 AMU every one second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets all of the criteria in Table 1 when 50 ng of the GC/MS tuning standard is injected through the GC.

6.2 Data System:

6.2.1 ChemStation software system that allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the length of the chromatographic program.

6.2.2 Target software system allows the searching of any GC/MS data file for ions of a specified mass and plots such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). The software allows integrating the abundances in any EICP for a specified time or scan-number limit. Also, for the non-target compounds with a mass spectrum that meets the required criteria, software must be available that allows for the comparison of sample spectra against the reference library spectra.

6.2.3 Data Library: NIST05

6.3 Carrier gas: Ultra high purity helium

6.4 Instrument columns and run conditions are posted in the instrument area.

6.5 Amber vials. Crimp top seals

6.6 Disposal pipettes

6.7 Micro syringes- 10µL, 250µL, 500µL, 1000µL. Hamilton 1700 series

6.8 Volumetric flasks, Class A

6.9 Analytical Balance, capable of weighing ± 0.01 grams.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 See recipes for standards and QC samples in the Reagent Log program.

7.3 At a minimum, a five point calibration curve is prepared. The low point should be at or below the reporting limit. Refer to Table 3 for typical calibration levels for all analytes. Other calibration levels may be used, depending on instrument capability, but the low standard must support the reporting limit and the high standard defines the range of the calibration.

7.4 An Internal Standard (IS) solution is prepared. Compounds in the I.S. Mix are: acenaphthene-d10, chrysene-d12, 1,4-dichlorobenzene-d4, naphthalene-d8, perylene-d12, and phenanthrene-d10.

7.5 Internal Standards are added to all standards and extracts to result in 40ng injected onto the column.

7.6 GC/MS Tuning Standard: A methylene chloride solution containing 50 µg/mL of decafluorotriphenylphosphine (DFTPP) is prepared.

7.7 ICV standards, NIST traceable:
- 7.7.1 The Semivolatile ICV standard is a second source from the calibration standard.
- 7.7.2 ICV standard is prepared and stored in the same way as calibration standards.

7.8 Standards are to be refrigerated at $\leq 6^oC$ when not in use. Refrigeration at -10^oC to -20^oC may be used if it can be demonstrated that analytes do not fall out of solution at this temperature. The standards must be replaced at least 6 months after opening.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Water samples are collected in amber glass, unpreserved and stored at 4 ± 2°C.

8.3 Soil samples are refrigerated at 4 ± 2°C.

8.4 The extraction holding time for Semivolatiles analysis in waters is 7 days.

8.5 The extraction holding time for Semivolatiles in soil/solid matrix is 14 days.

8.6 Extracts must be refrigerated at $\leq 6^oC$ and analyzed within 40 days of the beginning of the extraction.

9.0 QUALITY CONTROL

9.1 Batch
- 9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.
- 9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.
- 9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a MS/MSD, an LCS Duplicate (LCSD) is prepared and analyzed.

9.2 **Method Blank (MB)**
- 9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.
- 9.2.2 A method blank must be prepared with every sample batch.

9.2.3 DI water is used for the Method Blank.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.3.3 The LCS is comprised of sodium sulfate fortified with the target analyte(s).

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Surrogate**

9.5.1 A surrogate is a non-target analyte similar in chemical composition and behavior, which mimics the target analytes during preparation, extraction and analysis.

9.5.2 Surrogate(s) is added to every field sample, method blank, LCS and MS/MSD for analysis at the beginning of the sample preparation process.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Internal standard calibration is used.

10.1.1 Internal Standard Calibration Procedure: Internal standards are listed in Table 2. Use the base peak m/z as the primary m/z for quantitation of the standards. If interferences are noted, use one of the next two most intense masses for quantitation.

10.1.1.1 Compounds are assigned to the IS, generally with the closest retention time. See Table 2.

10.2 **Instrument Tuning**

10.2.1 The GC/MS system must be checked to see if acceptable performance criteria are achieved for DFTPP (decafluorotriphenylphosphine). See Table 1 in this SOP.

10.2.1.1 The DFTPP and calibration verification standard may be combined into a single standard as long as both tuning and calibration verification acceptance criteria for the project can be met without interferences.

10.2.1.2 **8270** - At the beginning of every twelve hour shift

10.2.1.3 **625** - At the beginning of every 24 hour shift.

10.2.1.3.1 The time period begins at the moment of injection of DFTPP.

10.2.2 Inject 50 ng of the GC/MS tuning standard into the GC/MS system. Obtain a background-corrected mass spectrum of DFTPP and confirm that all the key m/z criteria in Table 1 are achieved. If all the criteria are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are achieved. The performance criteria must be achieved before any samples, blanks, or standards are analyzed.

10.2.3 Degradation of DDT to DDE and DDD should not exceed 20%. (See SOP: ST-GC-0016 for the percent breakdown calculation.) Benzidine and pentachlorophenol should be present at their normal responses, and should not exceed a tailing factor of 2 given by the following equation:

Tailing Factor = BC/AB

Where the peak is defined as follows:

AC is the width at 10% height; DE is the height of peak and B is the height at 10% of DE. This equation compares the width of the back half of the peak to the width of the front half of the peak at 10% of the height.

10.3 **Initial Calibration**

10.3.1 Prepare calibration standards at a minimum of five concentration levels, six points for a quadratic fit, (see Table 3 for suggested concentrations) for each parameter of interest. It may be useful to analyze six calibration levels and use the lower five for most analytes and the upper five for analytes that have poor response. The low level standard should be at or below the reporting limit. The other standards define the working range of the detector.

10.3.2 Add the internal standard mixture to result in 40 ng on column. The concentrations of all analytes are listed in Table 3. Add the internal standard mixture to result in 4ng on column for SIM analysis.

10.3.3 Analyze each calibration standard and tabulate the area of the primary characteristic m/z against concentration for each compound and internal standard. The low level standard must be at or below the reporting limit.

10.3.4 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica corporate policy, "Calibration Curves."

10.3.5 It may be necessary to analyze more than one set of calibration standards to encompass all of the analytes required for some tests.

10.3.6 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance (e.g., cleaning the ion source).

10.3.7 Sample peak areas are compared to peak areas of the standards. The ratio of the detector response to the amount concentration of analyte in the calibration standard is defined as the response factor (RF) or calibration factor (CF).

10.3.8 **Initial Calibration Criteria (8270D)**

10.3.8.1 Minimum Response Factors

10.3.8.2 See Table 4 in this SOP for the minimum response factors. These minimum response factors are prescribed by SW method 8270D. For analytes not given a minimum response factor by the method, St. Louis has established a default minimum response factor of 0.01 for compound, except for Famphur, Hexachlorophene, Kepone, Phthalic Anhydride which have a minimum response factor of 0.001.

10.3.8.2.1 SW-846 chromatographic methods allow the use of both linear and non-linear models for the calibration data.

10.3.8.3 The first way is to begin with the simplest approach, the linear model through the origin, and then progress through other options until the calibration acceptance criteria are met. The second way is to use technical knowledge of the detector response to the target compound to choose the calibration model.

10.3.8.4 The option for non-linear calibration may be necessary to address specific instrumental techniques. However, it is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance.

10.3.8.5 **Linear calibration using the average response factor**

10.3.8.5.1 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 20% for each target analyte.

10.3.8.5.2 If the %RSD in the initial calibration is > 20%, then calibration using a linear regression may be employed.

10.3.8.6 **Linear calibration using a least squares regression**

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The intercept of a linear calibration at zero response (i.e. the y-intercept) must have an absolute value less than the reporting limit for each analyte. Client requirements may be tighter, please check Client Requirement Memorandum (CRM) if identified in comments.

Note, for analyses utilizing an internal standard the Target variable "b" does NOT equal the y-intercept. For analyses utilizing an internal standard, the Target variable "b" must be multiplied by the associated internal standard concentration to derive the concentration at the y-intercept.

10.3.8.6.1 r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.3.8.6.2 When calculating the calibration curves using the linear regression model, a minimum quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration calibration standard back into the curve.

10.3.8.6.3 It is not necessary to re-analyze a low concentration standard; rather the data system can recalculate the concentrations.

10.3.8.6.4 The recalculated concentration of the low calibration point should be within ± 30% of the standard's true concentration.

10.3.8.6.4.1 Analytes which do not meet the minimum quantitation calibration re-fitting criteria should be considered "out of control" and corrective action should be taken.

10.3.8.7 **Linear calibration using a least squares regression, forcing thru zero**

10.3.8.7.1 Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration. In essence, if the curve is forced through zero, the intercept is set to 0 *before* the regression is calculated, thereby setting the bias to favor the low end of the calibration range by "pivoting" the function around the origin to find the best fit and resulting in one less degree of freedom. It may be appropriate to force the regression though zero for some calibrations.

10.3.8.7.2 Curve must still meet criteria in 10.3.8.6.1 and 10.3.8.6.2

10.3.8.7.3 For samples requiring adherence to method 8000B, forcing through zero is ***NOT*** allowed.

10.3.8.8 **Linear calibration using a least squares regression, weighting of data points**

10.3.8.8.1 In linear, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration; for this reason it may be preferable to increase the weighting of the lower concentration points, $1/\text{Concentration}^2$ weighting (often called $1/X^2$ weighting), to improve accuracy at the low end of the curve.

10.3.8.8.2 Curve must still meet criteria in 10.3.8.6.1 and 10.3.8.6.2

10.3.8.9 **Non-linear calibration**

10.3.8.9.1 In situations where the analyst knows that the instrument response does not follow a linear model over a sufficiently wide working range, or when the other approaches have not met the acceptance criteria, a non-linear calibration model may be employed.

10.3.8.9.2 It is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance. Thus, non-linear calibrations are not to be employed for analytes shown to consistently exhibit linear calibration for the analytes of interest.

10.3.8.9.2.1 These compounds are not to use non-linear calibrations: 1,4-Dioxane; Pyridine; n-Nitrosodimethylamine;

2-Fluorophenol; Aniline; Bis(2-chloroethyl)ether; Phenol-d5; Phenol; 2-Chlorophenol; 1,3-Dichlorobenzene; 1,4-Dichlorobenzene; 1,2-Dichlorobenzene; Benzyl Alcohol; 2-Methylphenol; N-nitrosodinpropylamine; Hexachloroethane; 3 and 4-Methylphenol; Nitrobenzene-d5; Nitrobenzene; Isophorone; 2-Nitrophenol;
2,4-Dimethylphenol; Bis(2-chloroethoxy) methane;
2,4- Dichlorophenol; 1,2,4-Trichlorobenzene; Naphthalene; Hexachlorobutadiene; 4-Chloro-3-Methylphenol;
2-Methylnaphthalene; 2,4,6-Trichlorophenol;
2-Fluorobiphenyl; 2,4,5-Trichlorophenol; 2-Chloronaphthalene; Dimethylphathalate; Acenaphthylene; Acenaphthene; Dibenzofuran; Diethylphthalate; Fluorene; 4-Chlorophenyl-phenylether; N-Nitrosodiphenylamine; Azobenzene; 4-Bromophenyl-phenylether; Hexachlorobenzene; Phenanthrene; Anthracene; Carbazole; Di-n-Butylphthalate; Fluoranthene; Pyrene; Terphenyl-d14; Butylbenzylphthalate; Benzo(a)Anthracene; Chrysene; bis(2-ethylhexyl)Phthalate; 2-Picoline;
n-Nitrosomethylethylamine; Methyl methanesulfonate;
n-Nitrosodiethylamine; Ethyl Methanesulfonate; Pentachloroethane; Acetophenone; n-Nitrosopyrrolidine;
n-Nitrosomorpholine; O-Toluidine; n-Nitrosopiperidine; o,o,o-Triethyl-Phosphorothioate; 2,6-Dichlorophenol; Hexachloropropene; Benzothiazole;
n-Nitrosodi-n-butylamine; Safrole;
1,2,4,5-Tetrachlorobenzene; cis-Isosafrole; trans-Isosafrole; 1,4-Dinitrobenzene; 1,3-Dinitrobenzene; Pentachlorobenzene; 1-Naphthylamine; 2-Naphthylamine; Thionazin; 5-Nitro-o-toluidine; Tri-n-butylphosphate; Sulfotepp; Diallate; Phorate; Phenacetin; Tris (2-chloroethyl) phosphate; 4-Aminobiphenyl; Pronamide; Pentachloronitrobenzene; Disulfoton; Parathion; Isodrin; Aramite; p- (Dimethylamino) azobenzene; Chlorobenzilate; 2-Acetylaminofluorene; 4,4'-Methylenebis (2)-Chloroaniline; 7,12-Dimethylbenz (a) anthracene;
3-Methylcholanthrene; Isosafrole; Benzenethiol;
4-Chlorobenzenethiol; p-Chlorophenyl methyl sulfide; Phenyl sulfide; Phenyl disulfide; Phenyl sulfone; Octachlorostyrene; 2,2'Dichlorobenzil;
4-Chlorophenyl sulfone; Methyl methacrylate;
Ethyl methacrylate; Benzaldehyde; Caprolactam;
1-Methylnaphthalene; Biphenyl; Atrazine.

10.3.8.9.2.2 EPA Method 8000C suggests a 20% RSD limit be used when evaluating a calibration. The above compound list was constructed based on the 20% RSD criteria. TestAmerica St. Louis reserves the right to employ different calibration models when client mandated criteria are less than the 20% criteria found in method 8000C.

10.3.8.9.3 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.3.8.9.4 r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.3.8.9.5 Due to the nature of SIM analysis, non-linear calibrations may be used.

10.3.9 **625 criteria**

10.3.9.1 Method 625 only requires a 3 point calibration. We routinely perform a 6 point calibration; however, 3 points may be removed from the curve if necessary to meet 625 calibration criteria.

10.3.9.1.1 Refer to the TestAmerica corporate policy, "Calibration Curves."

10.3.9.2 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be < 35%.

10.3.9.3 If the %RSD in the initial calibration is > 35%, then calibration using a linear regression may be employed.

10.3.9.4 If a linear regression curve is used, the intercept of the curve at zero response must be less than ± the reporting limit for the analyte. It is recommended that for linear regression curves the line be set through the origin.

10.3.9.5 Use of $1/\text{Concentration}^2$ weighting is recommended to improve the accuracy of quantitation at the low end of the curve. The analyst should consider instrument maintenance to improve the linearity of response.

10.3.9.6 Weighting of data points

10.3.9.6.1 The points at the lower end of the calibration curve have less weight in determining the curve generated than points at the high concentration end of the curve. However, in environmental analysis, accuracy at the low end of the curve is very important. For this reason it is preferable to increase the weighting of the lower concentration points. $1/\text{Concentration}^2$ weighting (often called $1/X^2$ weighting) will improve accuracy at the low end of the curve and should be used if the data system has this capability.

10.4 **Initial Calibration Verification (ICV)**

10.4.1 An initial calibration verification standard is a different standard source than the one used for the initial calibration.

10.4.2 An ICV must be performed with every initial calibration.

10.4.3 The ICV performance must be within ± 30% D criteria.

10.4.3.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV or analysis of a different ICV). Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.5 **Continuing Calibration Verification (CCV)**

10.5.1 At the start of each 12 hour period (8270) or 24 hour period (EPA 625) the GC/MS tuning standard must be analyzed. A 50 ng injection of DFTPP must result in a mass spectrum for DFTPP which meets the criteria. See Table 1 in this SOP.

10.5.2 Following a successful DFTPP analysis the continuing calibration standard(s) are analyzed. The standards must contain all semivolatile analytes, including all required surrogates. A mid level calibration standard is used for the continuing calibration

10.5.3 A CCV standard is analyzed every analysis tune clock immediately following the DFTPP tune.

10.5.3.1 **EPA 8270 –** for each 12 hour tune time period

10.5.3.2 **EPA 625 –** for each 24 hour tune time period

10.5.4 The CCV can be the same source or a second source from the calibration.

10.5.5 The internal standard response must be within 50-200 area counts (-50% to 100%) of the response in the mid level of the initial calibration. The internal standard retention times must be within 30 seconds of the retention times in the mid-level of the initial calibration.

10.5.6 **EPA 8270 Criteria**

10.5.6.1 Minimum Response Factors

10.5.6.2 See Table 4 in this SOP for the minimum response factors. These minimum response factors are prescribed by SW-846 method 8270D. For analytes not given a minimum response factor by the method, St. Louis has established a default minimum response factor of 0.01 per compound, except for Famphur, Hexachlorophene, Kepone, Phthalic Anhydride which have a minimum response factor of 0.001.

10.5.6.3 The CCV performance must be with ± 20% D criteria.

10.5.6.4 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument. If this CCV meets criteria then sample analysis may continue; however the preceding samples must be reanalyzed. If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require re-calibration (i.e. initial calibration).

10.5.7 **EPA 625 Criteria**

10.5.7.1 For each target analyte %D must be < 20%.

10.5.8 Calibration excursions are to be documented via a NCM.

10.6 Retention Time (RT) windows

10.6.1 Relative Retention Time (RRT)

10.6.1.1 In addition to normalizing the response (peak area) of the target compound to the response of the internal standard in that sample or extract for that injection, the retention times of the target compound and the internal standard may be used to calculate the relative retention time (RRT) of the target compound.

10.6.1.2 The RRT is expressed as a unit-less quantity:

$$\text{RRT} = \frac{\text{Retention time of the analyte}}{\text{Retention time of the internal standard}}$$

10.6.1.3 The RRT of each target analyte in each calibration standard should agree within ± 0.06 RRT units.

10.6.1.4 It is recognized here that with increasing retention times of the internal standard, target analytes will be able to more easily meet this criterion. Thus, care should be exercised when selecting the appropriate internal standards by retention times. The process of selecting internal standards to quantify target analytes should also include consideration of retention times as they should be similar.

10.6.1.5 If this criterion is not met and unless there are no other indicators of a component's identification such as a very unique but a high probability mass spectral match then that component may not be considered as identified by relative retention time.

10.6.1.6 The RRT evaluation allows the analyst to compensate for modest shifts in the chromatographic conditions that can occur due to interferences and simple day-to-day instrument variability. Many methods that employ internal standard calibration use more than one internal standard and the target compounds are related to the internal standards on the basis of the similarity of their respective chromatographic retention times (see Table 5).

10.6.2 Internal standard retention time

10.6.2.1 The retention times of the internal standards in the calibration verification standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from that in the mid-point standard level of the most recent initial calibration sequence, then the chromatographic system must be inspected for malfunctions and corrections must be made, as required. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is required.

10.6.3 Retention Time Criteria

10.6.3.1 The retention times of all compounds in each continuing calibration must be within the retention time windows established.

11.0 PROCEDURE

11.1 Samples are prepared following ST-OP-0002.

11.2 All standards and extracts are allowed to warm to room temperature before injecting.

11.3 All samples must be analyzed using the same instrument conditions as the initial calibration.

11.4 Add internal standard to the extract to result in 40ng injected on column. Mix thoroughly before injection into the instrument.

11.4.1 Add internal standard to the extract to result in 4ng injected on column for SIM analysis.

11.5 Inject the sample extract into the GC/MS system using the same injection technique as used for the standards.

11.6 The data system will determine the concentration of each analyte in the extract using calculations equivalent to those in section 12. Quantitation is based on the initial calibration, not the continuing calibration.

11.7 Perform all qualitative and quantitative measurements. When the extracts are not being used for analyses, refrigerate at -10^{o}C to -20^{o}C (if it can be demonstrated that analytes do not fall out of solution at this temperature), protected from light in screw cap vials equipped with un-pierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 External Standard Calculations
12.1.1 See Target software for calculations.

12.2 Manual Integrations
12.2.1 Identified compounds are reviewed for proper integration. Integrations are performed automatically by the data system. If necessary, manual integrations are performed and are documented by the analyst. Manual integrations are denoted with "M" flag on the Target quantitation report. See TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

12.3 Qualitative identification
12.3.1 An analyte is identified by retention time and by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference may be obtained on the user's GC/MS by analysis of the calibration standards or from the NIST Library. Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC retention time as the standard component; and (2) correspondence of the sample component and the standard component characteristic ions.
12.3.1.1 Note: Care must be taken to ensure that spectral distortion due to co-elution is evaluated. The following analytes should be carefully reviewed:

1,4-Dichlorobenzene-d4	Aniline	Bis (2-Chloroethyl) ether
1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,2-Dichlorobenzene
Benzyl alcohol	2-Methylphenol	3,4-Methylphenol
2,4-Dichlorophenol	2,4,6-Trichlorophenol	2,4,5-Trichlorophenol
Phenanthrene	Anthracene	Benz (a) anthracene
Bis (2-ethylhexyl) phthalate	Chrysene	Di-n-octyl phthalate
Benzo (b) fluoranthene	Benzo (k) fluoranthene	Indeno (1,2,3-cd) pyrene

Benzo (g,h,i) perylene	p-Phenylenediamine	Safrole
Cis-Isosafrole	Trans-isosafrole	1,4-Dinitrobenzene
1,3-Dinitrobenzene	1-Naphthylamine	2-Naphthylamine
2,3,4,6-Tetrachlorophenol	Dinoseb	Sulfotepp
Diallate 1 & 2	Methapyrilene	Aramite 1 & 2

12.3.2 The sample component retention time must compare to within ± 0.2 min. of the retention time of the standard component. For reference, the standard must be run within the same twelve hours as the sample.

12.3.3 All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) should be present in the sample spectrum.

12.3.4 The relative intensities of ions should agree to within ±30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance should be between 20 and 80 percent.)

12.3.4.1 See Table 2 for primary, secondary and tertiary ion assignments.

12.3.5 If a compound cannot be verified by all the above criteria, but in the technical judgment of the analyst, the identification is correct, then the analyst shall report that identification and proceed with quantitation.

12.3.6 Retention time criteria for samples

12.3.6.1 If the retention time for any internal standard changes by more than 0.5 minutes from the last continuing calibration standard, the chromatographic system must be inspected for malfunctions and corrected. Reanalysis of samples analyzed while the system was malfunctioning is required.

12.3.6.2 If the retention time of any internal standard in any sample varies by more than 0.1 minute from the preceding continuing calibration standard, the data must be carefully evaluated to ensure that no analytes have shifted outside their retention time windows.

12.4 Library searches of peaks present in the chromatogram that are not target compounds (Tentatively Identified Compounds, TIC) may be performed if required by the client.

12.4.1 TICs are done as follows:

12.4.1.1 The computer will give quality matches in order from most likely to least likely. In order for us to call a TIC a certain compound, the quality match must be at least 90%. However, if the next two quality matches are within (around) 10% quality match of the first choice, the compound will be identified as an unknown because it is too close to call. Unknowns are put into a group if possible (such as Unknown alkanes) but if a group is not available it will be called Unknown. A compound will be also called unknown if the top three matches are all different groups of compounds and the quality match is < 90% (ex. If the top choice is an alkane, the second choice is an alcohol, the third choice is an acid).

12.4.1.2 The first 30 TICs, based on abundance, will be identified in a sample, unless a different number is specified by the client. See client requirement sheet.

12.5 Dilutions

12.3.7 If the concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample must be diluted and reanalyzed.

12.5.1 A dilution should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the client specific project requirements.

12.5.2 Samples may be diluted initially if the project reporting limits are above the laboratory's routine calibration lower limit, if there is physical evidence of matrix, or historical knowledge of the site.

12.6 Carryover

12.6.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.6.1.1 If a sample analyzed after a sample with high concentrations has negative results or is non-detect, carryover did not occur.

12.6.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, carryover may have occurred.

12.6.1.2.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

12.6.1.3 If the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 This SOP lists requirements for the standard Quality Assurance criteria followed at TestAmerica St. Louis. If a client or program requires stricter quality controls (i.e. DoD, DOE) the analyst is directed to the Client Requirement Memo for that client/project for limits.

13.2 The data assessment and corrective action process is detailed through the LIMS Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036.

13.3 Method Blank

13.3.1 Acceptance Criteria:

13.3.1.1 No target analytes may be present in the method blank above the reporting limit.

13.3.1.2 The method blank must have acceptable surrogate recoveries.

13.3.1.3 Corrective Action for Method Blanks not meeting acceptance criteria:

13.3.1.3.1 <u>Method Blank Contamination</u> – Blank contamination above the RL (>1/2 RL for some programs – see specific Client Requirement Memos for details) requires re-prep of batch unless all associated samples are < RL or greater than 10 times the amount detected in the method blank.

13.3.1.3.2 <u>Method Blank Surrogate excursion</u> – If excursion is limited to the blank, data may be reported with an NCM. If surrogates are also outside criteria in samples, re-prep and re-anlaysis is required. In cases where the surrogate recovery is high and the samples are non-detect, the data may be reported with an NCM.

13.4 Laboratory Control Sample (LCS)

13.4.1 Acceptance Criteria: All control analytes must be within established control limits for accuracy (%Recovery) and precision (RPD).

13.4.1.1 For long analyte spike list, marginal exceedances (ME) are allowed as follows:

13.4.1.2 less than 11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

13.4.1.3 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit.

13.4.1.4 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit.

13.4.1.5 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit.

13.4.1.6 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit.

13.4.1.7 More than 90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit.

13.4.1.8 No LCS recoveries may be outside the Marginal Exceedance limit.

13.4.1.9 Marginal exceedances must be random. If the same LCS analyte exceeds the control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken.

13.4.2 The LCS should have acceptable surrogate recoveries.

13.4.3 Corrective Action for LCS not meeting acceptance criteria:

13.4.3.1 <u>LCS Spike Recovery excursion (high)</u> – Samples that are non-detect may be reported with an NCM (unless prohibited by client requirements). Samples with detects for the analyte recovered high in the LCS are re-prepped and re-analyzed. . In cases where the surrogate recovery is high and the samples are non-detect, the data may be reported with an NCM

13.4.3.2 <u>LCS Spike Recovery excursion (low)</u> – batch is re-prepped and re-analyzed.

13.4.3.3 LCS Surrogate Recovery excursion – If excursion is limited to the LCS, data may be reported with an NCM. If target analytes are in control in the LCS, data may be reported with an NCM. If surrogates are also outside criteria in samples, re-prep and re-analysis is required.

13.4.3.4 RPD excursion for LCS/LCSD – If target analytes recoveries are in control, data may be reported with an NCM

13.5 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.5.1 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.5.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.5.2.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. If affected analyte concentration in the original sample is greater than four times the amount spiked, percent recovery information is ineffective. Data is reported with an NCM. If the excursion is due to a physically evident matrix interference, the data is reported with an NCM (the physical interference must be described in the NCM). If there is no evidence of interference and the RPD as well as spike recoveries out outside limits out, sample re-prep and re-analysis are required.

13.6 Sample result evaluation

13.6.1 Dilutions

13.6.1.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.6.1.2 Dilution: Sample– An NCM is created when dilutions are required.

13.6.1.3 Dilution: Surrogate(s)/spikes diluted out– An NCM is generated to document the surrogates/spikes being diluted out.

13.6.2 Carryover

13.6.2.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.6.2.2 If a sample analyzed after a sample with high concentrations is non-detect for the high concentration analyte, carryover did not occur.

13.6.2.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.6.3 Internal Standards

13.6.3.1 Acceptance Criteria:

13.6.3.1.1 If the EICP area for any of the internal standards in the calibration verification standard changes by a factor of two (-50% to +100%) from that in the mid-point standard level of the most recent initial calibration sequence.

13.6.3.1.2 If the EICP area for any of the internal standards in samples, spikes and blanks changes by a factor of two (-50% to +100%) from the areas determined in the continuing calibration analyzed that day, corrective action must be taken. The samples, spikes or blanks should be reanalyzed or the data should be qualified. (Some programs may require that the midpoint of the initial calibration be used for ISTD monitoring. See the project CRM for specifics.)

13.6.3.2 Corrective Action for Internal Standards not meeting acceptance criteria:

13.6.3.2.1 Internal Standard excursion – high – High ISTD recovery indicates a potential low bias to analytical results. Instrument maintenance, if required, is done and affected samples are reanalyzed. If ISTDs are outside criteria on the re-analysis, a matrix interference is suspected and data reported with an NCM.

13.6.3.2.2 Internal Standard excursion – low – Low ISTD recovery indicates the potential for a high bias to analytical results. Samples that are non-detect for affected analytes may be reported with an NCM. Samples with positive hits above the RL for analytes associated with the poor ISTD recovery require re-analysis. Instrument maintenance, if required, is done. If ISTDs are outside criteria on the re-analysis, a matrix interference is suspected and data reported with an NCM.

13.7 Insufficient Sample

13.7.1 For each prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis, an NCM is created and a narrative comment stating such is included in the report's Case Narrative.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the LIMS.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Auto-sample vials containing Methylene Chloride are to be disposed of in the appropriate solvent vial waste accumulation container located within the GC/MS lab, for temporary storage. Once this temporary container is full or once it reaches a one-year collection time, this container must be dumped into the permanent solvent vial waste container located in the 90-day storage area, which is marked as a Type "C" waste accumulation container.

16.2.1.2 Waste Methylene Chloride rinses are to be collected and disposed of within the solvent waste accumulation container located in the Organic Prep. Lab. This temporary storage container shall be dumped on a daily basis into the permanent waste accumulation container located in the 90-day storage area which is marked as a Type "D" waste drum.

17.0 REFERENCES

17.1 SW846, Test Methods for Evaluating Solid Waste, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Method 8000B, 8000C and 8270D.

17.2 40CFR Part 136: "Guidelines Establishing Test Procedures for the Analysis of Pollutants, Appendix A, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", Code of Federal Regulations, Revised July1, 1995, Method 625.

17.3 TestAmerica St. Louis Quality Assurance Manual (QAM), current revision.

17.4 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (ST-HS-0002), current revision.

17.5 TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

17.6 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

17.7 Associated SOPs, current revisions
- 17.7.1 ST-OP-0002, Extraction and Cleanup of Organic Compounds from Waters and Soils, Based on SW-846 3500 Series, 3600 Series, and 600 Series Methods
- 17.7.2 ST-PM-0002, Sample Receipt and Chain of Custody
- 17.7.3 ST-QA-0002, Standard and Reagent Preparation
- 17.7.4 ST-QA-0005, Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes.
- 17.7.5 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
- 17.7.6 ST-QA-0016, IDL/MDL Determination
- 17.7.7 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

18.1 The quantitation and qualifier ions for some compounds have been changed from those recommended in SW-846 in order to improve the reliability of qualitative identification.

19.0 CHANGES TO PREVISION SOP REVISION

19.1 Table reference in Section 6.1 was corrected.
19.2 Y-intercept requirements added to Section 10.
19.3 Added requirement for 6 levels for a quadratic curve to Section 10
19.4 Added CLP allowance for reporting data within 10% of upper standard without dilution to Section 12
19.5 Clarification of criteria for TIC reporting added to Section 12.4.
19.6 Table 1: clarified Tune criteria and added allowance of other published DFTPP Tune criteria (i.e. EPA CLP)
19.7 Added Table 5, a listing of internal standards and associated analytes
19.8 Revision 13:
- 19.8.1 Grammatical /spelling corrections
- 19.8.2 Added SIM analysis to section 11

19.9 Revision 14:
- 19.9.1 Removed QuantIMS and Clouseau references – replaced with LIMs
- 19.9.2 Created hyperlinks to tables

19.9.3 Appended LVI Calibration Levels to Table 3
19.9.4 Combined fragmented Table 5 into one table
19.9.5 Added table of potentially mis-identifiable analytes to Section 12.3.
19.9.6 Removed CLP allowance for reporting data within 10% of upper standard without dilution from Section 12.
19.9.7 Revised Section 13 to remove Clouseau corrective action references and to provide specific corrective actions for non-conformances.

Table 1
DFTPP Key Ions and Ion Abundance Criteria*

Mass	Ion Abundance Criteria
51	30 - 60% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	40 - 60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5 - 9% of mass 198
275	10 - 30% of mass 198
365	>1% of mass 198
441	Present, but less than mass 443
442	>40% of mass 198
443	17 - 23% of mass 442

* Tune criteria in use is a combination of 8270C and 8270D which is more stringent than either method. Alternatively, other documented tuning criteria (e.g. EPA CLP) may be used provided method performance is not aversely affected.

Table 2
Analytes in Approximate Retention Time Order and Characteristic Ions

Primary Standard			
Analyte	**Primary**	**Secondary**	**Tertiary**
1,4 Dioxane	88	58	43
n-Nitrosodimethylamine	74*	42	44
Pyridine	79	52	—
Dimethylformamide	44	73	42
Cyclohexanol	57	82	67
2-Fluorophenol (Surrogate Standard)	112	64	63**
Phenol-d5 (Surrogate Standard)	99	42	71
Aniline	93	66	65
Phenol	94	65	66
Bis(2-chloroethyl)ether	93	63	95
2-Chlorophenol	128	64	130
1,3-Dichlorobenzene	146	148	111
1,4-Dichlorobenzene-d4 (Internal Standard)	152	150	115
1,4-Dichlorobenzene	146	148	111
Benzyl Alcohol	108	79	77
1,2-Dichlorobenzene	146	148	111
2-Methylphenol	108*	107	79
2,2'-oxybis(1-chloropropane)[1]	45	77	121
3&4-Methylphenol	107	108	79
n-Nitroso-di-n-propylamine	70	42	101
Hexachloroethane	117	201	199
Nitrobenzene-d5 (Surrogate Standard)	82	128	54
Nitrobenzene	77	123	65
Isophorone	82	95	138
2-Nitrophenol	139	65	109
2,4-Dimethylphenol	107*	121	122
Benzoic Acid	122	105	77
Bis(2-chloroethoxy)methane	93	95	123

Table 2
Analytes in Approximate Retention Time Order and Characteristic Ions

Primary Standard			
Analyte	**Primary**	**Secondary**	**Tertiary**
2,4-Dichlorophenol	162	164	98
1,2,4-Trichlorobenzene	180	182	145
Naphthalene-d8 (Internal Standard)	136	68	54**
Naphthalene	128	129	127
4-Chloroaniline	127	129	65
Hexachlorobutadiene	225	223	227
4-Chloro-3-methylphenol	107	144	142
2-Methylnaphthalene	142	141	—
Hexachlorocyclopentadiene	237	235	272
2,4,6-Trichlorophenol	196	198	200
2,4,5-Trichlorophenol	196	198	200
2-Fluorobiphenyl (Surrogate Standard)	172	171	—
2-Chloronaphthalene	162	164	127
2-Nitroaniline	65	92	138
Dimethylphthalate	163	194	164
Acenaphthylene	152	151	153
2,6-Dinitrotoluene	165	63	89
Acenaphthene-d10 (Internal Standard)	164	162	160
3-Nitroaniline	138	108	92
Acenaphthene	153*	152	154
2,4-Dinitrophenol	184	63	154
Dibenzofuran	168	139	—
4-Nitrophenol	109*	139	65
2,4-Dinitrotoluene	165	63	89
Diethylphthalate	149	177	150
Fluorene	166	165	167
4-Chlorophenylphenylether	204	206	141
4-Nitroaniline	138	92	108
4,6-Dinitro-2-methylphenol	198	105	51

Table 2
Analytes in Approximate Retention Time Order and Characteristic Ions

Primary Standard			
Analyte	**Primary**	**Secondary**	**Tertiary**
n-Nitrosodiphenylamine	169	168	167
2,4,6-Tribromophenol (Surrogate Standard)	330	332**	141
Azobenzene	77	51**	105
4-Bromophenylphenylether	248	250	141
Hexachlorobenzene	284	142	249
Pentachlorophenol	266	264	268
Phenanthrene-d10 (Internal Standard)	188	94	80
Phenanthrene	178	179	176
Anthracene	178	179	176
Carbazole	167	166	139
Di-n-butylphthalate	149	150	104
Fluoranthene	202	101	203
Benzidine	184	92	185
Pyrene	202	200	203
Terphenyl-d14 (Surrogate Standard)	244	122	212
Butylbenzylphthalate	149	91	206
Benzo(a)Anthracene	228	229	226
Chrysene-d12 (Internal Standard)	240	120	236
3,3'-Dichlorobenzidine	252	254	126
Chrysene	228	226	229
Bis(2-ethylhexyl)phthalate	149	167	279
Di-n-octylphthalate	149	167	43
Benzo(b)fluoranthene	252	253	125
Benzo(k)fluoranthene	252	253	125
Benzo(a)pyrene	252	253	125
Perylene-d12 (Internal Standard)	264	260	265
Indeno(1,2,3-cd)pyrene	276	138	277
Dibenz(a,h)anthracene	278	139	279
Benzo(g,h,i)perylene	276	138	277

Table 2
Analytes in Approximate Retention Time Order and Characteristic Ions

Primary Standard			
Analyte	**Primary**	**Secondary**	**Tertiary**

***** primary/secondary and/or tertiary ions are switched from order in Method
** not listed in the method

Appendix IX Standard

Analyte	Primary	Secondary	Tertiary
Methyl methacrylate	69	41	39
Ethyl methacrylate	69	41	39
2-Picoline	93	66	92
n-Nitrosomethylethylamine	88	42	43
Methyl methanesulfonate	80	79	65
2-Fluorophenol (Surrogate Standard)	112	64	63**
n-Nitrosodiethylamine	102	44	57
Ethyl methanesulfonate	79	109	97
Benzaldehyde	77	106	51
Phenol-d5 (Surrogate Standard)	99	42	71
Pentachloroethane	117	119	167
1,4-Dichlorobenzene-d4 (Internal Standard)	152	150	115
Acetophenone	105	77	120
n-Nitrosopyrrolidine	100	41	42
n-Nitrosomorpholine	116	56	86
o-Toluidine	106	107	—
Nitrobenzene-d5 (Surrogate Standard)	82	128	54
n-Nitrosopiperidine	114	42	55
O,o,o-Triethyl-Phosphorothioate	198	121	93
a,a-Dimethyl-phenethylamine	58	91	—
Naphthalene-d8 (Internal Standard)	136	68	54**
2,6-Dichlorophenol	162	164	63
Hexachloropropene	213	215	211
Benzothiazole	135	108	69
Caprolactam	55	113	42

Appendix IX Standard

Analyte	Primary	Secondary	Tertiary
p-Phenylenediamine	108	80	—
n-Nitrosodi-n-butylamine	84	57	41
Safrole	162	104	77
Phthalic anhydride	104	76	50
1-methylnaphthalene	142	141	115
1,2,4,5-Tetrachlorobenzene	216	214	218
Isosafrole, cis	162	104	131
2-Fluorobiphenyl (Surrogate Standard)	172	171	—
Isosafrole, trans	162	104	131
Biphenyl	154	153	152
1,4-Dinitrobenzene	168	75	50
1,4-Naphthoquinone	158	104	102
1,3-Dinitrobenzene	168	75	76
Acenaphthene-d10 (Internal Standard)	164	162	160
Pentachlorobenzene	250	248	252
1-Naphthylamine	143	115	—
2-Naphthylamine	143	115	—
2,3,4,6-Tetrachlorophenol	232	230	131
5-Nitro-o-toluidine	152	77	106
Thionazin	107	96	143
1,3,5-Trinitrobenzene	213*	75	120
2,4,6-Tribromophenol (Surrogate Standard)	330	332**	141**
Sulfotepp	97	322	202
Phorate	75	97	121
Phenacetin	108	179	109
Diallate 1	86	234	43
Diallate 2	86	234	43
Dimethoate	87	93	125
4-Aminobiphenyl	169	168	170
Pentachloronitrobenzene	237	142	214
Phenanthrene-d10 (Internal Standard)	188	94	80
Pronamide	173	175	145
Disulfoton	88	97	89

Appendix IX Standard

Analyte	Primary	Secondary	Tertiary
2-secbutyl-4,6-dinitrophenol (Dinoseb)	211	163	147
Methyl parathion	109	125	263
4-Nitroquinoline-1-oxide	190	128	75
Parathion	109	97	291
Isodrin	193	66	195
Kepone	272	274	237
Methapyrilene	97	58**	—
Octachlorostyrene	308	343	154
Terphenyl-d14 (Surrogate Standard)	244	122	212
Aramite 1	185	319	—
Aramite 2	185	319	—
p-(Dimethylamino)azobenzene	120*	225	77
p-Chlorobenzilate	251	139	253
3,3'-Dimethylbenzidine	212	106	—
2-Acetylaminofluorene	181	180	223
Famphur	218	125	93
Chrysene-d12 (Internal Standard)	240	120	236
Hexachlorophene	196	198	209
7,12-Dimethylbenz(a)anthracene	256	241	120
Perylene-d12 (Internal Standard)	264	260	265
3-Methylcholanthrene	268	252	126

***** primary/secondary and/or tertiary ions are switched from order in Method
** not listed in the method

Table 3
Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
1,4 Dioxane	10	20	50	80	120	160
Pyridine	10	20	50	80	120	160
n-Nitrosodimethylamine	10	20	50	80	120	160
Dimethylformamide	10	20	50	80	120	160
Cyclohexanol	10	20	50	80	120	160
Aniline	10	20	50	80	120	160
Phenol	10	20	50	80	120	160
Bis(2-chloroethyl)ether	10	20	50	80	120	160
2-Chlorophenol	10	20	50	80	120	160
1,3-Dichlorobenzene	10	20	50	80	120	160
1,4-Dichlorobenzene	10	20	50	80	120	160
Benzyl alcohol	10	20	50	80	120	160
1,2-Dichlorobenzene	10	20	50	80	120	160
2-Methylphenol	10	20	50	80	120	160
2,2'-oxybis(1-chloropropane)[1]	10	20	50	80	120	160
3&4-Methylphenol	20	40	100	160	240	320
n-Nitroso-di-n-propylamine	10	20	50	80	120	160
Hexachloroethane	10	20	50	80	120	160
Nitrobenzene	10	20	50	80	120	160
Isophorone	10	20	50	80	120	160
2-Nitrophenol	10	20	50	80	120	160
2,4-Dimethylphenol	10	20	50	80	120	160
Benzoic acid	10	20	50	80	120	160
bis(2-Chloroethoxy)methane	10	20	50	80	120	160
2,4-Dichlorophenol	10	20	50	80	120	160
1,2,4-Trichlorobenzene	10	20	50	80	120	160
Naphthalene	10	20	50	80	120	160
4-Chloroaniline	10	20	50	80	120	160
Hexachlorobutadiene	10	20	50	80	120	160

Table 3
Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
4-Chloro-3-methylphenol	10	20	50	80	120	160
2-Methylnaphthalene	10	20	50	80	120	160
Hexachlorocyclopentadiene	10	20	50	80	120	160
2,4,6-Trichlorophenol	10	20	50	80	120	160
2,4,5-Trichlorophenol	10	20	50	80	120	160
2-Chloronaphthalene	10	20	50	80	120	160
2-Nitroaniline	10	20	50	80	120	160
Dimethyl phthalate	10	20	50	80	120	160
Acenaphthylene	10	20	50	80	120	160
3-Nitroaniline	10	20	50	80	120	160
Acenaphthene	10	20	50	80	120	160
2,4-Dinitrophenol	10	20	50	80	120	160
4-Nitrophenol	10	20	50	80	120	160
Dibenzofuran	10	20	50	80	120	160
2,4-Dinitrotoluene	10	20	50	80	120	160
2,6-Dinitrotoluene	10	20	50	80	120	160
Diethylphthalate	10	20	50	80	120	160
4-Chlorophenyl phenyl ether	10	20	50	80	120	160
Fluorene	10	20	50	80	120	160
4-Nitroaniline	10	20	50	80	120	160
4,6-Dinitro-2-methylphenol	10	20	50	80	120	160
N-Nitrosodiphenylamine	10	20	50	80	120	160
Azobenzene[2]	10	20	50	80	120	160
4-Bromophenyl phenyl ether	10	20	50	80	120	160
Hexachlorobenzene	10	20	50	80	120	160
Pentachlorophenol	10	20	50	80	120	160
Phenanthrene	10	20	50	80	120	160
Anthracene	10	20	50	80	120	160
Carbazole	10	20	50	80	120	160
Di-n-butyl phthalate	10	20	50	80	120	160
Fluoranthene	10	20	50	80	120	160

Table 3
Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Benzidine	10	20	50	80	120	160
Pyrene	10	20	50	80	120	160
Butyl benzyl phthalate	10	20	50	80	120	160
3,3'-Dichlorobenzidine	10	20	50	80	120	160
Benzo(a)anthracene	10	20	50	80	120	160
Bis(2-ethylhexyl)phthalate	10	20	50	80	120	160
Chrysene	10	20	50	80	120	160
Di-n-octylphthalate	10	20	50	80	120	160
Benzo(b)fluoranthene	10	20	50	80	120	160
Benzo(k)fluoranthene	10	20	50	80	120	160
Benzo(a)pyrene	10	20	50	80	120	160
Indeno(1,2,3-cd)pyrene	10	20	50	80	120	160
Dibenz(a,h)anthracene	10	20	50	80	120	160
Benzo(g,h,i)perylene	10	20	50	80	120	160

[1] 2,2'oxybis(1-chloropropane) was formally known as bis(2-chloroisopropyl)ether
[2] Azobenzene is formed by decomposition of 1,2-diphenlyhydrazine. If 1,2-diphenylhydrazine is requested, it will be analyzed as azobenzene.
[3] Lower concentration standards may be analyzed on a project specific basis.

Calibration Levels, Appendix IX Standard, µg/mL

Semivolatiles	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Methyl methacrylate	10	20	50	80	120	160
Ethyl methacrylate	10	20	50	80	120	160
2-Picoline	10	20	50	80	120	160
n-Nitrosomethylethylamine	10	20	50	80	120	160
Methyl methanesulfonate	10	20	50	80	120	160
n-Nitrosodiethylamine	10	20	50	80	120	160
Ethyl methanesulfonate	10	20	50	80	120	160
Benzaldehyde	10	20	50	80	120	160

Calibration Levels, Appendix IX Standard, µg/mL

Semivolatiles	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Pentachloroethane	10	20	50	80	120	160
Acetophenone	10	20	50	80	120	160
n-Nitrosopyrrolidine	10	20	50	80	120	160
n-Nitrosomorpholine	10	20	50	80	120	160
o-Toluidine	10	20	50	80	120	160
n-Nitrosopiperidine	10	20	50	80	120	160
O,o,o-Triethyl-Phosphorothioate	10	20	50	80	120	160
A,a-Dimethyl-phenethylamine	10	20	50	80	120	160
2,6-Dichlorophenol	10	20	50	80	120	160
Hexachloropropene	10	20	50	80	120	160
Benzothiazole	10	20	50	80	120	160
Caprolactam	10	20	50	80	120	160
p-Phenylenediamine	10	20	50	80	120	160
n-Nitrosodi-n-butylamine	10	20	50	80	120	160
Safrole	10	20	50	80	120	160
Phthalic anhydride	10	20	50	80	120	160
1-Methylnaphthalene	10	20	50	80	120	160
1,2,4,5-Tetrachlorobenzene	10	20	50	80	120	160
Isosafrole, cis	10	20	50	80	120	160
Isosafrole, trans	10	20	50	80	120	160
Biphenyl	10	20	50	80	120	160
1,4-Dinitrobenzene	10	20	50	80	120	160
1,4-Naphthoquinone	10	20	50	80	120	160
1,3-Dinitrobenzene	10	20	50	80	120	160
Pentachlorobenzene	10	20	50	80	120	160
1-Naphthylamine	10	20	50	80	120	160
2-Naphthylamine	10	20	50	80	120	160
2,3,4,6-Tetrachlorophenol	10	20	50	80	120	160
5-Nitro-o-toluidine	10	20	50	80	120	160
Thionazin	10	20	50	80	120	160
1,3,5-Trinitrobenzene	10	20	50	80	120	160
Sulfotepp	10	20	50	80	120	160
Phorate	10	20	50	80	120	160

Calibration Levels, Appendix IX Standard, µg/mL

Semivolatiles	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Phenacetin	10	20	50	80	120	160
Diallate 1	10	20	50	80	120	160
Diallate 2	10	20	50	80	120	160
Dimethoate	10	20	50	80	120	160
4-Aminobiphenyl	10	20	50	80	120	160
Pentachloronitrobenzene	10	20	50	80	120	160
Pronamide	10	20	50	80	120	160
Disulfoton	10	20	50	80	120	160
2-sec butyl-4,6-dinitrophenol (Dinoseb)	10	20	50	80	120	160
Methyl parathion	10	20	50	80	120	160
4-Nitroquinoline-1-oxide	10	20	50	80	120	160
Parathion	10	20	50	80	120	160
Isodrin	10	20	50	80	120	160
Kepone	10	20	50	80	120	160
Famphur	10	20	50	80	120	160
Methapyrilene	10	20	50	80	120	160
Octachlorostyrene	10	20	50	80	120	160
Aramite 1	10	20	50	80	120	160
Aramite 2	10	20	50	80	120	160
p-(Dimethylamino)azobenzene	10	20	50	80	120	160
p-Chlorobenzilate	10	20	50	80	120	160
3,3'-Dimethylbenzidine	10	20	50	80	120	160
Hexachlorophene	100	200	500	800	1200	1600
2-Acetylaminofluorene	10	20	50	80	120	160
Dibenz (a,j)acridine	10	20	50	80	120	160
7,12-Dimethylbenz(a)anthracene	10	20	50	80	120	160
3-Methylcholanthrene	10	20	50	80	120	160
2-Fluorophenol (Surrogate Standard	10	20	50	80	120	160
Phenol-d5 (Surrogate Standard)	10	20	50	80	120	160
Nitrobenzene-d5 (Surrogate Standard)	10	20	50	80	120	160
2-Fluorobiphenyl (Surrogate Standard)	10	20	50	80	120	160
2,4,6-Tribromophenol (Surrogate Standard)	10	20	50	80	120	160
Terphenyl-d14 (Surrogate Standard)	10	20	50	80	120	160

Calibration Levels SIM Standard, ug/mL

Naphthalene	0.2	0.5	1.0	2.0	5.0	10.0
Acenaphthylene	0.2	0.5	1.0	2.0	5.0	10.0
Acenaphthene	0.2	0.5	1.0	2.0	5.0	10.0
Fluorene	0.2	0.5	1.0	2.0	5.0	10.0
Phenanthrene	0.2	0.5	1.0	2.0	5.0	10.0
Pyrene	0.2	0.5	1.0	2.0	5.0	10.0
Benzo(a)anthracene	0.2	0.5	1.0	2.0	5.0	10.0
Chrysene	0.2	0.5	1.0	2.0	5.0	10.0
Benzo(b)fluoranthene	0.2	0.5	1.0	2.0	5.0	10.0
Benzo(k)fluoranthene	0.2	0.5	1.0	2.0	5.0	10.0
Benzo(a)pyrene	0.2	0.5	1.0	2.0	5.0	10.0
Indeno(1,2,3-cd)pyrene	0.2	0.5	1.0	2.0	5.0	10.0
Dibenz(a,h)anthracene	0.2	0.5	1.0	2.0	5.0	10.0
Anthracene	0.2	0.5	1.0	2.0	5.0	10.0
Fluoranthene	0.2	0.5	1.0	2.0	5.0	10.0
Benzo(g,h,i)perylene	0.2	0.5	1.0	2.0	5.0	10.0

Table 3

LVI Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
1,4 Dioxane	1	2	5	10	20	30	40	50	60
Pyridine	1	2	5	10	20	30	40	50	60

Table 3

LVI Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
n-Nitrosodimethylamine	1	2	5	10	20	30	40	50	60
Dimethylformamide	1	2	5	10	20	30	40	50	60
Cyclohexanol	1	2	5	10	20	30	40	50	60
Aniline	1	2	5	10	20	30	40	50	60
Phenol	1	2	5	10	20	30	40	50	60
Bis(2-chloroethyl)ether	1	2	5	10	20	30	40	50	60
2-Chlorophenol	1	2	5	10	20	30	40	50	60
1,3-Dichlorobenzene	1	2	5	10	20	30	40	50	60
1,4-Dichlorobenzene	1	2	5	10	20	30	40	50	60
Benzyl alcohol	1	2	5	10	20	30	40	50	60
1,2-Dichlorobenzene	1	2	5	10	20	30	40	50	60
2-Methylphenol	1	2	5	10	20	30	40	50	60
2,2'-oxybis(1-chloropropane)[1]	1	2	5	10	20	30	40	50	60
3&4-Methylphenol	2	4	10	20	40	60	80	100	120
n-Nitroso-di-n-propylamine	1	2	5	10	20	30	40	50	60
Hexachloroethane	1	2	5	10	20	30	40	50	60
Nitrobenzene	1	2	5	10	20	30	40	50	60
Isophorone	1	2	5	10	20	30	40	50	60
2-Nitrophenol	1	2	5	10	20	30	40	50	60
2,4-Dimethylphenol	1	2	5	10	20	30	40	50	60
Benzoic acid	1	2	5	10	20	30	40	50	60
bis(2-Chloroethoxy)methane	1	2	5	10	20	30	40	50	60
2,4-Dichlorophenol	1	2	5	10	20	30	40	50	60
1,2,4-Trichlorobenzene	1	2	5	10	20	30	40	50	60
Naphthalene	1	2	5	10	20	30	40	50	60
4-Chloroaniline	1	2	5	10	20	30	40	50	60
Hexachlorobutadiene	1	2	5	10	20	30	40	50	60
4-Chloro-3-methylphenol	1	2	5	10	20	30	40	50	60
2-Methylnaphthalene	1	2	5	10	20	30	40	50	60
Hexachlorocyclopentadiene	1	2	5	10	20	30	40	50	60
2,4,6-Trichlorophenol	1	2	5	10	20	30	40	50	60
2,4,5-Trichlorophenol	1	2	5	10	20	30	40	50	60

Table 3

LVI Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
2-Chloronaphthalene	1	2	5	10	20	30	40	50	60
2-Nitroaniline	1	2	5	10	20	30	40	50	60
Dimethyl phthalate	1	2	5	10	20	30	40	50	60
Acenaphthylene	1	2	5	10	20	30	40	50	60
3-Nitroaniline	1	2	5	10	20	30	40	50	60
Acenaphthene	1	2	5	10	20	30	40	50	60
2,4-Dinitrophenol	1	2	5	10	20	30	40	50	60
4-Nitrophenol	1	2	5	10	20	30	40	50	60
Dibenzofuran	1	2	5	10	20	30	40	50	60
2,4-Dinitrotoluene	1	2	5	10	20	30	40	50	60
2,6-Dinitrotoluene	1	2	5	10	20	30	40	50	60
Diethylphthalate	1	2	5	10	20	30	40	50	60
4-Chlorophenyl phenyl ether	1	2	5	10	20	30	40	50	60
Fluorene	1	2	5	10	20	30	40	50	60
4-Nitroaniline	1	2	5	10	20	30	40	50	60
4,6-Dinitro-2-methylphenol	1	2	5	10	20	30	40	50	60
N-Nitrosodiphenylamine	1	2	5	10	20	30	40	50	60
Azobenzene[2]	1	2	5	10	20	30	40	50	60
4-Bromophenyl phenyl ether	1	2	5	10	20	30	40	50	60
Hexachlorobenzene	1	2	5	10	20	30	40	50	60
Pentachlorophenol	1	2	5	10	20	30	40	50	60
Phenanthrene	1	2	5	10	20	30	40	50	60
Anthracene	1	2	5	10	20	30	40	50	60
Carbazole	1	2	5	10	20	30	40	50	60
Di-n-butyl phthalate	1	2	5	10	20	30	40	50	60
Fluoranthene	1	2	5	10	20	30	40	50	60
Benzidine	1	2	5	10	20	30	40	50	60
Pyrene	1	2	5	10	20	30	40	50	60
Butyl benzyl phthalate	1	2	5	10	20	30	40	50	60
3,3'-Dichlorobenzidine	1	2	5	10	20	30	40	50	60
Benzo(a)anthracene	1	2	5	10	20	30	40	50	60
Bis(2-ethylhexyl)phthalate	1	2	5	10	20	30	40	50	60

Table 3

LVI Calibration Levels, Primary Standard, µg/mL[3]

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
Chrysene	1	2	5	10	20	30	40	50	60
Di-n-octylphthalate	1	2	5	10	20	30	40	50	60
Benzo(b)fluoranthene	1	2	5	10	20	30	40	50	60
Benzo(k)fluoranthene	1	2	5	10	20	30	40	50	60
Benzo(a)pyrene	1	2	5	10	20	30	40	50	60
Indeno(1,2,3-cd)pyrene	1	2	5	10	20	30	40	50	60
Dibenz(a,h)anthracene	1	2	5	10	20	30	40	50	60
Benzo(g,h,i)perylene	1	2	5	10	20	30	40	50	60

[1]2,2'oxybis(1-chloropropane) was formally known as bis(2-chloroisopropyl)ether
[2]Azobenzene is formed by decomposition of 1,2-diphenlyhydrazine. If 1,2-diphenylhydrazine is requested, it will be analyzed as azobenzene.
[3]Lower concentration standards may be analyzed on a project specific basis.

LVI Calibration Levels, Appendix IX Standard, µg/mL

Semivolatiles	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
Methyl methacrylate	1	2	5	10	20	30	40	50	60
Ethyl methacrylate	1	2	5	10	20	30	40	50	60
2-Picoline	1	2	5	10	20	30	40	50	60
n-Nitrosomethylethylamine	1	2	5	10	20	30	40	50	60
Methyl methanesulfonate	1	2	5	10	20	30	40	50	60
n-Nitrosodiethylamine	1	2	5	10	20	30	40	50	60
Ethyl methanesulfonate	1	2	5	10	20	30	40	50	60
Benzaldehyde	1	2	5	10	20	30	40	50	60
Pentachloroethane	1	2	5	10	20	30	40	50	60
Acetophenone	1	2	5	10	20	30	40	50	60
n-Nitrosopyrrolidine	1	2	5	10	20	30	40	50	60
n-Nitrosomorpholine	1	2	5	10	20	30	40	50	60
o-Toluidine	1	2	5	10	20	30	40	50	60
n-Nitrosopiperidine	1	2	5	10	20	30	40	50	60
O,o,o-Triethyl-Phosphorothioate	1	2	5	10	20	30	40	50	60
A,a-Dimethyl-phenethylamine	1	2	5	10	20	30	40	50	60

LVI Calibration Levels, Appendix IX Standard, µg/mL

Semivolatiles	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
2,6-Dichlorophenol	1	2	5	10	20	30	40	50	60
Hexachloropropene	1	2	5	10	20	30	40	50	60
Benzothiazole	1	2	5	10	20	30	40	50	60
Caprolactam	1	2	5	10	20	30	40	50	60
p-Phenylenediamine	1	2	5	10	20	30	40	50	60
n-Nitrosodi-n-butylamine	1	2	5	10	20	30	40	50	60
Safrole	1	2	5	10	20	30	40	50	60
Phthalic anhydride	1	2	5	10	20	30	40	50	60
1-Methylnaphthalene	1	2	5	10	20	30	40	50	60
1,2,4,5-Tetrachlorobenzene	1	2	5	10	20	30	40	50	60
Isosafrole, cis	1	2	5	10	20	30	40	50	60
Isosafrole, trans	1	2	5	10	20	30	40	50	60
Biphenyl	1	2	5	10	20	30	40	50	60
1,4-Dinitrobenzene	1	2	5	10	20	30	40	50	60
1,4-Naphthoquinone	1	2	5	10	20	30	40	50	60
1,3-Dinitrobenzene	1	2	5	10	20	30	40	50	60
Pentachlorobenzene	1	2	5	10	20	30	40	50	60
1-Naphthylamine	1	2	5	10	20	30	40	50	60
2-Naphthylamine	1	2	5	10	20	30	40	50	60
2,3,4,6-Tetrachlorophenol	1	2	5	10	20	30	40	50	60
5-Nitro-o-toluidine	1	2	5	10	20	30	40	50	60
Thionazin	1	2	5	10	20	30	40	50	60
1,3,5-Trinitrobenzene	1	2	5	10	20	30	40	50	60
Sulfotepp	1	2	5	10	20	30	40	50	60
Phorate	1	2	5	10	20	30	40	50	60
Phenacetin	1	2	5	10	20	30	40	50	60
Diallate 1	1	2	5	10	20	30	40	50	60
Diallate 2	1	2	5	10	20	30	40	50	60
Dimethoate	1	2	5	10	20	30	40	50	60
4-Aminobiphenyl	1	2	5	10	20	30	40	50	60
Pentachloronitrobenzene	1	2	5	10	20	30	40	50	60
Pronamide	1	2	5	10	20	30	40	50	60
Disulfoton	1	2	5	10	20	30	40	50	60

LVI Calibration Levels, Appendix IX Standard, µg/mL

Semivolatiles	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9
2-sec butyl-4,6-dinitrophenol (Dinoseb)	1	2	5	10	20	30	40	50	60
Methyl parathion	1	2	5	10	20	30	40	50	60
4-Nitroquinoline-1-oxide	1	2	5	10	20	30	40	50	60
Parathion	1	2	5	10	20	30	40	50	60
Isodrin	1	2	5	10	20	30	40	50	60
Kepone	1	2	5	10	20	30	40	50	60
Famphur	1	2	5	10	20	30	40	50	60
Methapyrilene	1	2	5	10	20	30	40	50	60
Octachlorostyrene	1	2	5	10	20	30	40	50	60
Aramite 1	1	2	5	10	20	30	40	50	60
Aramite 2	1	2	5	10	20	30	40	50	60
p-(Dimethylamino)azobenzene	1	2	5	10	20	30	40	50	60
p-Chlorobenzilate	1	2	5	10	20	30	40	50	60
3,3'-Dimethylbenzidine	1	2	5	10	20	30	40	50	60
2-Acetylaminofluorene	1	2	5	10	20	30	40	50	60
Dibenz (a,j)acridine	1	2	5	10	20	30	40	50	60
7,12-Dimethylbenz(a)anthracene	1	2	5	10	20	30	40	50	60
3-Methylcholanthrene	1	2	5	10	20	30	40	50	60
2-Fluorophenol (Surrogate Standard	1	2	5	10	20	30	40	50	60
Phenol-d5 (Surrogate Standard)	1	2	5	10	20	30	40	50	60
Nitrobenzene-d5 (Surrogate Standard)	1	2	5	10	20	30	40	50	60
2-Fluorobiphenyl (Surrogate Standard)	1	2	5	10	20	30	40	50	60
2,4,6-Tribromophenol (Surrogate Standard)	1	2	5	10	20	30	40	50	60
Terphenyl-d14 (Surrogate Standard)	1	2	5	10	20	30	40	50	60

Table 4
Minimum Response Factor Criteria

Semivolatile Compounds	Minimum Response Factor (RF)
Benzaldehyde	0.010
Phenol	0.800

Table 4
Minimum Response Factor Criteria

Semivolatile Compounds	Minimum Response Factor (RF)
Bis(2-chloroethyl)ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.600
2,2'-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600
N-Nitroso-di-n-propylamine	0.500
Hexachlorethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Naphthalene	0.700
4-Chloroanline	0.010
Hexachlorobutadiene	0.010
Caprolactam	0.010
4-Chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthanlene	0.800
2-Nitroaniline	0.010
Dimethyl phthalate	0.010
2,6-Dinitrotulene	0.200

Table 4
Minimum Response Factor Criteria

Semivolatile Compounds	Minimum Response Factor (RF)
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dinitrophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4-Dinitrotoluene	0.200
Diethyl phthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-Chlorophenyl-phenyl ether	0.400
Fluorene	0.900
4-Nitroaniline	0.010
4,6-Dinitro-2-methylphenol	0.010
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butyl phthalate	0.010
Fluoranthene	0.600
Pyrene	0.600
Butyl benzyl phthalate	0.010
3,3’-Dichlorobenzidine	0.010
Benzo(a)anthracene	0.800

Table 4
Minimum Response Factor Criteria

Semivolatile Compounds	Minimum Response Factor (RF)
Chrysene	0.700
Bis-(2-ethylhexyl)phthalate	0.010
Di-n-octyl phthalate	0.010
Benzo(b)fluoranthene	0.700
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010

TestAmerica St. Louis has established a default minimum response factor of 0.01 for compound not identified in this table, except for Famphur, Hexachlorophene, Kepone, Phthalic Anhydride which have a minimum response factor of 0.001.

Table 5

Semi-Volatile Internal Standards with Corresponding Analytes*

1,4-Dichlorobenzene-d4	**Naphthalene-d8**	**Acenaphthene-d10**	**Phenanthrene-d10**	**Chrysene-d12**	**Perylene-d12**
1,4-Dioxane	Acetophenone	cis-Isosafrole	5-Nitro-o-toluidine	Benzidine	Benzo(b)fluoranthene
Methyl methacrylate	N-Nitrosopyrrolidine	1,2,4,5-Tetrachlorobenzene	4,6-Dinitro-2-methylphenol	Pyrene	Benzo(k)fluoranthene
Pyridine	N-Nitrosomorpholine	Hexachlorocyclopentadiene	N-Nitrosodiphenylamine	Terphenyl-d14	7,12-Dimethyl benz(a)anthracene
N-Nitrosodimethylamine	O-Toluidine	2,4,6-Trichlorophenol	Tri-n-butyl phosphate	Aramite 1	Hexachlorophene
N,N-Dimethylformamide	Nitrobenzene-d5	2,4,5-Trichlorophenol	Azobenzene	Kepone	Benzo(a)pyrene
Ethyl methacrylate	Nitrobenzene	2-Fluorobiphenyl	Sulfotep	Aramite 2	3-methylcholanthrene
2-Picoline	N-Nitrosopiperidine	trans-Isosafrole	Diallate 1	p-(dimethylamino) azobenzene	Indeno (1,2,3-cd) pyrene
N-Nitrosomethylethylamine	Isophorone	Biphenyl	1,3,5-Trinitrobenzene	Chlorobenzilate	Dibenz(a,h)anthracene
Methyl methanesulfonate	2-Nitrophenol	2-Chloronaphthalene	Phorate	3,3'-Dimethylbenzidine	Benzo(g,h,i)perylene
2-Fluorophenol	2,4-Dimethylphenol	2-Nitroaniline	4-Bromophenyl phenyl ether	Butyl benzyl phthalate	
Cyclohexanol	Bis (2-chloroethoxy) methane	1,4-Naphthoquinone	Phenacetin	2-Acetylaminofluorene	
N-Nitrosodiethylamine	o,o,o-Triethylphosphorothioate	1,4-Dinitrobenzene	Diallate 2	Famphur	
Ethyl methanesulfonate	Benzoic acid	Dimethylphthalate	Hexachlorobenzene	Benzo (a) anthracene	
Benzaldehyde	2,4-Dichlorophenol	1,3-Dinitrobenzene	Dimethoate	4,4'-methylenebis (2-Chloroaniline)	
Phenol-d5	a,a-Dimethylphenethylamine	Acenaphthylene	Atrazine	3,3'-Dichlorobenzidine	
Phenol	1,2,4-Trichlorobenzene	2,6-Dinitrotoluene	Tris(2-chloroethyl) phosphate	Chrysene	
Aniline	Naphthalene	3-Nitroaniline	4-Aminobiphenyl	Bis (2-ethylhexyl) phthalate	
Pentachloroethane	4-Chloroaniline	Acenaphthene	Pentachlorophenol	Di-n-octyl phthalate	
Bis (2-chloroethyl) ether	2,6-Dichlorophenol	2,4-Dinitrophenol	Pronamide		
2-Chlorophenol	Hexachloropropene	4-Nitrophenol	Pentachloronitrobenzene		
1,3-Dichlorobenzene	Hexachlorobutadiene	Dibenzofuran	Phenanthrene		

Table 5

Semi-Volatile Internal Standards with Corresponding Analytes*

1,4-Dichlorobenzene-d4	Naphthalene-d8	Acenaphthene-d10	Phenanthrene-d10	Chrysene-d12	Perylene-d12
1,4-Dichlorobenzene	Benzothiazole	Pentachlorobenzene	Disulfoton		
1,2-Dichlorobenzene	Caprolactam	2,4-Dinitrotoluene	Anthracene		
Benzyl alcohol	N-Nitroso-di-n-butylamine	1-Naphthylamine	Dinoseb		
2-Methylphenol	p-Phenylenediamine	2-Naphthylamine	Carbazole		
Bis (2-chloroisopropyl) ether	4-Chloro-3-methylphenol	2,3,4,6-Tetrachlorophenol	Methyl parathion		
3,4-Methylphenol	Safrole	Diethylphthalate	Di-n-butyl phthalate		
N-Nitroso-di-n-propylamine	2-Methylnaphthalene	Fluorene	Parathion		
Hexachloroethane		4-Chlorophenyl phenyl ether	4-Nitroquinoline-1-oxide		
		Thionazin	Methapyrilene		
		4-Nitroaniline	Isodrin		
		2,4,6-Tribromophenol	Fluoranthene		

* ISTD assignment is based on instrument operating conditions and column type and may vary slightly from this listing.

Title: PESTICIDE GAS CHROMATOGRAPHIC ANALYSIS [SW-846 8081B; EPA 608]

Approvals (Signature/Date):

Ben Hicks	5/30/12	Michael Ridenhower	5/30/12
Ben Hicks Organics Manager	Date	Michael Ridenhower Health & Safety Manager / Coordinator	Date
Marti Ward	5/30/12	Elaine Wild	5/30/12
Marti Ward Quality Assurance Manager	Date	Elaine Wild Laboratory Director	Date

This SOP was previously identified as SOP No. ST-GC-0016 Rev. 12

Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This SOP describes procedures to be used for the analysis of Pesticides by GC/ECD.

1.2 Sample preparation techniques are described in SOP ST-OP-0002.

1.3 This SOP is based on SW-846 Methods 8000B, 8000C and 8081B and EPA Method 608.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

1.4.1 Additional compounds may be amendable to this method. The minimum requirement for non-standard analytes is that the reporting limit be set at the lowest required concentration that can actually be detected by the instrument, and when an MDL study can not be conducted, the MDL be set equal to the reporting limit.

2.0 SUMMARY OF METHOD

2.1 Aqueous samples are prepared for analysis using continuous or separatory funnel liquid / liquid extraction. Solid samples are prepared using sonication. Waste dilution and wipes are extracted by autoshaker.

2.2 After the initial preparation step, the sample is introduced to the GC, equipped with capillary columns and dual Electron Capture Detectors (ECD). Concentrations of target analytes are measured by the detector response within a defined retention time window, relative to the response to standard concentrations. The external standardization procedure is used.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

4.0 INTERFERENCES

4.1 Interferences in the GC analysis arise from many compounds amenable to gas chromatography that give a measurable response on the electron capture detector. Phthalate esters, which are common plasticizers, can pose a major problem in the determinations. Interferences from phthalates are minimized by avoiding contact with any plastic materials.

4.2 Interferences co-extracted from samples will vary considerably from source to source. The presence of interferences may raise quantitation limits for individual samples. Specific cleanups may be performed on the sample extracts, including florisil cleanup (Method 3620).

4.3 Contamination by carryover can occur when a low concentration sample is analyzed after a high concentration sample. Co-elution of target analytes with non-targets can occur, resulting in false positives or biased high results.

4.4 Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and interferences to sample extracts. Strict attention to glassware cleaning and handling and demonstration of solvent purity will lead minimization of these interferences.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual, Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1 The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.2 There are areas of high voltage in the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	**Hazards**	**Exposure Limit (2)**	**Signs and symptoms of exposure**
Hexane	Flammable Irritant	500 ppm (TWA)	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methanol	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			

6.0 EQUIPMENT AND SUPPLIES

6.1 GC/ECD system: The lab utilizes an Agilent GC 6890 dual micro ECD system with autosampler.

6.1.1 GC column type, and instrument run conditions are posted on the individual GC instruments.

6.2 Disposable pipettes

6.3 Amber vials: Crimp top seals

6.4 Clear vials and silicon crimp seals

6.5 Micro syringes- 10µL, 250µL, 500µL, 1000µL. Hamilton 1700 series.

6.6 Volumetric flasks, Class A

6.7 Analytical Balance, capable of weighing ± 0.01 grams.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Pesticide stock standard solutions must be replaced after 6 months, once opened, or manufacturer's expiration date whichever is shorter. Pesticide calibration solutions must be refrigerated at $\leq 6^{o}$C and protected from light. Intermediate and working standards must be replaced at least every six months, or the stock solutions expiration date, whichever is sooner. Additionally standards are discarded if comparison with check standards indicates a problem.

7.3 See reagent log for specific information regarding standards and reagents.

7.4 ICV standards, NIST traceable:

7.4.1 The Pesticide ICV standard is a second source from the calibration standard.

7.4.2 ICV standard is prepared and stored in the same way as calibration standards.

7.5 Surrogate Standards

7.5.1 Tetrachloro-m-xylene and decachlorobiphenyl are the surrogate standards.

7.6 Column Degradation Evaluation Mix (PEM Standard)

7.6.1 A standard containing 4,4'-DDT and Endrin and not containing any of their breakdown products must be prepared for evaluation of degradation of these compounds by the GC column and injection port. This mix must be replaced after 6 months, or whenever corrective action to columns fails to eliminate the breakdown of the compounds, whichever is shorter. This solution also contains the surrogates. Refer to Table 2 for details of the column degradation evaluation mix.

7.7 Gases for carrier and make-up: Hydrogen carrier, Nitrogen make-up

8.0 SAMPLE PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Water samples are unpreserved and stored at 4 ± 2˚C.

8.3 Soil samples are refrigerated at 4 ± 2˚C.

8.4 The extraction holding time for Pesticides analysis in waters is 7 days.

8.5 The extraction holding time for Pesticides analysis in soil/solid matrix is 14 days.

8.6 Extracts must be refrigerated at $\leq 6^{o}$C and analyzed within 40 days of the end of the extraction.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a MS/MSD an LCS Duplicate (LCSD) is prepared and analyzed.

9.2 **Method Blank (MB)**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 For Method 608 a matrix spike must be performed at a frequency of one per ten samples.

9.5 **Surrogate**

9.5.1 A surrogate is a non-target analyte similar in chemical composition and behavior, which mimics the target analytes during preparation, extraction and analysis.

9.5.2 Surrogate(s) is added to every field sample, method blank, LCS and MS/MSD for analysis at the beginning of the sample preparation process.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP STL-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 External standard calibration is used.

10.2 Column Degradation Evaluation (PEM)

10.2.1 The column evaluation mix must be injected before each initial calibration, the beginning of an analytical sequence and every subsequent 12 hours of continuous analysis.

10.2.2 The degradation of DDT and Endrin must be calculated (see equations Section 12) and each shown to be less than 15% before calibration can proceed.

10.2.3 If the breakdown of DDT and/or Endrin exceeds the limits given above, corrective action must be taken. This action may include:

10.2.3.1 Replacement of the injection port liner or the glass wool.

10.2.3.2 Cutting off a portion of the injection end of a capillary column.

10.2.3.3 Replacing the GC column.

10.3 Initial Calibration

10.3.1 Prepare a Pesticide standard at a minimum of five concentration levels. The low level standard should be at or below the reporting limit. The other standards define the working range of the detector. Six points are required for 2nd order curves or higher.

10.3.2 A single point calibration for Technical Chlordane and Toxaphene is performed with every initial calibration for pattern recognition.

10.3.2.1 Select 3-5 major peaks in the mulit-component analyte pattern. Calculate the response using the total area of these peaks.

10.3.2.2 If Toxaphene or Technical Chlordane is detected, sample will require re-analysis under a five point calibration for the analyte found. See Client Requirements Sheet to determine if this is needed.

10.3.3 The analyst may include a full 5 point calibration for any of the multi-component analytes with the initial calibration.

10.3.4 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance (e.g., ECD replacement).

10.3.5 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the STL corporate policy, “Selection of Calibration Points”, P-T-001.

10.3.6 Sample peak areas are compared to peak areas of the standards. The ratio of the detector response to the amount concentration of analyte in the calibration standard is defined as the response factor (RF) or calibration factor (CF).

10.4 SW 8081 criteria

10.4.1 SW-846 chromatographic methods allow the use of both linear and non-linear models for the calibration data.

10.4.1.1 The first way is to begin with the simplest approach, the linear model through the origin, and then progress through other options until the calibration acceptance criteria are met. The second way is to use technical knowledge of the detector response to the target compound to choose the calibration model.

10.4.1.2 The option for non-linear calibration may be necessary to address specific instrumental techniques. However, it is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance.

10.4.2 Linear calibration using the average response factor

10.4.2.1 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 20% for each target analyte.

10.4.2.2 If the %RSDs in the initial calibration is > 20%, then calibration using a linear regression may be employed.

10.4.3 Linear calibration using a least squares regression

10.4.3.1 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.4.3.2 r (correlation coefficient) must be $\geq$ 0.995 OR r^2 (coefficient of difference) must be $\geq$ 0.990.

10.4.3.3 Linear calibration using a least squares regression, forcing thru zero

10.4.3.3.1 Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration. In essence, if the curve is forced through zero, the intercept is set to 0 *before* the regression is calculated, thereby setting the bias to favor the low end of the calibration range by “pivoting” the function around the origin to find the best fit and resulting in one less degree of freedom. It may be appropriate to force the regression though zero for some calibrations.

10.4.3.3.2 Curve must still meet criteria in 10.4.3.1 and 10.4.3.2.

10.4.3.3.3 For samples requiring adherence to SW846 Method 8000B, forcing through zero is NOT allowed.

10.4.3.4 Linear calibration using a least squares regression, weighting of data points

10.4.3.4.1 In linear, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. For this reason it may preferable to increase the weighting of the lower concentration points. 1/Concentration^2 weighting (often called $1/X^2$ weighting) to improve accuracy at the low end of the curve.

10.4.3.4.2 Curve must still meet criteria in 10.4.3.1 and 10.4.3.2.

10.4.4 Non-linear calibration

10.4.4.1 In situations where the analyst knows that the instrument response does not follow a linear model over a sufficiently wide working range, or when the other approaches have not met the acceptance criteria, a non-linear calibration model may be employed. Non linear calibration requires 6 points.

10.4.4.1.1 It is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance. Thus, non-linear calibrations are not be employed for analytes shown to consistently exhibit linear calibration for the analytes of interest.

10.4.4.2 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.4.4.3 r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.5 608 Criteria

10.5.1 Method 608 only requires a 3-point calibration.

10.5.1.1 We routinely perform a 5-point calibration; however, 2 points may be removed from the curve if necessary to meet 608 calibration criteria.

10.5.1.2 Refer to the STL corporate policy, “Selection of Calibration Points”, P-T-0001.

10.5.2 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be ≤ 10%.

10.5.3 If the %RSDs in the initial calibration is > 10%, then calibration using a linear regression may be employed. See section 10.4.3 for criteria.

10.6 Initial Calibration Verification (ICV)

10.6.1 An initial calibration verification standard must be a different standard source than the one used for the initial calibration.

10.6.2 An ICV must be performed with every initial calibration.

10.6.3 The ICV performance must be within +/- 20% D criteria.

10.6.3.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV, or analysis of a different ICV). Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.7 Continuing Calibration Verification (CCV)

10.7.1 A CCV may be the same source or second source as the calibration.

10.7.2 Analyte response factors must be verified at the beginning of each analytical run (by either an ICV or a CCV), after every 10 samples and at the end of the analysis run through the analysis of a mid-level calibration standard.

10.7.3 SW 8081 criteria

10.7.3.1 The calibration verification is acceptable if the %D for each single component pesticide is ≤ 20%.

10.7.3.2 The same criteria will be used if Technical Chlordane or Toxaphene verifications are performed.

10.7.3.3 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument. If this CCV meets criteria then sample analysis may continue; however the preceding samples must be reanalyzed. If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require re-calibration (ie initial calibration).

10.7.4 608 criteria

10.7.4.1 At the beginning of each 24-hour long (or less) analytical sequence, demonstrate that the instrument calibration is still within the linear range established by the initial calibration through the analysis of mid-level standards of each compound of interest.

10.7.4.2 If the analyzed concentration of each analyte is within ± 15% of the true value, the daily calibration check is successful, and samples may be analyzed until 24-hours have elapsed from the injection of the first daily calibration standard.

10.8 Retention Time (RT) Windows

10.8.1 Retention Time (RT) windows must be determined for all analytes.

10.8.1.1 Establishing RT windows:

10.8.1.1.1 Make an injection of all analytes of interest each day over a three day period. Calculate the mean and the standard deviation of the three retention times for each analyte.

10.8.1.1.2 The width of the retention time window for each analyte, surrogate, and major constituent in multi-component analytes is defined as ± 3 times the standard deviation of the mean absolute retention time established during the 72-hour period or 0.03 minutes, whichever is greater. Historically, calibrations RT windows have not been greater than 0.03 minutes. Windows larger than 0.03 minutes are indicative of equipment issues.

10.8.1.1.3 The center of the retention time window is the retention time from the CCV performed at the beginning of the analytical run. For samples run during the same shift as the initial calibration, use the retention time of the mid-point standard from the initial calibration. Some clients may have specific requirements regarding the updating of RT windows. Review the Client Requirement Memo for instructions.

10.8.1.1.4 A new retention time windows is performed annually or when the analytical column from a new vendor or different stationary phase is used.

10.8.1.1.4.1 Until these standards have been run on the new column, the retention time windows from the old column may be used, updated with the retention times from the new initial calibration.

10.8.2 Retention Time Criteria

10.8.2.1 The retention times of all compounds in each continuing calibration must be within the retention time windows established.

11.0 PROCEDURE

11.1 Allow standards, samples and sample extracts to reach ambient temperature before analysis.

11.2 All analysis conditions and injection volumes for samples must be the same as for the calibration standards.

11.3 Sample Introduction

11.3.1 Semivolatile analytes are introduced by direct injection of the extract. Samples, standards, and QC must be introduced using the same procedure.

11.4 Perform all qualitative and quantitative measurements. When the standards and extracts are not being used, refrigerate them at 4 $\pm$ 2^{o}C, protected from light in screw cap vials equipped with unpierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 External Standard Calculations

12.2.1 See Target software for calculations.

12.3 Manual Integrations

12.3.1 Identified compounds are reviewed for proper integration. Manual integrations are performed if necessary and are documented by the analyst or automatically by the data system. See TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices. Manual integrations are denoted with a “M” flag on the Target quantitation report.

12.4 Dilutions

12.4.1 If the concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample must be diluted and reanalyzed.

12.4.2 A dilution should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the client specific project requirements.

12.5 Carryover

12.5.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.5.1.1 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

12.5.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, carryover may have occurred.

12.5.1.2.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

12.5.1.3 If the chromatographic profile resembles the previous sample, the results are questionable.

12.5.1.3.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

12.6 Dual column quantitation

12.6.1 As per 8000C, report the lower result of the two columns, unless the Client SOW requires that the higher result be reported. See Client Requirements Sheet for determination.

12.6.1.1 For non-detect (ND) results, report from the A channel, unless there is evidence of chromatographic interference in the A channel’s performance.

12.6.1.2 If one result is significantly higher (e.g., >40%), check the chromatograms to see if an obviously overlapping peak is causing an erroneously high result. If no overlapping peaks are noted, examine the baseline parameters established by the instrument data system (or operator) during peak integration. If no anomalies are noted, review the chromatographic conditions. If there is no evidence of chromatographic problems, report the lower result. The data user should be advised of the disparity between the results on the two columns.

12.6.1.3 Use the higher result if there is obvious chromatographic interference on the column with the lower result.

12.6.1.4 If the CCV performance on one of the two channels is outside acceptance criteria due to confirmed matrix interference, report sample data from the column with acceptable performance, irrespective of it being the higher or lower result.

12.6.1.4.1 See Clouseau for data assessment and narration.

12.6.2 The QC should be reported from the column that reflects the column used for the majority of the samples associated with the QC.

12.6.3 The surrogate should be reported from the column that reflects the column used for the majority of the analytes associated with a sample.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: STL-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target analytes present above ½ RL), will be noted on the client requirements sheet.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.3.1.1.1 For long analyte spike list, marginal exceedances (ME) are allowed as follows:

13.3.1.1.2 < 11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

13.3.1.1.3 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit.

13.3.1.1.4 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit.

13.3.1.1.5 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit.

13.3.1.1.6 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit.

13.3.1.1.7 > 90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit.

13.3.1.1.8 No LCS recoveries may be outside the Marginal Exceedance limit.

13.3.1.1.9 Marginal exceedances must be random. If the same LCS analyte exceeds the control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken.

13.3.1.1.10 The LCS should have acceptable surrogate recoveries.

13.3.2 Corrective Action for LCS not meeting acceptance criteria:

13.3.2.1 LCS Spike Recovery excursion (high) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.2.2 LCS Spike Recovery excursion (low) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.2.3 RPD Duplicate excursion – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.2.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Surrogate

13.5.1 All Surrogates should be within established control limits for accuracy (%Recovery).

13.5.2 Corrective Action for Surrogate not meeting acceptance criteria:

13.5.2.1 Surrogate Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.6 Sample result evaluation

13.6.1 Dilutions

13.6.1.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.6.1.2 Dilution: Sample– See Clouseau NCM for corrective action.

13.6.1.3 Dilution: Surrogate(s) diluted out– See Clouseau NCM for corrective action.

13.6.1.4 Dilution: Surrogates(s) and/or Spike(s) diluted out– See Clouseau NCM for corrective action.

13.6.2 Carryover

13.6.2.1 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be demonstrated to not have occurred.

13.6.2.1.1 The carryover affected analyses are not reported, unless specifically requested by the client or there was insufficient extract/sample remaining to reanalyze. – See Clouseau NCM for narrative.

13.6.3 Insufficient Sample

13.6.3.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in QAM section 18.3.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in QAM section 18.3.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in QAM section 18.3.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in QAM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Environmental Health and Safety Manual for “Waste Management and Pollution Prevention.”

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Solvent waste generated. Solvent waste must be accumulated in the appropriate waste accumulation container, labeled as Drum Type “D”.

16.2.1.2 Vials containing sample extract will be accumulated in the appropriate waste accumulation container, labeled as Drum Type “C”.

17.0 REFERENCES

17.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Methods 8000B and 8000C.

17.2 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 8081B.

17.3 USEPA Wastewater Method 608.

17.4 TestAmerica Quality Assurance Manual (QAM), current revision

17.5 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.6 TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

17.7 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

17.8 Associated SOPs

17.8.1 ST-OP-0001, Labware Preparation for Organic Analysis

17.8.2 ST-OP-0002, Extraction and Cleanup of Organic Compounds from Water and Soils, Based on SW-846 3500 Series, 3600 Series, and 600 Series

17.8.3 ST-PM-0002, Sample Receipt and Chain of Custody
17.8.4 ST-QA-0002, Standard and Reagent Preparation
17.8.5 ST-QA-0005, "Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes."
17.8.6 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.8.7 ST-QA-0016, IDL/MDL Determination
17.8.8 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

18.1 Chapter 1 of SW-846 states that the method blank should not contain any analyte of interest at or above the Method Detection Limit. This SOP states that the Method Blank must not contain any analyte of interest at or above the reporting limit. Common lab contaminants are allowed to be up to 5 times the reporting limit in the blank following consultation with the client.

18.2 The surrogate calibration curve is calculated from the Pesticide mix standard. Surrogates are not included in the Technical Chlordane and Toxaphene standards.

18.3 SW846 requires that new retention time windows be established if a GC column has been shortened during maintenance. Given the matrices of the sample the laboratory receives, and the number of times the GC column may require clipping, TestAmerica St. Louis does not perform a RT study after clipping a column. RT studies done by the laboratory show that, historically, RT windows have not been greater than the method allowed 0.03 minutes. The lab defaults to a 0.03 minute RT window as allowed by the method.

18.4 Method 608 only requires a 3 point calibration. We routinely perform a 5 point calibration.

19.0 CHANGES TO PREVIOUS REVISION

19.1 Updated section 4.2 by removing Gel Permeation Chromatography (Method 3640) and Sulfur cleanup (Method 3660).

19.2 Rev 11:

19.2.1 Annual Review, No Changes.

19.3 Rev 12:

19.3.1 Annual Review, No Changes.

19.4 Rev 13:

19.4.1 Added new equipment and supplies to section 6.0.

19.4.2 Updated information regarding reagent log in section 7.0.

19.4.3 Updated instructions for initial calibrations in section 10.3.

19.4.4 Updated non-linear calibration point requirements in section 10.4.

19.4.5 Updated requirements for performing RT window studies.

Table 2	
Column Degradation Evaluation Mix	
Component	Concentration (ug/L)
4,4'-DDT	100.000
Alpha-BHC	10.000
Beta-BHC	10.000
Endrin	50.000
Gamma-BHC	10.000
Methoxychlor	250.000
Tetrachloro-m-xylene (Surrogate)	20.000
Decachlorobiphenyl (Surrogate)	20.000

Analytical Sequence

Initial Calibration

Conditioning Standard	
Hexane Blank	
Instrument Blank	
Breakdown Mix (PEM)	
Individual mix	All levels
Individual mix ICV	
Technical Chlordane	All levels
Technical Chlordane ICV	
Toxaphene	All levels
Toxaphene ICV	
2,4'-DD* Mix	All levels
2,4'-DD* Mix ICV	
Hexachlorobenzene	All levels
Hexachlorobenzene ICV	
Sample injections (maximum 10)	
Continuing Calibration Verification (CCV)	Mid level (for needed target analytes)
Sample injections (maximum 10)	
Continuing Calibration Verification (CCV)	Mid level (for needed target analytes)

Breakdown check (beginning of an analytical run and subsequently every 12 hours of continuous analysis)

TAL Reference Data Summary

Structured Analysis Code: I-10-DM-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Pesticides/PCB (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	69	140	20	C	Y	0.50	ug/L	57	150	20
226	alpha-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	140	20	C	Y	0.50	ug/L	61	150	20
228	beta-BHC	0.05	ug/L	0.013	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	38	150	20
230	delta-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	54	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	150	20
497	alpha-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	138	20	C	Y	0.50	ug/L	54	150	20
499	gamma-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	150	20
476	Chlordane (technical)	0.5	ug/L	0.231	ug/L	20100601	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	64	150	20
2779	2,4'-DDD	0.05	ug/L	0.01	ug/L	20100601														
777	4,4'-DDE	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	139	20
2781	2,4'-DDE	0.05	ug/L	0.01	ug/L	20100601														
780	4,4'-DDT	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	66	150	20
2783	2,4'-DDT	0.05	ug/L	0.02	ug/L	20100601													-	
1052	Dieldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	68	140	20	C	Y	0.50	ug/L	66	149	20
1236	Endosulfan I	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	138	20	C	Y	0.50	ug/L	64	143	20
1239	Endosulfan II	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	133	20	C	Y	0.50	ug/L	64	146	20
1241	Endosulfan sulfate	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	135	20	C	Y	0.50	ug/L	64	147	20
1270	Endrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	70	150	20
1277	Endrin aldehyde	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	57	140	20	C	Y	0.50	ug/L	47	150	20
1279	Endrin ketone	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	144	20
1470	Heptachlor	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	52	150	20
1479	Heptachlor epoxide	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	64	140	20	C	Y	0.50	ug/L	54	150	20
1741	Methoxychlor	0.1	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	60	140	20	C	Y	0.50	ug/L	58	150	20
2499	Toxaphene	2.0	ug/L	0.66	ug/L	20100601	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	76	120	0	X	Y	0.2	ug/L	74	127	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	66	127	0	X	Y	0.2	ug/L	56	136	0

TAL Reference Data Summary

Structured Analysis Code: I-KF-QJ-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Low Level, Liq/Liq, CONT (P/P)
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.025	ug/L	0.0052	ug/L	20051007	C	Y	0.50	ug/L	69	140	20	C	Y	0.50	ug/L	57	150	20
226	alpha-BHC	0.025	ug/L	0.0041	ug/L	20051007	C	Y	0.50	ug/L	71	140	20	C	Y	0.50	ug/L	61	150	20
228	beta-BHC	0.025	ug/L	0.0051	ug/L	20051007	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	38	150	20
230	delta-BHC	0.025	ug/L	0.0124	ug/L	20051007	C	Y	0.50	ug/L	54	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.025	ug/L	0.0046	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	150	20
497	alpha-Chlordane	0.025	ug/L	0.0060	ug/L	20051007	C	Y	0.50	ug/L	70	138	20	C	Y	0.50	ug/L	54	150	20
499	gamma-Chlordane	0.025	ug/L	0.0056	ug/L	20051007	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	150	20
476	Chlordane (technical)	0.250	ug/L	0.0542	ug/L	20050923	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.025	ug/L	0.0075	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	64	150	20
777	4,4'-DDE	0.025	ug/L	0.0065	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	139	20
780	4,4'-DDT	0.025	ug/L	0.0085	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	66	150	20
1052	Dieldrin	0.025	ug/L	0.0065	ug/L	20051007	C	Y	0.50	ug/L	68	140	20	C	Y	0.50	ug/L	66	149	20
1236	Endosulfan I	0.025	ug/L	0.0052	ug/L	20051007	C	Y	0.50	ug/L	66	138	20	C	Y	0.50	ug/L	64	143	20
1239	Endosulfan II	0.025	ug/L	0.0065	ug/L	20051007	C	Y	0.50	ug/L	71	133	20	C	Y	0.50	ug/L	64	146	20
1241	Endosulfan sulfate	0.025	ug/L	0.0074	ug/L	20051007	C	Y	0.50	ug/L	70	135	20	C	Y	0.50	ug/L	64	147	20
1270	Endrin	0.025	ug/L	0.0070	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	70	150	20
1277	Endrin aldehyde	0.025	ug/L	0.0071	ug/L	20051007	C	Y	0.50	ug/L	57	140	20	C	Y	0.50	ug/L	47	150	20
1279	Endrin ketone	0.025	ug/L	0.0082	ug/L	20051007	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	144	20
1470	Heptachlor	0.025	ug/L	0.0107	ug/L	20051007	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	52	150	20
1479	Heptachlor epoxide	0.025	ug/L	0.0056	ug/L	20051007	C	Y	0.50	ug/L	64	140	20	C	Y	0.50	ug/L	54	150	20
1741	Methoxychlor	0.025	ug/L	0.0187	ug/L	20051007	C	Y	0.50	ug/L	60	140	20	C	Y	0.50	ug/L	58	150	20
2499	Toxaphene	1	ug/L	0.2959	ug/L	20051007	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	76	120	0	X	Y	0.2	ug/L	74	127	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	66	127	0	X	Y	0.2	ug/L	56	136	0

TAL Reference Data Summary

Structured Analysis Code: I-KH-QJ-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Low Level Liq/Liq, CONT (P/P)
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20030214														
226	alpha-BHC	0.1	ug/L	0.0058	ug/L	20050923														
228	beta-BHC	0.1	ug/L	0.034	ug/L	20030214														
230	delta-BHC	0.1	ug/L	0.02	ug/L	20030214														
232	gamma-BHC (Lindane)	0.1	ug/L	0.0053	ug/L	20050923	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	0.250	ug/L	0.0542	ug/L	20050923	C	Y			70	130	20							
770	4,4'-DDD	0.025	ug/L	0.0056	ug/L	20050923														
777	4,4'-DDE	0.05	ug/L	0.006	ug/L	20030214														
780	4,4'-DDT	0.05	ug/L	0.014	ug/L	20030214														
1052	Dieldrin	0.1	ug/L	0.0053	ug/L	20050923														
1236	Endosulfan I	0.1	ug/L	0.0045	ug/L	20050923														
1239	Endosulfan II	0.1	ug/L	0.0066	ug/L	20050923														
1241	Endosulfan sulfate	0.1	ug/L	0.0076	ug/L	20050923														
1270	Endrin	0.1	ug/L	0.0174	ug/L	20030214	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.1	ug/L	0.0087	ug/L	20050923														
1470	Heptachlor	0.1	ug/L	0.013	ug/L	20030214	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.1	ug/L	0.0057	ug/L	20050923	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1741	Methoxychlor	0.2	ug/L	0.026	ug/L	20030214	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	4.0	ug/L	0.054	ug/L	20030213	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: **I-10-QJ-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	69	140	20	C	Y	0.50	ug/L	57	150	20
226	alpha-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	140	20	C	Y	0.50	ug/L	61	150	20
228	beta-BHC	0.05	ug/L	0.013	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	38	150	20
230	delta-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	54	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	150	20
497	alpha-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	138	20	C	Y	0.50	ug/L	54	150	20
499	gamma-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	150	20
476	Chlordane (technical)	0.5	ug/L	0.231	ug/L	20100601	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	64	150	20
2779	2,4'-DDD	0.05	ug/L	0.016	ug/L	20110624														
777	4,4'-DDE	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	139	20
2781	2,4'-DDE	0.05	ug/L	0.01	ug/L	20100601														
780	4,4'-DDT	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	66	150	20
2783	2,4'-DDT	0.05	ug/L	0.02	ug/L	20100601														
1052	Dieldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	68	140	20	C	Y	0.50	ug/L	66	149	20
1236	Endosulfan I	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	138	20	C	Y	0.50	ug/L	64	143	20
1239	Endosulfan II	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	133	20	C	Y	0.50	ug/L	64	146	20
1241	Endosulfan sulfate	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	135	20	C	Y	0.50	ug/L	64	147	20
1270	Endrin	0.05	ug/L	0.017	ug/L	20110624	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	70	150	20
1277	Endrin aldehyde	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	57	140	20	C	Y	0.50	ug/L	47	150	20
1279	Endrin ketone	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	144	20
1470	Heptachlor	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	52	150	20
1479	Heptachlor epoxide	0.05	ug/L	0.017	ug/L	20110624	C	Y	0.50	ug/L	64	140	20	C	Y	0.50	ug/L	54	150	20
1482	Hexachlorobenzene	0.05	ug/L	0.015	ug/L	20110624														
1741	Methoxychlor	0.50	ug/L	0.01	ug/L	20110624	C	Y	0.50	ug/L	60	140	20	C	Y	0.50	ug/L	58	150	20
2499	Toxaphene	2.0	ug/L	0.66	ug/L	20100601	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	76	120	0	X	Y	0.2	ug/L	74	127	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	66	127	0	X	Y	0.2	ug/L	56	136	0

TAL Reference Data Summary

Structured Analysis Code: I-14-QJ-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	50	ug/L	4.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
226	alpha-BHC	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
228	beta-BHC	50	ug/L	12.7	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
230	delta-BHC	50	ug/L	6.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
232	gamma-BHC (Lindane)	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
497	alpha-Chlordane	50	ug/L	3.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
499	gamma-Chlordane	50	ug/L	2.7	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
476	Chlordane (technical)	500	ug/L	18.0	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
770	4,4'-DDD	50	ug/L	3.8	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
777	4,4'-DDE	50	ug/L	2.7	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
780	4,4'-DDT	50	ug/L	5.6	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1052	Dieldrin	50	ug/L	2.3	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1236	Endosulfan I	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1239	Endosulfan II	50	ug/L	10.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1241	Endosulfan sulfate	50	ug/L	17.3	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1270	Endrin	50	ug/L	2.8	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1277	Endrin aldehyde	50	ug/L	3.2	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1279	Endrin ketone	50	ug/L	16.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1470	Heptachlor	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1479	Heptachlor epoxide	50	ug/L	3.2	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1741	Methoxychlor	100	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
2499	Toxaphene	2000	ug/L	330	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: I-3H-QJ-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
232	gamma-BHC (Lindane)	50	ug/L	1.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
476	Chlordane (technical)	500	ug/L	20.0	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
1052	Dieldrin	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1241	Endosulfan sulfate	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1270	Endrin	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1470	Heptachlor	50	ug/L	1.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1479	Heptachlor epoxide	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1741	Methoxychlor	100	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
2499	Toxaphene	2000	ug/L	330.0	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-44-QJ-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: I-47-QJ-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: I-48-QJ-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6190							Spike List 6191						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1482	Hexachlorobenzene	0.5	ug/L			0														
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	20	ug/L	6.02	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: A-KH-QJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Low Level Liq/Liq, CONT (P/P)
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20030214														
226	alpha-BHC	0.1	ug/L	0.0058	ug/L	20050923														
228	beta-BHC	0.1	ug/L	0.034	ug/L	20030214														
230	delta-BHC	0.1	ug/L	0.02	ug/L	20030214														
232	gamma-BHC (Lindane)	0.1	ug/L	0.0053	ug/L	20050923	C	Y	5	ug/L	81	135	20	C	Y	5	ug/L	78	141	20
476	Chlordane (technical)	0.250	ug/L	0.0542	ug/L	20050923	C	Y			70	130	20							
770	4,4'-DDD	0.025	ug/L	0.0056	ug/L	20050923														
777	4,4'-DDE	0.05	ug/L	0.006	ug/L	20030214														
780	4,4'-DDT	0.05	ug/L	0.014	ug/L	20030214														
1052	Dieldrin	0.1	ug/L	0.0053	ug/L	20050923														
1236	Endosulfan I	0.1	ug/L	0.0045	ug/L	20050923														
1239	Endosulfan II	0.1	ug/L	0.0066	ug/L	20050923														
1241	Endosulfan sulfate	0.1	ug/L	0.0076	ug/L	20050923														
1270	Endrin	0.1	ug/L	0.0174	ug/L	20030214	C	Y	5	ug/L	79	140	20	C	Y	5	ug/L	80	148	20
1277	Endrin aldehyde	0.1	ug/L	0.0087	ug/L	20050923														
1470	Heptachlor	0.1	ug/L	0.013	ug/L	20030214	C	Y	5	ug/L	65	140	20	C	Y	5	ug/L	52	150	20
1479	Heptachlor epoxide	0.1	ug/L	0.0057	ug/L	20050923	C	Y	5	ug/L	79	132	20	C	Y	5	ug/L	83	136	20
1741	Methoxychlor	0.2	ug/L	0.026	ug/L	20030214	C	Y	10	ug/L	74	138	20	C	Y	10	ug/L	69	144	20
2499	Toxaphene	4.0	ug/L	0.054	ug/L	20030213	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	78	124	0	X	Y	50	ug/L	69	131	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	79	115	0	X	Y	50	ug/L	74	121	0

TAL Reference Data Summary

Structured Analysis Code: A-13-QJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	1.7	ug/kg	0.306	ug/kg	20120228	C	Y	16.7	ug/kg	61	126	20	C	Y	16.7	ug/kg	49	135	30
226	alpha-BHC	1.7	ug/kg	0.185	ug/kg	20120228	C	Y	16.7	ug/kg	59	132	20	C	Y	16.7	ug/kg	47	145	30
228	beta-BHC	1.7	ug/kg	0.300	ug/kg	20120228	C	Y	16.7	ug/kg	58	126	20	C	Y	16.7	ug/kg	43	140	30
230	delta-BHC	1.7	ug/kg	0.242	ug/kg	20120228	C	Y	16.7	ug/kg	55	140	20	C	Y	16.7	ug/kg	50	150	30
232	gamma-BHC (Lindane)	1.7	ug/kg	0.339	ug/kg	20120228	C	Y	16.7	ug/kg	59	127	20	C	Y	16.7	ug/kg	57	128	30
497	alpha-Chlordane	1.7	ug/kg	0.567	ug/kg	20120228	C	Y	16.7	ug/kg	65	128	20	C	Y	16.7	ug/kg	54	139	30
499	gamma-Chlordane	1.7	ug/kg	0.286	ug/kg	20120223	C	Y	16.7	ug/kg	63	131	20	C	Y	16.7	ug/kg	52	147	30
476	Chlordane (technical)	17	ug/kg	3.729	ug/kg	20120214	C	Y			70	130	20	C	Y			50	150	30
770	4,4'-DDD	1.7	ug/kg	0.221	ug/kg	20120218	C	Y	16.7	ug/kg	65	134	20	C	Y	16.7	ug/kg	40	150	30
2779	2,4'-DDD	1.7	ug/kg	0.223	ug/kg	20120215														
777	4,4'-DDE	1.7	ug/kg	0.390	ug/kg	20120228	C	Y	16.7	ug/kg	62	130	20	C	Y	16.7	ug/kg	47	150	30
2781	2,4'-DDE	1.7	ug/kg	0.314	ug/kg	20120215														
780	4,4'-DDT	1.7	ug/kg	0.628	ug/kg	20120228	C	Y	16.7	ug/kg	57	140	20	C	Y	16.7	ug/kg	38	150	30
2783	2,4'-DDT	1.7	ug/kg	0.328	ug/kg	20120215														
1052	Dieldrin	1.7	ug/kg	0.215	ug/kg	20120228	C	Y	16.7	ug/kg	64	134	20	C	Y	16.7	ug/kg	45	150	30
1236	Endosulfan I	1.7	ug/kg	0.570	ug/kg	20120228	C	Y	16.7	ug/kg	61	133	20	C	Y	16.7	ug/kg	38	150	30
1239	Endosulfan II	1.7	ug/kg	0.235	ug/kg	20120228	C	Y	16.7	ug/kg	64	129	20	C	Y	16.7	ug/kg	54	141	30
1241	Endosulfan sulfate	1.7	ug/kg	0.340	ug/kg	20120228	C	Y	16.7	ug/kg	62	129	20	C	Y	16.7	ug/kg	52	144	30
1270	Endrin	1.7	ug/kg	0.158	ug/kg	20120228	C	Y	16.7	ug/kg	67	134	20	C	Y	16.7	ug/kg	51	150	30
1277	Endrin aldehyde	1.7	ug/kg	0.389	ug/kg	20120228	C	Y	16.7	ug/kg	52	129	20	C	Y	16.7	ug/kg	46	134	30
1279	Endrin ketone	1.7	ug/kg	0.417	ug/kg	20120228	C	Y	16.7	ug/kg	59	132	20	C	Y	16.7	ug/kg	50	148	30
1470	Heptachlor	1.7	ug/kg	0.204	ug/kg	20120228	C	Y	16.7	ug/kg	46	140	20	C	Y	16.7	ug/kg	28	150	30
1479	Heptachlor epoxide	1.7	ug/kg	0.429	ug/kg	20120228	C	Y	16.7	ug/kg	63	128	20	C	Y	16.7	ug/kg	45	149	30
1482	Hexachlorobenzene	1.7	ug/kg	0.450	ug/kg	20120215														
1741	Methoxychlor	3.3	ug/kg	0.719	ug/kg	20120228	C	Y	16.7	ug/kg	47	140	20	C	Y	16.7	ug/kg	37	150	30
2499	Toxaphene	67	ug/kg	15.16	ug/kg	20120214	C	Y			50	150	30	C	Y			50	150	30
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	72	116	0	X	Y	6.67	ug/kg	46	150	0
2739	Tetrachloro-m-xylene						X	Y	6.67	ug/kg	67	119	0	X	Y	6.67	ug/kg	52	127	0

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TAL Reference Data Summary

Structured Analysis Code: A-14-QJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	50	ug/kg	2.84	ug/kg	20080212	C	Y	16.7	ug/kg	56	132	20	C	Y	16.7	ug/kg	56	132	20
226	alpha-BHC	50	ug/kg	8.47	ug/kg	20080212	C	Y	16.7	ug/kg	55	136	20	C	Y	16.7	ug/kg	55	136	20
228	beta-BHC	50	ug/kg	5.59	ug/kg	20080212	C	Y	16.7	ug/kg	64	123	20	C	Y	16.7	ug/kg	64	123	20
230	delta-BHC	50	ug/kg	5.01	ug/kg	20080212	C	Y	16.7	ug/kg	58	124	20	C	Y	16.7	ug/kg	58	124	20
232	gamma-BHC (Lindane)	50	ug/kg	3.70	ug/kg	20080212	C	Y	16.7	ug/kg	64	128	20	C	Y	16.7	ug/kg	64	128	20
497	alpha-Chlordane	50	ug/kg	6.31	ug/kg	20080212	C	Y	16.7	ug/kg	60	127	20	C	Y	16.7	ug/kg	60	127	20
499	gamma-Chlordane	50	ug/kg	2.35	ug/kg	20080212	C	Y	16.7	ug/kg	65	123	20	C	Y	16.7	ug/kg	65	123	20
476	Chlordane (technical)	500	ug/kg	69.8	ug/kg	20080212														
770	4,4'-DDD	50	ug/kg	2.68	ug/kg	20080212	C	Y	16.7	ug/kg	55	140	20	C	Y	16.7	ug/kg	55	140	20
2780	o,p'-DDD	50	ug/kg	9.16	ug/kg	20080212														
2779	2,4'-DDD	50	ug/kg	9.16	ug/kg	20080212														
777	4,4'-DDE	50	ug/kg	5.77	ug/kg	20080212	C	Y	16.7	ug/kg	62	136	20	C	Y	16.7	ug/kg	62	136	20
2782	o,p'-DDE	50	ug/kg	6.01	ug/kg	20080212														
2781	2,4'-DDE	50	ug/kg	6.01	ug/kg	20080212														
780	4,4'-DDT	50	ug/kg	6.06	ug/kg	20080212	C	Y	16.7	ug/kg	61	150	20	C	Y	16.7	ug/kg	61	150	20
2784	o,p'-DDT	50	ug/kg	12.1	ug/kg	20080212														
2783	2,4'-DDT	50	ug/kg	12.1	ug/kg	20080212														
1052	Dieldrin	50	ug/kg	2.74	ug/kg	20080212	C	Y	16.7	ug/kg	66	128	20	C	Y	16.7	ug/kg	66	128	20
1236	Endosulfan I	50	ug/kg	3.16	ug/kg	20080212	C	Y	16.7	ug/kg	61	130	20	C	Y	16.7	ug/kg	61	130	20
1239	Endosulfan II	50	ug/kg	2.78	ug/kg	20080212	C	Y	16.7	ug/kg	63	128	20	C	Y	16.7	ug/kg	63	128	20
1241	Endosulfan sulfate	50	ug/kg	7.85	ug/kg	20080212	C	Y	16.7	ug/kg	61	127	20	C	Y	16.7	ug/kg	61	127	20
1270	Endrin	50	ug/kg	2.36	ug/kg	20080212	C	Y	16.7	ug/kg	65	138	20	C	Y	16.7	ug/kg	65	138	20
1277	Endrin aldehyde	50	ug/kg	5.37	ug/kg	20080212	C	Y	16.7	ug/kg	59	122	20	C	Y	16.7	ug/kg	59	122	20
1279	Endrin ketone	50	ug/kg	4.90	ug/kg	20080212	C	Y	16.7	ug/kg	63	131	20	C	Y	16.7	ug/kg	63	131	20
1470	Heptachlor	50	ug/kg	5.16	ug/kg	20080212	C	Y	16.7	ug/kg	56	140	20	C	Y	16.7	ug/kg	56	140	20
1479	Heptachlor epoxide	50	ug/kg	3.92	ug/kg	20080212	C	Y	16.7	ug/kg	64	126	20	C	Y	16.7	ug/kg	64	126	20
1741	Methoxychlor	100	ug/kg	9.46	ug/kg	20080212	C	Y	16.7	ug/kg	62	153	20	C	Y	16.7	ug/kg	62	153	20
2499	Toxaphene	2000	ug/kg	174	ug/kg	20080212														
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	57	150	0	X	Y	6.67	ug/kg	57	150	0
2739	Tetrachloro-m-xylene						X	Y	6.67	ug/kg	38	142	0	X	Y	6.67	ug/kg	38	142	0

TAL Reference Data Summary

Structured Analysis Code: A-3H-QJ-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
232	gamma-BHC (Lindane)	50	ug/L	1.5	ug/L	20080402	C	Y	16.7	ug/kg	64	128	20	C	Y	16.7	ug/kg	64	128	20
476	Chlordane (technical)	500	ug/L	20.0	ug/L	20080402														
1052	Dieldrin	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	66	128	20	C	Y	16.7	ug/kg	66	128	20
1241	Endosulfan sulfate	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	61	127	20	C	Y	16.7	ug/kg	61	127	20
1270	Endrin	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	65	138	20	C	Y	16.7	ug/kg	65	138	20
1470	Heptachlor	50	ug/L	1.5	ug/L	20080402	C	Y	16.7	ug/kg	56	140	20	C	Y	16.7	ug/kg	56	140	20
1479	Heptachlor epoxide	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	64	126	20	C	Y	16.7	ug/kg	64	126	20
1741	Methoxychlor	100	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	62	153	20	C	Y	16.7	ug/kg	62	153	20
2499	Toxaphene	2000	ug/L	330.0	ug/L	20080402														
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	57	150	0	X	Y	6.67	ug/kg	57	150	0
2739	Tetrachloro-m-xylene						X	Y	6.67	ug/kg	38	142	0	X	Y	6.67	ug/kg	38	142	0

TAL Reference Data Summary

Structured Analysis Code: A-44-QJ-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	81	135	20	C	Y	5	ug/L	78	141	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
480	Chlordane	5.0	ug/L	0.20	ug/L	20100601														
770	4,4'-DDD	0.5	ug/L	0.05	ug/L	20100601														
777	4,4'-DDE	0.5	ug/L	0.10	ug/L	20100601														
780	4,4'-DDT	0.5	ug/L	0.05	ug/L	20100601														
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	140	20	C	Y	5	ug/L	80	148	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	65	140	20	C	Y	5	ug/L	52	150	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	132	20	C	Y	5	ug/L	83	136	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	74	138	20	C	Y	10	ug/L	69	144	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	78	124	0	X	Y	50	ug/L	69	131	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	79	115	0	X	Y	50	ug/L	74	121	0

TAL Reference Data Summary

Structured Analysis Code: A-47-QJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	81	135	20	C	Y	5	ug/L	78	141	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
480	Chlordane	5.0	ug/L	0.20	ug/L	20100601														
777	4,4'-DDE	0.5	ug/L	0.10	ug/L	20100601														
780	4,4'-DDT	0.5	ug/L	0.05	ug/L	20100601														
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	140	20	C	Y	5	ug/L	80	148	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	65	140	20	C	Y	5	ug/L	52	150	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	132	20	C	Y	5	ug/L	83	136	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	74	138	20	C	Y	10	ug/L	69	144	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	78	124	0	X	Y	50	ug/L	69	131	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	79	115	0	X	Y	50	ug/L	74	121	0

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Title: PCB GC ANALYSIS [SW-846 8000C/8082A; EPA 608]

Approvals (Signature/Date):

Ben Hicks 2/12/13 Date Organics Department Manager	Michael Ridenhower 2/14/13 Date Health & Safety Manager / Coordinator
Marti Ward 2.12.13 Date Quality Assurance Manager	Elaine Wild 2/12/13 Date Laboratory Director

This SOP was previously identified as SOP No. ST-GC-0015 Rev. 10

Facility Distribution No.: 0 **Distributed To: See Electronic Distribution Sheet**

1.0 SCOPE AND APPLICATION

1.1 This SOP describes procedures to be used for the analysis of polychlorinated biphenyls (PCB) by GC/ECD. The PCBs are determined and quantitated as multi-component Aroclor mixes.

1.2 Sample preparation techniques are described in SOP ST-OP-0002.

1.3 This SOP is based on EPA SW-846 Methods 8000C and 8082A, and EPA Method 608.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Laboratory Information Management System (LIMS).

1.4.1 Additional compounds may be amendable to this method. The minimum requirement for non-standard analytes is that the reporting limit be set at the lowest required concentration that can actually be detected by the instrument, and when an MDL study can not be conducted, the MDL be set equal to the reporting limit.

2.0 SUMMARY OF METHOD

2.1 Aqueous samples are prepared for analysis using continuous or separatory funnel liquid / liquid extraction. Solid samples are prepared using sonication. Wipes are extracted by autoshaker.

2.2 After the initial preparation step, the sample is introduced to the GC and concentrations of target analytes are measured by the detector response within a defined retention time window, relative to the response to standard concentrations. The external standardization procedure is used.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (ST-QAM) for a glossary of common laboratory terms and data reporting qualifiers.

4.0 INTERFERENCES

4.1 Interferences in GC analysis arise from many compounds amenable to gas chromatography that give a measurable response on the electron capture detector. Phthalate esters, which are common plasticizers, can pose a major problem in the determinations. Interferences from phthalates are minimized by avoiding contact with any plastic materials.

4.2 Interferences co-extracted from samples will vary considerably from source to source. The presence of interferences may raise quantitation limits for individual samples. Specific cleanups may be performed on the sample extracts, including florisil cleanup (Method 3620), Gel Permeation Chromatography (Method 3640), and Sulfur cleanup (Method 3660). For PCBs the most common cleanup procedure is the Sulfuric Acid cleanup (Method 3665A).

4.3 Contamination by carryover can occur when a low concentration sample is analyzed after a high concentration sample. Co-elution of target analytes with non-targets can occur, resulting in false positives or high biased results.

4.4 Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and interferences to sample extracts. Strict attention to glassware cleaning and handling and demonstration of solvent purity will lead to minimization of these interferences.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1 The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.2 There are areas of high voltage in the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	OSHA Exposure Limit (2)	Signs and symptoms of exposure/Unusual Hazards
Hexane	Flammable Irritant	500 ppm-(TWA)	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methanol	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limits refer to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			

6.0 EQUIPMENT AND SUPPLIES

6.1 GC/ECD system: The lab utilizes a Hewlett Packard GC 5890 dual ECD system and an Agilent GC 6890 dual micro ECD system with autosampler.

6.1.1 GC column types, and instrument run conditions are posted on the individual GC instruments.

6.2 Data System – Chemstation for acquisition and Target™ for data processing.

6.3 Amber and/or clear glass vials. Crimp top seals.

6.4 Disposal pipettes.

6.5 Micro syringes- 10µL, 250µL, 500µL, 1000µL. Hamilton 1700 series.

6.6 Volumetric flasks, Class A

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 PCB primary standard solutions:

7.2.1 Primary standards are prepared by dilution of neat liquid Aroclor mix 1016/1260, and from single aroclor mixes in hexane. Primary standards must be replaced after 6 months or the manufacturer's expiration date whichever is shorter. Standards must be stored in refrigerator or freezer at $\leq 6^{\circ}$C.

7.3 Working standards:

7.3.1 The working standards are prepared in hexane from the primary standard solution for a minimum of five concentration levels of the Aroclor mix 1016/1260 and one level of the single aroclors. Working standards must be replaced after 6 months or manufacturer's expiration date whichever is shorter. All working standards expire after six months or at the expiration date of their stock standards, whichever comes sooner.

7.4 Gases for carrier and make-up: Hydrogen carrier, Nitrogen make-up.

7.5 Decachlorobiphenyl (surrogate)

7.6 Copper powder

7.6.1 Remove oxides (if powder is dark) by treating with dilute nitric acid, rinse with organic-free reagent water to remove all traces of acid, rinse with acetone, and dry under a stream of nitrogen.

7.7 Initial Calibration Verification (ICV) spiking standard is similar to calibration standards, but are from a different source or vendor and are prepared and stored in the same way as calibration standards.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Water samples are unpreserved and stored at $4 \pm 2^{\circ}$ C.

8.3 Soil samples are refrigerated at $4 \pm 2^{\circ}$ C.

8.4 Extracts must be refrigerated at $\leq 6^{o}$C.

8.5 Sample extracts need to be isolated from all potential contaminants and all standards.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 A preparation batch is composed of one to 20 environmental samples of a similar matrix, meeting the above mentioned criteria. Where no preparation method exists (example, volatile organics, water) the batch is defined as environmental samples that are analyzed together with the same process and personnel, using the same lots of reagents, not to exceed 20 environmental samples, and/or 24 hours (12 hours for GC/MS).

9.1.3 An analytical batch is composed of prepared environmental samples, extracts, digestates or concentrates that are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

9.1.4 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.5 Each analytical batch may contain up to 20 environmental samples, a Method Blank (MB), a single Laboratory Control Sample (LCS) and a Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair. In the event that there is insufficient sample to analyze an MS/MSD, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.6 Samples having different QC codes, due to non-standard client specific QC requirements, must be batched separately in the LIMS. A method blank and LCS may be shared across QC codes provided the actual “sample batch” does not exceed 20 environmental samples. Duplicates (and MS/MSD if applicable) must be performed for each separate QC code.

9.2 **Method Blank (MB)**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every batch (20 or fewer samples of the same matrix).

9.2.3 DI water is used as the blank matrix for water batches.

9.2.4 Sodium sulfate is used as the blank matrix for solid batches.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every batch.

9.3.3 DI water, spiked with the analytes of interest is used as the LCS for water batches.

9.3.4 Sodium sulfate, spiked with the analytes of interest is used as the LCS for solid batches

9.4 **Matrix Spike/Matrix Spike Duplicate (MS/MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 Additional MS/MSDs do not count towards the 20 samples in an analytical batch.

9.4.3 An MS/MSD can be prepared with every batch, although it is not a method requirement. If there is insufficient sample to perform an MS/MSD, a duplicate LCS is analyzed.

9.5 **Procedural Variations/Nonconformance and Corrective Action**

9.5.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.5.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 External standard calibration is used.

10.2 Initial Calibration

10.2.1 Prepare an Aroclor 1016/1260 and Decachlorobiphenyl (surrogate) standard at a minimum of five concentration levels. (Six points are required if a quadratic (second order) curve is used.) The low level standard should be at or below the reporting limit. The other standards define the working range of the detector. Recommended calibration levels are given in Table 1.

10.2.1.1 If a specific Aroclor is of interest for a particular project, that Aroclor may be used for the five point calibration rather than the 1016 / 1260 mix. See Client Requirements Sheet or Memo.

10.2.1.2 A single point calibration for Aroclor 1221, 1232, 1242, 1248, 1254, 1262, and 1268 is performed with every initial calibration for pattern recognition.

10.2.1.2.1 If any of the above single point Aroclors are detected, samples may be required to be re-analyzed under a five point calibration for the aroclor found. See Client Requirement Sheet to determine if this is needed.

10.2.1.3 Select 3-5 major peaks in the analyte pattern. Calculate the response using the area of these individual peaks.

10.2.1.3.1 Aroclor 1221 uses only 3 peaks due to the limited amount of peaks available to choose from.

10.2.2 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance (e.g., ECD replacement).

10.2.3 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica Corporate policy, “Calibration Point Selection”, CA-Q-T-002.

10.3 SW 8082 criteria

10.3.1 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 20%.

10.3.2 If the %RSDs in the initial calibration is > 20%, then calibration using a linear regression may be employed.

10.3.2.1 If a linear regression curve is used, the intercept of the curve at zero response must be less than + or – the reporting limit for the analyte. It is recommended that for linear regression curves the line be set through the origin.

10.3.2.2 If a linear regression curve is used, r must be $\geq$ 0.99

10.3.2.3 Weighting of data points

10.3.2.3.1 In linear, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. However, in environmental analysis, accuracy at the low end of the curve is very important. For this reason it may preferable to increase the weighting of the lower concentration points. 1/Concentration^2 weighting (often called 1/X^2 weighting) will improve accuracy at the low end of the curve and should be used if the data system has this capability.

10.4 608 Criteria

10.4.1 Method 608 only requires a 3 point calibration. We routinely perform a 5 point calibration; however, 2 points may be removed from a curve if necessary to meet 608 calibration criteria. The lowest level of the curve must be at or below the reporting limit. The other standards define the working range of the detector.

10.4.1.1 Refer to the TestAmerica Corporate policy, “Calibration Point Selection”, CA-Q-T-002.

10.4.2 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 10%.

10.4.3 If the %RSDs in the initial calibration is > 10%, then calibration using a linear regression may be employed.

10.4.3.1 If a linear regression curve is used, the intercept of the curve at zero response must be less than + or – the reporting limit for the analyte. It is recommended that for linear regression curves the line be set through the origin.

10.4.3.2 If a linear regression curve is used, r must be $\geq$ 0.995

10.4.3.3 Use of 1/Concentration^2 weighting is recommended to improve the accuracy of quantitation at the low end of the curve. The analyst should consider instrument maintenance to improve the linearity of response.

10.4.3.3.1 Weighting of data points

10.4.3.3.2 The points at the lower end of the calibration curve have less weight in determining the curve generated than points at the high concentration end of the curve. However, in environmental analysis, accuracy at the low end of the curve is very important. For this reason it is preferable to increase the weighting of the lower concentration points. 1/Concentration^2 weighting (often called 1/X^2 weighting) will improve accuracy at the low end of the curve and should be used if the data system has this capability.

10.5 Initial Calibration Verification (ICV)

10.5.1 An initial calibration verification standard must be a different standard source than the one used for the initial calibration.

10.5.1.1 The ICV is not performed for the single point aroclors.

10.5.2 An ICV must be performed with every initial calibration.

10.5.2.1 A passing ICV may be used as the opening CCV for a set of samples run following the ICV.

10.5.3 The ICV performance must be within +/- 20% D criteria.

10.5.3.1 Only the analytes present in the ICAL are evaluated for the 20% criteria.

10.5.3.2 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV or analysis of a different ICV).

10.5.3.3 Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.6 Continuing Calibration Verification (CCV)

10.6.1 A CCV may be a second source or the same source as the initial calibration standards and should be made to represent the midpoint of the curve.

10.6.2 Analyte response factors must be verified at the beginning of each analytical run (by either an ICV or a CCV), after every 10 samples and at the end of the analysis run through the analysis of a CCV.

10.6.3 It is adequate to verify calibration with a single mixture of Aroclors 1016 and 1260.

10.6.3.1 For projects with specific Aroclor requirements, a specific Aroclor may be included in the daily calibration check.

10.6.4 The calibration verification is acceptable if the %D for both 1016/1260 and the surrogate (DCB) is $\leq$ 20%.

10.6.4.1 The same criterion is used if other Aroclor verifications are performed.

10.6.4.2 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument.

10.6.4.3 If this CCV meets criteria then sample analysis may continue; however the preceding samples must be reanalyzed.

10.6.4.4 If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require re-calibration (i.e. initial calibration).

10.7 Retention Time (RT) Windows

10.7.1 Retention Time (RT) windows must be determined for all analytes.

10.7.2 Establishing RT windows:

10.7.2.1 Make an injection of all analytes of interest each day over a three day period. Calculate the standard deviation of the three retention times for each analyte (relative retention times may also be used).

10.7.2.2 The width of the retention time window for each analyte, surrogate, and major constituent in multi-component analytes is defined as ± 3 times the standard deviation of the mean absolute retention time established during the 72-hour period or 0.03 minutes, whichever is greater.

10.7.2.3 The center of the retention time window is the retention time from the average of three standards used to calculate the RT window.

10.7.2.4 The center of the window is updated with the midpoint standard of the initial calibration.

10.7.2.5 A new retention time window is established annually or each time a new column is installed.

10.7.2.5.1The new windows must be generated within one week of the installation of the new column.

10.7.2.5.2Until these standards have been run on the new column, the retention time windows from the old column may be used, updated with the retention times from the new initial calibration.

10.7.3 Retention Time Criteria

10.7.3.1 The retention times of AR 1016/1260 (and other aroclors if applicable) in each continuing calibration must be within the retention time windows established.

11.0 PROCEDURE

11.1 Allow standards, samples and sample extracts to reach ambient temperature before analysis.

11.2 Sulfur Removal

11.2.1 Sulfur Removal with Copper Powder

11.2.1.1 Transfer 1.0 mL of sample extract, and associated QC, into labeled vials.

11.2.1.2 Add approximately 2g cleaned copper powder to the vial.

11.2.1.3 Mix for one minute on a mechanical shaker.

11.2.1.4 Allow phases to separate.

11.2.1.5 Separate extract from copper by drawing the extract off with a disposable pipette.

11.2.1.6 Transfer the supernate to a clean, labeled vial.

11.3 All analysis conditions and injection volumes for samples must be the same as for the calibration standards.

11.4 Sample Introduction

11.4.1 Semivolatile analytes are introduced by direct injection of the extract. Samples, standards, and QC must be introduced using the same procedure.

11.5 Perform all qualitative and quantitative measurements. When the standards and extracts are not being used, refrigerate them at $\leq 6^{o}C$, protected from light in screw cap vials equipped with unpierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis ST-QAM.

12.2 External Standard Calculations

12.2.1 *Analyte Concentration (µg/L) in sample*

Concentration (µg/L):

$$[C] = \frac{A_x * V_t * D}{\overline{\overline{CF}} * V_i * V_s}$$

Where:

$[C]$	=	*Analyte Concentration in sample (µg/L)*
A_x	=	*Area of peak (response)*
V_t	=	*Total volume of extract (µL)*
D	=	*Dilution factor*
$\overline{CF}$	=	*Calibration factor (* $\overline{RF}$ *in target) – Response factor*
V_i	=	*Volume of extract injected (µL)*
V_s	=	*Volume of sample extracted*

12.2.2 *On column concentration*

On Column Concentration (µg/mL):

$$[OC] = \frac{A_x}{\overline{\overline{CF}}}$$

Where:

$[OC]$ = *On Column Concentration [typically expressed in µg/mL (ppm)]*

Then substitute/derive

$$[C] = [OC]\left(\frac{V_t * D}{V_i * V_s}\right)$$

When *on column concentration* $[OC]$ is equal to the *CAL-AMT (calibration amount)* of the low level standard needed to support the *reporting limit (µg/L)* and we solve the equation for *concentration (µg/L)*

Then

$$[C] \equiv RL \equiv [OC]\left(\frac{V_t * D}{V_i * V_s}\right)$$

Where:

RL = Reporting Limit

12.2.3 See Target software for additional calculations.

12.3 Manual Integrations

12.3.1 Identified compounds are reviewed for proper integration. Manual integrations are performed if necessary and are documented by the analyst or automatically by the data system. See TestAmerica policy: CA-Q-S-002, "Manual Integrations". Manual integrations are denoted with an "M" flag on the Target quantitation report.

12.4 Identification of Aroclors

12.4.1 Tentative identification of an Aroclor occurs when multi-component peaks are found within their respective retention time window for an analyte, at a concentration above the reporting limit, or above the MDL if J flags are required.

12.4.2 Definitive Aroclor identification is based primarily on pattern recognition. Retention times and retention time windows are used to tentatively identify Aroclors, but the fingerprint produced by major peaks of those analytes in the standard is used in tandem with the retention times for identification. The ratios of the areas of the major peaks are also taken into consideration. Identification may be made even if the retention times of the peaks in the sample fall outside of the retention time windows of the standard, if in the analyst's judgment the fingerprint (retention time and peak ratios) resembles the standard chromatogram.

12.4.3 When samples are analyzed from a source known to contain specific Aroclors, the results from a single-column analysis may be confirmed on the basis of a clearly recognizable Aroclor pattern. Source-specific information, such as historical data, indicating the anticipation of Aroclors must be documented. The pattern of peaks can serve as confirmation depending of the client specific project requirements.

12.5 Quantitation of Aroclors

12.5.1 Use three to five major peaks when calibrating Aroclors. Choose peaks distinctive of the individual Aroclor. Any manual integration made in the ICAL levels must be noted and be made in any subsequent samples to maintain consistency with the initial calibration. These same three to five peaks are then used to calculate the response/concentration of the Aroclor(s) when present in a sample.

12.5.1.1 For Aroclor 1221 only three peaks are used due to the limited number of peaks available.

12.5.1.2 In instances where less than five peaks are used those peaks that are not used are said to be "dropped" and an NCM must be written. When quantitating Aroclors 1016/1260 in an LCS/D and/or MS/MSD, all five peaks must be used. In samples, less than the standard five peaks may be used to quantitate target analytes if there is demonstrated matrix interferences and/or if multiple, overlapping Aroclors are present. If there is a predominance of one Aroclor that elutes next to and shares peaks with another Aroclor and it is apparent to the analyst that the lesser Aroclor's concentration is elevated significantly by the more dominant Aroclor, then three peaks may be dropped and an NCM written. It is never allowable to quantitate an Aroclor using only one peak.

12.5.2 If well distinguishable Aroclor patterns are present, then multiple Aroclors are quantitated and reported.

12.5.2.1 Aroclor elution times may overlap and one or more Aroclor peaks may be "shared" with another Aroclor. When this occurs, only the predominant Aroclor is quantitated and reported. Aroclors sharing elution time and peaks include: 1016, 1232, 1242, 1248 – these cannot be identified together (unless quantitating an MS/D where Aroclor 1016 is known to be present). Aroclors 1260 and 1262 also share peaks; only one of these can be reported (unless quantitating and MS/D where 1260 is known to be present).

12.5.3 Dual Column Quantitation

12.5.3.1 Dual column confirmation is required for positive Aroclor identification. A secondary column using an alternate phase is employed and the sample is injected simultaneously into both a primary and secondary column. Elution times often differ, as does overall pattern/fingerprint of Aroclors between the two columns. Determination of target analytes on the secondary column is made in the same way as on the primary column. Target analytes may be reported from either column.

12.5.3.2 Report the lower result of the two columns, unless the Client SOW requires that the higher result be reported. See Client Requirement Sheet for determination.

12.5.3.2.1 For non-detect (ND) results, report from the primary channel if all QC and CCVs are acceptable. If the QC and CCVs are only acceptable on the secondary column, report the non-detects from this column.

12.5.3.2.2 If the %D between the two columns is greater than 40%, report the higher result if there are obvious chromatographic interferences on the column with the lower result.

12.5.3.2.3 If one result is significantly higher (e.g., >40%), check the chromatograms to see if an obviously overlapping peak is causing an erroneously high result. If no overlapping peaks are noted, examine the baseline parameters established by the instrument data system (or operator) during peak integration. If no anomalies are noted, review the chromatographic conditions.

12.5.3.2.3.1 If there is no evidence of chromatographic problems, report the lower result. The data user should be advised of the disparity between the results on the two columns.

12.5.3.2.3.2 Use the higher result if there is obvious chromatographic interference on the column with the lower result.

12.5.3.3 The QC should be reported from the column that reflects the column used for the majority of the samples associated with the QC.

12.5.3.4 The surrogate should be reported from the column used for the reporting of the sample results.

12.6 Dilutions

12.6.1 If concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample data is “E” flagged and the sample must be diluted and reanalyzed. Dilutions should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the calibration range. Target analytes with resulting concentrations lower than the dilution adjusted RL should be flagged with a “J” qualifier.

12.6.2 It may be necessary to dilute samples due to matrix.

12.7 Carryover

12.7.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.7.1.1 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

12.7.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the LIMS Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036.

13.2 Method Blank (MB)

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target analytes present above ½ RL), will be noted on the client requirements sheet.

13.2.1.3 The Method Blank must have acceptable surrogate recoveries.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 Method Blank Contamination – Blank contamination above the RL (>1/2 RL for some programs – see specific Client Requirement Memos for details) requires re-prep of batch unless all associated samples are < RL or greater than 10 times the amount detected in the method blank.

13.2.2.2 Method Blank Surrogate excursion – If excursion is limited to the blank, data may be reported with an NCM. If surrogates are also outside criteria in samples, re-prep and re-analysis is required. In cases where the surrogate recovery is high and the samples are non-detect, the data may be reported with an NCM.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes must be within established control limits for accuracy (%Recovery) and precision (RPD).

13.3.1.2 The LCS must have acceptable surrogate recoveries.

13.3.2 Corrective Action for LCS not meeting acceptance criteria:

13.3.2.1 LCS Spike Recovery excursion (high) – Samples that are non-detect may be reported with an NCM (unless prohibited by client requirements). Samples with detects for the analyte recovered high in the LCS are re-prepped and re-analyzed. In cases where the surrogate recovery is high and the samples are non-detect, the data may be reported with an NCM

13.3.2.2 LCS Spike Recovery excursion (low) – batch is re-prepped and re-analyzed.

13.3.2.3 LCS Surrogate Recovery excursion – If excursion is limited to the LCS, data may be reported with an NCM. If target analytes are in control in the LCS, data may be reported with an NCM. If surrogates are also outside criteria in samples, re-prep and re-analysis is required.

13.3.2.4 RPD excursion for LCS/LCSD – If target analytes recoveries are in control, data may be reported with an NCM.

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.2.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. If affected analyte concentration in the original sample is greater than four times the amount spiked, percent recovery information is ineffective. Data is reported with an NCM. If the excursion is due to a physically evident matrix interference, the data is reported with an NCM (the physical interference must be described in the NCM). If there is no evidence of interference and the RPD as well as spike recoveries out outside limits out, sample re-prep and re-analysis are required.

13.5 Surrogate

13.5.1 All Surrogates should be within established control limits for accuracy (%Recovery).

13.5.2 Corrective Action for Surrogate not meeting acceptance criteria:

13.5.2.1 Surrogate Spike Rec. excursion may not necessarily warrant corrective action other than narration.

13.6 Sample Result Evaluation

13.6.1 Dilutions

13.6.2 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.1.1.1 Dilution: Sample– An NCM is written to document the reason for the dilution

13.1.1.2 Dilution: Surrogate(s) and/or spikes diluted out– Dilution: Surrogate(s) and/or spike(s) diluted out– An NCM is written to document the reason for the dilution.

13.6.3 Carryover

13.6.3.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.6.3.2 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.6.3.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.7 Insufficient Sample

13.7.1 For each prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis a narrative comment stating such is included in the report case narrative.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are maintained in the LIMS.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the ST-QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the ST-QAM.

14.1 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the ST-QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on published methods (EPA, DOE, ASTM, Eichrom, Standard Methods) and do not require validation by the laboratory. The requirements for laboratory demonstration of capability are included in the ST-QAM. Laboratory validation data would be appropriate for performance based measurement systems, non-standard methods and significant modifications to published methods. Data from said validations is held in the QA department.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Acidic sample waste generated. All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "A" or "B".

16.2.1.2 Solvent waste generated. Solvent waste must be accumulated in the appropriate waste accumulation container, labeled as Drum Type "D".

16.2.1.3 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

16.2.1.4 Expired primary and working PCB standards shall be segregated and placed into the proper satellite accumulation container specifically for PCB waste which is located within the GC lab.

17.0 REFERENCES

17.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 8000C.

17.2 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 8082A, 8081B Update IV, February 2007and EPA 608 Method.

17.3 TestAmerica St. Louis Quality Assurance Manual (ST-QAM), current revision

17.4 Corporate Environmental Health and Safety Manual (CW-E-M-001), current revision

17.5 TestAmerica Policy CA-Q-S-002, Manual Integrations

17.6 TestAmerica Policy CA-Q-T-002, Calibration Point selection

17.7 Associated SOPs

17.7.1 ST-OP-0001, Labware Preparation for Organic Analysis

17.7.2 ST-OP-0002, Extraction and Cleanup of Organic Compounds from Water and Soils, Based on SW-846 3500 Series, 3600 Series, 8151A and 600 Series

17.7.3 ST-OP-0003, Extraction of PCB in Oil

17.7.4 ST-QA-0002, Standard and Reagent Preparation

17.7.5 ST-QA-0005, "Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes."

17.7.6 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts

17.7.7 ST-QA-0016, IDL/MDL Determination

17.7.8 ST-QA-0036, Non-conformance Memorandum (NCM) Process

17.7.9 ST-PM-0002, Sample Receipt and Chain of Custody

18.0 MODIFICATIONS FROM REFERENCE METHOD

18.1 Chapter 1 of SW-846 states that the method blank should not contain any analyte of interest at or above the Method Detection Limit. This SOP states that the Method Blank must not contain any analyte of interest at or above the reporting limit. Common lab contaminants are allowed to be up to 5 times the reporting limit in the blank following consultation with the client.

18.2 The surrogate calibration curve is calculated from the Aroclor 1016/1260 mix. Surrogates in the other calibration standards are used only as retention time markers.

18.3 Method 608 only requires a 3 point calibration. We routinely perform a 5 point calibration; however, 2 points may be removed from a curve if necessary to meet 608 calibration criteria. The lowest level of the curve must be at or below the reporting limit.

19.0 CHANGES FROM PREVIOUS REVISION

19.1 Updated the table one regarding the levels of calibration of Aroclor 1016/1260 and the amount of the surrogate used, Decachlorobipenyl.

19.2 Rev 10:

19.2.1 Removing holding times for PCB's in section 8.0

19.3 Revision 11:

19.3.1 Removed references to QuantIMS and Clouseau – replaced with LIMS.

19.3.2 Added software information to Section 6.

19.3.3 Added composition of Method Blank and LCS to Section 9.

19.3.4 Added requirement for 6 points for non-linear curves to Section 10.

19.3.5 Added Reporting limit calculations to Section 12

19.3.6 Added specific corrective actions to Section 13

19.3.7 Updated text in Section 15 to include methods beyond those approved by EPA.

Table 1								
Calibration Levels ng/ml								
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	
Aroclor 1016/1260	50	100 Reporting Limit	250	500	1000 ICV/CCV	2000	4000	
The surrogate is included with all calibration mixes at the following levels								
Decachlorobiphenyl	2.5	5	12.5	25	50	100	200	

* Level 1 is optional.
Aroclors 1232, 1221, 1242, 1248, 1254, 1262 and 1268 may be quantitated within the range 100 to 4000 ng/mL

Analytical Sequence

Initial Calibration
Injection #

1	Solvent blank (optional)	
2	Aroclor 1016/1260	Level 1
3	Aroclor 1016/1260	Level 2
4	Aroclor 1016/1260	Level 3
5	Aroclor 1016/1260	Level 4
6	Aroclor 1016/1260	Level 5
7	Aroclor 1232	Level 3
8	Aroclor 1242	Level 3
9	Aroclor 1248	Level 3
10	Aroclor 1221/1254	Level 3
11	Aroclor 1262	Level 3
12	Aroclor 1268	Level 3
13	Independent Calibration Verification (ICV) standard	
14-24	Sample Injections (max.10)	
25	Aroclor 1016/1260	Level 3

Title: AROMATIC VOLATILES AND VOLATILE PETROLEUM HYDROCARBONS BY GC-PID/FID [SW-846 8015B, 8021B; IOWA OA-1]

Approvals (Signature/Date):

Ben Hicks 7/31/12	Michael Ridenhower 7/31/12
Ben Hicks — Date	Michael Ridenhower — Date
Organics Manager	Health & Safety Manager / Coordinator
Marti Ward 7/31/12	Elaine Wild 7/31/12
Marti Ward — Date	Elaine Wild — Date
Quality Assurance Manager	Laboratory Director

This SOP was previously identified as SOP No. ST-GC-0014 Rev 10

Facility Distribution No.: 0   Distributed To: See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This SOP describes sample preparation and analysis of volatile petroleum hydrocarbons, including Benzene, Toluene, Ethylbenzene, Xylenes, MTBE and Gasoline, by a purge and trap GC-PID/FID procedure, following method OA-1.

1.2 This SOP describes sample preparation and analysis of aromatic volatile organics by a purge and trap GC PID procedure, following SW-846 methods 8000C and 8021B.

1.2.1 TestAmerica St. Louis does not perform the halogenated volatile organics portion of method 8021B.

1.3 This SOP describes sample preparation and analysis of volatile petroleum hydrocarbons. Gasoline Range Organics (GRO) correspond to the range of alkanes from C6 to C10 and cover a boiling point range of approximately 60^{o}C-170^{o}C. This procedure follows SW-846 methods 8000C and 8015B.

1.4 Water samples and soil samples with low levels of contamination may be analyzed directly by purge-and-trap extraction and gas chromatography. Higher concentrations of the analytes in soil may be determined by a methanol extraction procedure.

1.5 Water samples are prepared in accordance with SW-846 method 5030A. Soil samples are prepared in accordance with SW-846 method 5035. For specific client projects, the superceded SW-846 method 5030 may be used for soil analyses.

1.6 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 Helium gas is bubbled through the sample heated at 40^{o}C, and the volatile components are transferred from the aqueous phase to the vapor phase. The vapor is swept through a column where the volatile components are absorbed. After purging is completed, the column is heated and flushed with inert gas to desorb the components onto a gas chromatographic column. Hydrogen gas carries the analytes onto the GC column, where they are separated and finally detected by a Photo Ionization Detector (PID) and Flame Ionization Detector (FID) in tandem.

2.1.1 The GC is hooked up to two detectors that work in tandem. Analytes leave the column and enter the photo ionization detector (PID). The OA-1 compounds are analyzed using the PID. Compounds vent from the PID and go into the FID for further analysis by EPA Method 8015M.

2.2 If an aqueous or solid sample exhibits high level contamination, a portion of the sample is dispersed in methanol to dissolve the volatile organic constituents. An aliquot is extracted with methanol and combined with water in a purging chamber, and analyzed by purge-and-trap GC following the standard procedure for water samples.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual for a glossary of common laboratory terms and data reporting qualifiers.

3.2 For the Method 8015, Gasoline is defined as hydrocarbon peaks eluting in the carbon range C6-C10.

3.3 For the OA-1 Method, Gasoline is defined by its elution pattern.

4.0 INTERFERENCES

4.1 Impurities in the purge gas, and organic compounds out-gassing from the plumbing ahead of the trap, account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks. The use of non-TFE plastic tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

4.2 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) through the septum seal of the sample vial during shipment and storage. A trip blank prepared from organic-free reagent water and carried through sampling and handling protocols serves as a check on such contamination.

4.3 Contamination by carryover can occur whenever high-concentration and low-concentration samples are analyzed sequentially. The determination of carryover is mad by checking for trap contamination, and examining the positive hits in each sample against those is the sample run just before it.

4.4 The method is non-specific and all co-extracted compounds will be detected. Any GC chromatographable compound, organic or inorganic, which gives a flame detector response in the retention time window selected will be included in the quantification of total petroleum hydrocarbons.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS
The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them. There are areas of high voltage in both the gas chromatograph. Depending on the type of work involved, the analyst need to either turn off the power to the instrument, or disconnect it from its source of power.

5.3 PRIMARY MATERIALS USED
The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a de-fatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weight Average			

6.0 EQUIPMENT AND SUPPLIES

6.1 Gas Chromatograph (GC), Agilent 5890 with a Photo Ionization Detector (PID) and Flame Ionization Detector (FID) system with Archon autosampler, purge and trap concentrator.

6.2 GC column type, trap, and instrument run conditions are posted on the individual GC instruments.

6.3 Micro syringes – 10µL, 25µL, 100µL, 250µL, 500µL, and 1000µL. These should be equipped with a 20 gauge (0.006” ID) needle.

6.4 Gas tight syringes – 5 mL and 25 mL.

6.5 Volumetric flasks, Class A

6.6 pH paper

6.7 Vortex mixer

6.8 Analytical Balance, capable of weighing ± 0.01 grams

6.9 Glass beads: Store in a drying oven.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP STL-QA-0002, current revision.

7.2 Methanol: purge and trap grade.

7.3 Water: HPLC grade or equivalent.

7.4 Surrogate Spike Mix: a,a,a-Trifluorotoluene in methanol.

7.4.1 This standard has a maximum lifetime of six months.

7.5 Calibration standards, NIST traceable:

7.5.1 The Gasoline standard in methanol at a concentration of 1000 ug/mL.

7.5.2 The aromatic volatiles standard contains the following compounds 20 ug/mL MTBE, toluene, ethylbenzene, benzene, o-xylene, and m,p-xylene. (resulting in 60 ug/mL for Xylenes, total)

7.5.3 Working standards are good for 6 months from the date made, unless the parent expires first. If component breakdown occurs, (MTBE breakdown is common) replace the standard.

7.5.4 Gases for carrier and make- up: Hydrogen- carrier, Air – makeup.

7.6 ICV standards, NIST traceable:

7.6.1 Gasoline in methanol at a concentration 2500-µg/mL.

7.6.1.1 Due to manufacturer differences in hydrocarbon types, the ICV is from the same vendor but a separate standard lot from the calibration standard.

7.7 Marker Standards 2-methylpentane and 1,2,4-trimethylbenzene

7.8 The aromatic volatiles ICV standard is a second source from the calibration standard.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Aromatic volatiles water samples are preserved with 1:1 HCl and stored at 4 ± 2 °C. Analysis hold time is 14 days from collection.

8.3 GRO water samples may or may not be chemically preserved with HCl and stored at 4 ± 2 °C. Analysis hold time is 14 days from collection with or with chemical preservation.

8.4 Aqueous samples are stored in glass containers with Teflon lined septa at $4^{o}C$ +/- $2^{o}C$, with minimum headspace.

8.5 Soil samples are refrigerated at 4 ± 2 °C. Analysis hold time is 14 days from collection.

8.5.1 Medium level solid extracts are aliquoted into 2 - 5 mL glass vials with Teflon lined caps and stored at $4^{o}C$ +/- $2^{o}C$. The extracts are stored with minimum headspace.

8.6 For 5035 analysis

8.6.1 Solid samples, for low level analysis, may be field preserved with sodium bisulfate solution, or collected unpreserved using the Encore (or equivalent)™ sampler and shipped to the laboratory within 48 hours of sampling.

8.6.1.1 Following shipment back to the lab the soil is preserved with sodium bisulfate or kept frozen until analysis.

8.6.1.2 It is recommended that two Encore (or equivalent) samplers be used for each field sample position, to allow for any reruns than may be necessary.

8.6.2 Solid samples, for medium level analysis, may be field extracted with methanol, or collected unpreserved using the Encore (or equivalent)™ sampler and shipped to the laboratory within 48 hours of sampling.

8.6.2.1 It is recommended that two Encore (or equivalent) samplers be used for each field sample position, to allow for any reruns than may be necessary.

8.6.2.2 Solid samples – field extracted with methanol

8.6.2.2.1 Prepare a 2 oz sample container by adding 25 mL purge and trap grade methanol. (If a 5 g sample is to be used, add 5 mL methanol to a 2 oz container or VOA vial).

8.6.2.2.2 Seal the bottle and attach a label.

8.6.2.2.3 Weigh the bottle to the nearest 0.01g and note the weight on the label.

8.6.2.2.4 Ship with appropriate sampling instructions.

8.6.2.2.4.1 At client request, the methanol addition and weighing may also be performed in the field.

8.6.2.2.4.2 When the samples are returned to the lab, obtain the weight of the soil added to the vial and note on the label.

8.6.2.3 Solid samples – field extracted with methanol

8.6.2.3.1 When the samples are returned to the lab, extrude the (nominal) 5g (or 25g) sample into a pre-weighed VOA vial containing 5mL methanol (25mL methanol for the 25g sampler). Obtain the weight of the soil added to the vial and note on the label.

8.7 An additional sample is collected for percent moisture determination.

8.8 At specific client request, unpreserved soils packed into glass jars or brass tubes may be accepted and sub-sampled in the lab.

8.8.1 This is an older procedure based on method 5030A.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents. Where no preparation method exists (e.g. water sample volatile organics, water sample anion analysis) the batch is comprised of a maximum of 20 environmental samples which are analyzed together with the same process, lots of reagents and personnel.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), Matrix Spike (MS) and Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a MS/MSD, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.4 Samples having different QC codes, due to non-standard client specific QC requirements, must be batched separately in the LIMS. A method blank and LCS may be shared across QC codes provided the actual “sample batch” does not exceed 20 environmental samples. Duplicates (and MS/MSD if applicable) must be performed for each separate QC code.

9.2 **Method Blank**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be analyzed with every analysis water or low soil batch.

9.2.3 A method blank must be prepared with every medium level soil batch (20 or fewer samples of the same matrix). The medium level method blank is tied to an extraction and does not require repeated analysis with each sample analysis batch.

9.2.4 For Water analyses, the method blank is comprised of HPLC water.

9.2.5 For Soil analyses, the method blank is comprised of glass beads.

9.3 **Laboratory Control Sample**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be analyzed with every analysis water or low soil batch.

9.3.3 An LCS must be prepared with every medium level soil batch (20 or fewer samples of the same matrix).

9.3.3.1 The medium level LCS is tied to an extraction and does not require repeated analysis with each sample analysis batch.

9.3.4 For Water analyses, the LCS is comprised of HPLC water fortified with aromatic volatiles (the PID portion) or gasoline (the FID portion).

9.3.4.1 For water analyses, the LCS and ICV are the identical. If an ICV was already run in the 12 hour analysis clock, the analyst may chose to omit running a second LCS. The ICV is uploaded as the LCS.

9.3.5 For Soil analyses, the LCS is comprised of glass beads fortified with aromatic volatiles (the PID portion) or gasoline (the FID portion).

9.3.6 A separate aromatic volatiles (the PID portion) LCS and gasoline (the FID portion) LCS is performed.

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 MS/MSD samples do not count towards the 20 environmental samples in a sample batch.

9.4.3 MS/MSD samples, when requested, must be performed with every sample batch and every LIMS batch.

9.4.4 A separate aromatic volatiles (the PID portion) MS/MSD and gasoline (the FID portion) MS/MSD is required.

9.5 **Surrogate**

9.5.1 A surrogate is a non-target analyte similar in chemical composition and behavior, which mimics the target analytes during preparation, extraction and analysis.

9.5.2 Surrogate(s) is added to every field sample, method blank, LCS and MS/MSD for analysis at the beginning of the sample preparation process.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 External standard calibration is used.

10.2 The PID initial calibration (the aromatic volatile portion) and the FID initial calibration (the volatile petroleum hydrocarbon portion) are independent calibrations and need not be performed within the same 12 hour shift.

10.2.1 A failed PID initial calibration does not require the FID initial calibration to be repeated and vice versa; however, the analyst may elect to run them jointly.

10.3 Sample peak areas are compared to peak areas of the standards. The ratio of the detector response to the amount concentration of analyte in the calibration standard is defined as the response factor (RF) or calibration factor (CF).

10.4 **PID Initial Calibration**

10.4.1 Prepare a multi-point calibration curve by fortifying 5ml of HPLC water with incrementing concentrations of BTEX/MTBE standard.

10.4.2 Analyze standards in ascending order.

10.4.3 The initial calibration contains a minimum of 5 points, for each target. The low level standard must be at or below the reporting limit. The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.4.3.1 Note OA-1 requires a minimum 3 point calibration. The low level standard must be at or below the reporting limit. The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.4.4 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance.

10.4.5 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica Policy CA-T-P-0002, Selection of Calibration Points.

10.4.6 For initial calibration criteria see section 10.6

10.5 **FID Initial Calibration**

10.5.1 Prepare a multi-point calibration curve by fortifying 5ml of HPLC water with incrementing concentrations of Gasoline standard.

10.5.2 Analyze standards in ascending order.

10.5.3 The initial calibration contains a minimum of 5 points, for each target. The low level standard must be at or below the reporting limit. The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.5.3.1 Note OA-1 requires a minimum 3 point calibration. The low level standard must be at or below the reporting limit. The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.5.4 For initial calibration criteria see section 10.6

10.6 **Initial Calibration Criteria**

10.6.1 SW-846 chromatographic methods allow the use of both linear and non-linear models for the calibration data.

10.6.2 The first way is to begin with the simplest approach, the linear model through the origin, and then progress through other options until the calibration acceptance criteria are met. The second way is to use technical knowledge of the detector response to the target compound to choose the calibration model.

10.6.3 The option for non-linear calibration may be necessary to address specific instrumental techniques. However, it is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance.

10.6.4 **Linear calibration using the average response factor**

10.6.4.1 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 20% for each target analyte.

10.6.4.2 If the %RSDs in the initial calibration is > 20%, then calibration using a linear regression may be employed.

10.6.5 **Linear calibration using a least squares regression**

10.6.5.1 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.6.5.2 r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.6.5.3 **Linear calibration using a least squares regression, forcing thru zero**

10.6.5.3.1 Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration. In essence, if the curve is forced through zero, the intercept is set to 0 *before* the regression is calculated, thereby setting the bias to favor the low end of the calibration range by "pivoting" the function around the origin to find the best fit and resulting in one less degree of freedom. It may be appropriate to force the regression though zero for some calibrations.

10.6.5.3.2 Curve must still meet criteria in 10.6.5.1 and 10.6.5.2.

10.6.5.4 **Linear calibration using a least squares regression, weighting of data points**

10.6.5.4.1 In linear, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. For this reason it may preferable to increase the weighting of the lower concentration points. 1/Concentration^2 weighting (often called $1/X^2$ weighting) to improve accuracy at the low end of the curve.

10.6.5.4.2 Curve must still meet criteria in 10.6.5.1 and 10.6.5.2.

10.6.6 **Non-linear calibration**

10.6.6.1 In situations where the analyst knows that the instrument response does not follow a linear model over a sufficiently wide working range, or when the other approaches have not met the acceptance criteria, a non-linear calibration model may be employed.

10.6.6.2 It is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance. Thus, non-linear calibrations are not be employed for analytes shown to consistently exhibit linear calibration for the analytes of interest.

10.6.6.3 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.6.6.4 r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.6.6.5 If a quadratic curve fit is used, a minimum of 6 points are required.

10.7 **Initial Calibration Verification (ICV)**

10.7.1 The initial calibration verification standard should be from a different standard source than the one used for the initial calibration. Due to manufacturer differences in hydrocarbon types, the Gasoline ICV is from the same vendor but a separate standard lot from the calibration standard.

10.7.2 An ICV must be performed with each initial calibration.

10.7.3 The ICV performance must be within +/- 15% D criteria for each analyte.

10.7.3.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard.

10.7.3.2 Corrective action must be taken (including reanalysis of the ICV or analysis of a different ICV).

10.7.3.3 Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.8 **Continuing Calibration Verification (CCV)**

10.8.1 A CCV may be from the same source as the calibration or may be from a second source.

10.8.2 Analyte response factors must be verified at the beginning of each analytical run (either by an ICV or a CCV), after every 10 samples and at the end of the analytical run, by analyzing a mid-level calibration standard.

10.8.2.1 The ending CCV may be omitted for OA-1.

10.8.3 Analyze a CCV for the aromatic volatiles and/or gasoline being analyzed. It is not necessary to analyze both CCVs if only the PID or FID analysis is required for the set of samples.

10.8.4 The aromatic volatiles CCV %D must be within +/- 15%D.

10.8.4.1 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument.

10.8.4.1.1 If this second CCV meets the acceptance criteria the analysis run may continue; however, the preceding samples must be reanalyzed.

10.8.4.1.2 If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require calibration.

10.8.5 The gasoline CCV %D must be within +/- 15%D.

10.8.5.1 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument.

10.8.5.1.1 If this second CCV meets the acceptance criteria the analysis run may continue; however, the preceding samples must be reanalyzed.

10.8.5.1.2 If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require calibration.

10.9 **Marker Standards**

10.9.1 Marker Standards are run daily per the requirements of the method being utilized.

10.9.1.1 Method 8015 GRO analysis: Marker standards used to determine the retention time range are 2-methylpentane and 1,2,4-trimethylbenzene.

10.10 **Retention Time (RT) Windows**

10.10.1 Retention Time (RT) windows must be determined for all analytes.

10.10.1.1 Establishing RT windows:

10.10.1.1.1 Make an injection of all analytes of interest each day over a three day period. Calculate the standard deviation of the three retention times for each analyte (relative retention times may also be used).

10.10.1.1.2 The width of the retention time window for each analyte, surrogate, and major constituent in multi-component analytes is defined as ± 3 times the standard deviation of the mean absolute retention time established during the 72-hour period or 0.03 minutes,whichever is greater.

10.10.1.1.3 The center of the retention time window is the retention time from the average of three standards used to calculate the RT window.

10.10.1.1.4 The center of the window is updated with the midpoint standard of the initial calibration.

10.10.1.1.5 A new retention time window is established each time a new column is installed or the GC column has been shortened during maintenance.

10.10.1.1.5.1 The new windows must be generated within one week of the installation of the new column.

10.10.1.1.5.2 Until these standards have been run on the new column, the retention time windows from the old column may be used, updated with the retention times from the new initial calibration.

10.10.2 Retention Time Criteria

10.10.2.1 The retention times of all compounds in each continuing calibration must be within the retention time windows established.

10.10.2.1.1 If this condition is not met, all samples analyzed after the last compliant standard must be reanalyzed.

10.10.2.1.2 The retention time range for GRO is defined during initial calibration. Two specific gasoline components are used to establish the range, 2-methylpentane and 1,2,4-trimethylbenzene. The procedure described in

Method 8000 is used to establish the retention time windows for these two components. The GRO retention time range is then calculated based on the lower limit of the RT window for the first eluting component and the upper limit of the RT window for the last eluting component.

11.0 PROCEDURE

11.1 Allow standards, samples and sample extracts to reach ambient temperature before analysis.

11.2 All analysis conditions and injection volumes for samples must be the same for the calibration standards. (Including purge time and flow desorb time and temperature, column temperatures, multiplier setting etc.).

11.3 Water, soil and medium level extract analyses are all performed by heated purge (40^{o}C).

11.4 **<u>Water Sample Preparation (5030B method)</u>**

11.4.1 Remove 5ml sample with 5ml syringe.

11.4.2 Transfer the 5ml sample into an empty labeled 40ml VOA vial.

11.4.3 Add 5ul or 10ul of surrogate to sample.

11.4.3.1 Prepare a method blank with 5µL surrogate (8021B) or 10µL surrogate (8015B) using 5ml of HPLC water.

11.4.3.2 Prepare a LCS with 5µL of surrogate (8021B) or 10µL surrogate (8015B) and 10µL of spike (8015B) or 20µL of spike (8021B) 5ml of HPLC water.

11.4.3.3 For samples designated for MS/MSD analysis, add 10µL (8015B) or 20µL (8021B) of spiking solution.

11.4.4 Seal the vial.

11.4.5 Check and document the pH of the sample of the remaining sample.

11.4.5.1 Do not check pH prior to taking aliquot for analysis.

11.5 **<u>Low-Level Soil Preparation (5035A method)</u>**

11.5.1 If samples arrive unpreserved, the laboratory must, within 48 hours of collection, preserve samples with sodium bisulfate or by freezing.

11.5.1.1 Check the preparation method code of the SAC to determine preservation.

11.5.1.1.1 Sodium bisulfate code: 4D

11.5.1.1.2Freezing code: 4P

11.5.2 <u>If samples arrive in the Encore (or equivalent) sampler and require Sodium bisulfate preservation</u>:

11.5.2.1 Pre-weigh a labeled 40ml VOA vial.

11.5.2.1.1Label with an indelible marker rather than a paper label, since paper labels may cause the autosampler to bind and malfunction.

11.5.2.2 Extrude the soil sample from the Encore (or equivalent) sampler into the VOA vial.

11.5.2.3 Weigh the vial to the nearest 0.05g.

11.5.2.4 Record weight on the label and runlog.

11.5.2.5 Add a magnetic stir bar, approximately 1g of sodium bisulfate and 5mL of HPLC water.

11.5.2.5.1Soils containing carbonates may effervesce when adding the sodium bisulfate solution. If this is the case, retrieve a second Encore sample plug, add 5mL of water instead, and freeze at <10^{o}C until analysis.

11.5.2.6 Seal the vial.

11.5.2.7 Add 5ul surrogate (8021B) or 10µL surrogate (8015B) through the septum to each sample and QC.

11.5.2.7.1For samples designated for MS/MSD analysis, add 10µL (8015B) or 20µL (8021B) of spiking solution to the vials.

11.5.2.7.2Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) to the vial.

11.5.2.7.3Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) and 10µL (8015B) or 20µL (8021B) of spiking solution.

11.5.3 <u>If samples arrive 40ml VOA vial already preserved with Sodium bisulfate</u>:

11.5.3.1 Add 5µL of surrogate (8021B) or 10µL surrogate (8015B) through the septum to each sample and QC.

11.5.3.1.1 For samples designated for MS/MSD analysis, add 10µL (8015B) or 20µL (8021B) of spiking solution to the vials.

11.5.3.1.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) to the vial.

11.5.3.1.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) and 10µL (8015B) or 20µL (8021B) of spiking solution.

11.5.4 <u>If samples arrive in the Encore (or equivalent) sampler and require freezing as preservation:</u>

11.5.4.1 Freeze sample until time of analysis.

11.5.4.2 Pre-weigh a labeled 40ml VOA vial.

11.5.4.2.1 Label with an indelible marker rather than a paper label, since paper labels may cause the autosampler to bind and malfunction.

11.5.4.3 Extrude the soil sample from the Encore (or equivalent) sampler into the VOA vial.

11.5.4.4 Weigh the vial to the nearest 0.05g

11.5.4.5 Record weight on the label and runlog.

11.5.4.6 Add a magnetic stir bar, and 5mL of HPLC water.

11.5.4.7 Add 5µL of surrogate (8021B) or 10µL surrogate (8015B) to each sample and QC.

11.5.4.7.1 For samples designated for MS/MSD analysis, add 10µL (8015B) or 20µL (8021B) of spiking solution to the vials.

11.5.4.7.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) to the vial.

11.5.4.7.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) and 10µL (8015B) or 20µL (8021B) of spiking solution

11.5.4.8 Seal the vial.

11.5.5 <u>If samples arrive in 40ml VOA vial and require freezing as preservation</u>:

11.5.5.1 Freeze sample until time of analysis.

11.5.5.2 Add 5mL of HPLC water

11.5.5.3 Add 5µL of surrogate (8021B) or 10µL surrogate (8015B) to each sample and QC

11.5.5.3.1 For samples designated for MS/MSD analysis, add 10µL (8015B) or 20µL (8021B) of spiking solution to the vials.

11.5.5.3.2 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) to the vial.

11.5.5.3.3 Prepare a LCS using 5.0g glass beads, and 5ml HPLC water. Add 5µL surrogate (8021B) or 10µL surrogate (8015B) and 10µL (8015B) or 20µL (8021B) of spiking solution of spiking solution.

11.5.5.4 Seal the vial.

11.6 **<u>Low-Level Soil Preparation (superseded 5030A method)</u>**

11.6.1 See SOP ST-QA-0038 for the procedure for sub sampling.

11.6.2 Weigh 5g +/- 0.5 of the sample into a pre-weighed 40mL glass labeled vial.

11.6.2.1 If the sample is suspected or known to have high concentrations of analytes, reduce the sample aliquot to 1.0 g

11.6.3 Record the weight.

11.6.4 Add 5ml HPLC water

11.6.5 Add 5µL surrogate (8021B) or 10µL surrogate (8015B)

11.6.6 Seal the vial.

11.6.7 The above steps should be performed rapidly and without interruption to avoid loss of volatile organics.

11.6.7.1 Prepare a Method Blank using 5.0g of glass beads and 5mL of HPLC grade water, add 5µL of surrogate (8021B) or 10µL surrogate (8015B) to the vial.

11.6.7.2 Prepare a LCS using 5.0g glass beads, 5µL of surrogate and 20µL of spiking solution.

11.6.7.3 For samples designated as for MS/MSD, add 10µL (8015B) or 20µL (8021B) of spiking solution of spiking solution.

11.7 **Methanol Extraction of Soils (5035A method)**

11.7.1 Extrude the (nominal) 5g sample into a pre-weighed VOA vial containing 5mL methanol (25mL methanol for the 25g sampler).

11.7.2 Obtain the weight of the soil added to the vial and note on the label.

11.7.2.1 Prepare a Method Blank using 5.0g of glass beads and 10mL methanol. Add 4µL (8021B) surrogate parent or 8µL (8015) surrogate parent solution

11.7.2.2 Prepare a LCS using 5.0g glass beads, 10mL methanol, 4µL (8021B)surrogate parent or 8µL (8015) surrogate parent solution and 10µL spiking parent (8021B) or 5µL medium level spiking mix (8015B).

11.7.3 Using a vortex mixer, agitate sample for at least half a minute.

11.8 **Methanol Extraction of Soils (superseded 5030A method)**

11.8.1 See SOP ST-QA-0038 for the procedure for sub sampling.

11.8.2 Weigh 5 g +/- 0.5 of the sample into a pre-weighed 40mL glass labeled vial.

11.8.2.1 If the sample is suspected or known to have high concentrations of analytes, reduce the sample aliquot to 1.0 g

11.8.3 Record the weight.

11.8.4 Add 10mL of purge and trap methanol.

11.8.4.1 Prepare a Method Blank using 5.0g of glass beads and 10mL methanol. Add 4µL (8021B) surrogate parent or 8µL (8015) surrogate parent solution to the vial.

11.8.4.2 Prepare a LCS using 5.0g glass beads, 10mL methanol, 4µL (8021B) surrogate parent or 8µL (8015B) surrogate parent solution and 10µL spiking parent (8021B) or 5µL medium level spiking solution (8015B).

11.8.4.3 For the MS/MSD, add 4ul (8021B) surrogate parent or 8ul (8015B) surrogate and 10ul spiking parent (8021B) or 5ul medium level spiking mix (8015B) medium level spike mix.

11.8.5 Seal the vial.

11.8.6 Using a vortex mixer, agitate sample for at least half a minute.

11.9 **Volatile Analysis**:

11.9.1 Load each 40ml VOA sample vial (and QC) in the purge and trap autosampler.

11.9.1.1 Medium Level Analysis

11.9.1.1.1Fill gas-tight syringe with 5ml HPLC water.

11.9.1.1.2 Add sample methanol extract to the syringe (no more than 100µL for a 5mL purge).

11.9.1.1.2.1 If less than 1µL of methanol extract is to be added to the water, dilute the methanol extract using a serial dilution.

11.9.1.1.3Transfer methanol extract/HPLC water in syringe to a labeled 40ml VOA vial.

11.9.2 Record autosampler sample analysis sequence in logbook.

11.9.3 Start analysis.

11.9.4 After purging is complete, desorb the sample, start the GC temperature program, and begin data acquisition.

11.9.5 After desorption, bake the trap for 5-10 minutes to condition it for the next analysis. When the trap is cool, it is ready for the next sample.

11.9.6 When the standards and extracts are not being used, refrigerate them at 4 $\pm$ 2^{o}C, protected from light in screw cap vials equipped with unpierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 External Standard Calculations

12.2.1 See Target software for calculations.

12.3 Manual Integrations

12.3.1 Identified compounds are reviewed for proper integration. Integrations are performed automatically by the data system. If necessary, manual integrations are performed and are documented by the analyst. Manual integrations are denoted with a "M" flag on the Target quantitation report. See Corporate policy: S-Q-004, Manual Integration.

12.4 Quantitation of Hydrocarbons

12.4.1 Quantitate any peaks within the retention times from n-hexane to n-decane (excluding the surrogate) as gasoline using the average calibration factor from the initial calibration.

12.4.2 Use the total integrated area that results from a common baseline (include all of the area down to the baseline) between the established retention time limits, to quantify total volatile petroleum hydrocarbons in the sample.

12.5 Dilutions

12.5.1 If the concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample must be diluted and reanalyzed.

12.5.2 A dilution should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the client specific project requirements.

12.5.2.1 Aqueous samples requiring less than a 1:5000 dilution can be diluted directly using a 5-ml syringe

12.5.2.2 Low level soil samples may re-analyzed using a 1g sample aliquot or utilizing the methanol extraction technique.

12.6 Carryover

12.6.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.6.1.1 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

12.6.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, carryover may have occurred.

12.6.1.2.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred

12.6.1.3 If the chromatographic profile resembles the previous sample, the results are questionable.

12.6.1.3.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 Method OA-1 evaluation:

13.1.1 For hydrocarbons, the analyst should rely primarily on pattern recognition.

13.1.2 Also used for identification are Retention Time windows in tandem with the "pattern" produced by major peaks of these analytes in the standard. The ratios of the areas of the major peaks are also taken into consideration. Identification may be made even if the retention times of the peaks in the sample fall outside of the retention time windows of the standard, if in the analyst's judgment the pattern resembles the standard chromatogram.

13.1.3 Weathering can make pattern determination difficult. In weathering, the early eluting peaks of the hydrocarbon are often diminished and peaks may not be in the anticipated ratios. If severe weathering is indicated, the analyst may base hydrocarbon pattern on the general shape of the chromatography (e.g. diesel crown) and later eluting peaks.

13.1.4 Weathering, single peaks and comments regarding pattern, issues or anomalies should be documented using the NCM process.

13.2 Method 8015 evaluation:

13.2.1 For 8015, evaluation is based on carbon ranges, not pattern. All peaks observed within the prescribed carbon range are used in quantitation.

13.2.2 If the peaks observed, appear single peak in nature (e.g. BTEX) rather than "hydrocarbon like" (multi-peaks), the analyst may exclude them from quantitation.

13.2.3 Weathering, single peaks and comments regarding pattern, issues or anomalies should be documented using the NCM process.

13.3 Method 8021 evaluation:

13.3.1 Confirmation analysis (e.g. second column confirmation or GC/MS confirmation) results is required.

13.3.2 Dual column quantitation

13.3.2.1 As per 8000C, report the lower result of the two columns, unless the Client SOW requires that the higher result be reported. See Client Requirements Sheet for determination.

13.3.2.2 For non-detect (ND) results, report from the A channel, unless there is evidence of chromatographic interference in the A channel's performance.

13.3.2.3 If one result is significantly higher (e.g., >40%), check the chromatograms to see if an obviously overlapping peak is causing an erroneously high result. If no overlapping peaks are noted, examine the baseline parameters established by the instrument data system (or operator) during peak integration. If no anomalies are noted, review the chromatographic conditions. If there is no evidence of chromatographic problems, report the lower result. The data user should be advised of the disparity between the results on the two columns.

13.3.2.4 Use the higher result if there is obvious chromatographic interference on the column with the lower result.

13.3.2.5 If the CCV performance on one of the two channels is outside acceptance criteria due to confirmed matrix interference, report sample data from the column with acceptable performance, irrespective of it being the higher or lower result.

13.3.2.5.1See Clouseau for data assessment and narration.

13.3.2.6 The QC should be reported from the column that reflects the column used for the majority of the samples associated with the QC.

13.3.2.7 The surrogate should be reported from the column that reflects the column used for the majority of the analytes associated with a sample.

13.3.3 GC/MS confirmation

13.3.3.1 When utilizing GC/MS confirmation, the GC result is reported with narration that GC/MS was used to confirm results. The narrative should include comment as to comparability in results.

13.4 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. A hardcopy of all the data assessment types and descriptions along with their associated corrective actions is included in the SOP. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the Clouseau software program.

13.5 Method Blank

13.1.1 Acceptance Criteria:

13.1.1.1 No target analytes may be present in the method blank above the reporting limit.

13.1.1.2 The method blank must have acceptable surrogate recoveries.

13.1.1.3 Project specific requirements if more stringent than our routine procedure (e.g. no target analytes present above ½ RL), will be noted on the client requirements sheet.

13.1.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.1.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action. Note: certain analytes are common laboratory contaminants and require special narrative comment. These compounds are so designated in Clouseau.

13.1.2.2 <u>Method Blank Surrogate excursion</u> – See Clouseau NCM for corrective action.

13.2 Laboratory Control Sample (LCS)

13.2.1 Acceptance Criteria:

13.2.1.1 All control analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.2.1.1.1 For long analyte spike list, marginal exceedances (ME) are allowed as follows:

13.2.1.1.2 < 11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

13.2.1.1.3 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit.

13.2.1.1.4 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit.

13.2.1.1.5 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit.

13.2.1.1.6 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit.

13.2.1.1.7 > 90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit.

13.2.1.1.8 No LCS recoveries may be outside the Marginal Exceedance limit.

13.2.1.1.9 Marginal exceedances must be random. If the same LCS analyte exceeds the control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken.

13.2.1.2 The LCS should have acceptable surrogate recoveries.

13.2.2 Corrective Action for LCS not meeting acceptance criteria:

13.2.2.1 <u>LCS Spike Recovery excursion (high)</u> – See Clouseau NCM for corrective action.

13.2.2.2 <u>LCS Spike Recovery excursion (low)</u> – See Clouseau NCM for corrective action.

13.2.2.3 <u>LCS Surrogate Recovery excursion</u> – See Clouseau NCM for corrective action.

13.2.2.4 <u>RPD excursion for MS/MSD or LCS/LCSD</u> – See Clouseau NCM for corrective action.

13.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.3.1 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.3.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.3.2.1 <u>MS/MSD Spike Rec. excursion</u> may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation and/or re-analysis is required.

13.4 Surrogate

13.4.1 All Surrogates should be within established control limits for accuracy (%Recovery).

13.4.2 Corrective Action for Surrogate not meeting acceptance criteria:

13.4.2.1 <u>Surrogate Spike Rec. excursion</u> may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Sample result evaluation

13.5.1 Dilutions

13.5.1.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.5.1.1.1<u>Dilution: Sample</u>– See Clouseau NCM for corrective action.

13.5.1.1.2Dilution: Surrogate(s) diluted out– See Clouseau NCM for corrective action.

13.5.1.1.3Dilution: Surrogates(s) and/or Spike(s) diluted out– See Clouseau NCM for corrective action.

13.5.2 Carryover

13.5.2.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.5.2.2 If a sample is analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.5.2.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.5.3 Insufficient Sample

13.5.3.1 For each prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis, a narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in QAM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

16.2 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to ST-HS-0001, "Waste Minimization Plan".

16.3 Waste Streams Produced by the Method

16.3.1 The following waste streams are produced when this method is carried out.

16.3.1.1 Solvent waste generated. Solvent waste must be accumulated in the appropriate waste accumulation container, labeled as Drum Type "D".

16.3.1.2 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 SW-846,"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Method 8000C

17.2 SW-846,"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" Method 8015B

17.3 SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Method 8021B

17.4 SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", (Sample Prep- Purge and-Trap), Method 5030A and 5030B.

17.5 SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", (Sample Prep- Purge and-Trap), Method 5035.

17.6 IOWA Method OA-1University Hygienic Laboratory, Iowa City, IA, rev. 07/27/93.

17.7 TestAmerica Quality Assurance Manual (QAM), current revision

17.8 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.9 TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

17.10 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

17.11 Associated SOPs

17.11.1 ST-OP-0001, Labware Preparation for Organic Analysis
17.11.2 ST-PM-0002, Sample Receipt and Chain of Custody
17.11.3 ST-QA-0002, Standard and Reagent Preparation
17.11.4 ST-QA-0005, "Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes."
17.11.5 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.11.6 ST-QA-0016, IDL/MDL Determination
17.11.7 ST-QA-0036, Non-conformance Memorandum (NCM) Process
17.11.8 ST-QA-0038, Procedure for sub sampling.

18.0 MODIFICATIONS FROM REFERENCED METHOD

18.1 Chapter 1 of SW-846 states that the Method Blank should not contain any analyte of interest at or above the Method Detection Limit. This SOP states that the Method Blank must not contain any analyte of interest at or above the reporting limit. Common lab contaminants are allowed to be up to 5 times the reporting limit in the blank, following consultation with the client.

18.2 Method OA-1 only requires a 3 point calibration. We routinely perform a 5 point calibration

19.0 CHANGES TO PREVIOUS SOP REVISION

19.1 Rev 9: No changes made annual review.
19.2 Rev 10:
19.2.1 Marker standards add to Sections 7 and 10
19.2.2 Defined retention time for GRO in Section 10.10
19.3 Rev 11:
19.3.1 Updated calibration standards for gasoline in methanol in section 7.5.
19.3.2 Updated surrogate and spiking amounts for methods 8015B and 8021B throughout section 11.0.

TAL Reference Data Summary

Structured Analysis Code: I-15-WU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Hydrocarbons, Volatile Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6019							Spike List 6020						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2928	Volatile Petroleum Hydrocarbons	0.1	mg/L	0.01	mg/L	20090512	C	Y	1.0	mg/L	76	110	20	C	Y	1.0	mg/L	66	119	20
5292	TPH - Gasoline Range - WTPH-G	0.1	mg/L	0.01	mg/L	20090512	C	Y	1	mg/L	74	111	20	C	Y	1	mg/L	74	115	20
2741	Trifluorotoluene						X	Y	0.02	mg/L	53	140	0	X	Y	0.02	mg/L	80	125	0

TAL Reference Data Summary

Structured Analysis Code: A-15-WU-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Hydrocarbons, Volatile Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6019							Spike List 6020						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2928	Volatile Petroleum Hydrocarbons	0.1	mg/kg	0.01	mg/kg	20090512	C	Y	1.0	mg/kg	81	115	20	C	Y	1.0	mg/kg	10	115	30
5292	TPH - Gasoline Range - WTPH-G	0.1	mg/kg	0.01	mg/kg	20090512	C	Y	1	mg/kg	64	133	20	C	Y	1	mg/kg	15	124	30
2741	Trifluorotoluene						X	Y	0.02	mg/kg	85	115	0	X	Y	0.02	mg/kg	49	112	0

TAL Reference Data Summary

Structured Analysis Code: A-4P-WU-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: ENCORE (COLD PRESERVATION)
Method: Hydrocarbons, Volatile Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6019							Spike List 6020						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2928	Volatile Petroleum Hydrocarbons	0.1	mg/kg	0.01	mg/kg	20090512	C	Y	1.0	mg/kg	81	115	20	C	Y	1.0	mg/kg	10	115	30
5292	TPH - Gasoline Range - WTPH-G	0.1	mg/kg	0.01	mg/kg	20090512	C	Y	1	mg/kg	64	133	20	C	Y	1	mg/kg	15	124	30
2741	Trifluorotoluene						X	Y	0.02	mg/kg	85	115	0	X	Y	0.02	mg/kg	49	112	0

TAL Reference Data Summary

Structured Analysis Code: A-73-WU-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP, MeOH EXTRACTION (Solids or Waste
Method: Hydrocarbons, Volatile Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6054							Spike List 6055						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2928	Volatile Petroleum Hydrocarbons	10.0	mg/kg	1.566	mg/kg	20060928	C	Y	1.0	mg/kg	70	130	20	C	Y	1.0	mg/kg	70	130	25
2741	Trifluorotoluene						X	Y	0.02	mg/kg	85	115	0	X	Y	0.02	mg/kg	80	120	0
6205	Gasoline Range Organics						C	Y	1	mg/kg	70	130	20	X	Y	1	mg/kg	70	130	25

TAL Reference Data Summary

Structured Analysis Code: I-15-KJ-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Hydrocarbons, Volatile Petroleum (8015B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6019							Spike List 6020						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
2861	Gasoline Range Organics	0.1	mg/L	0.02888	mg/L	20040427														
2928	Volatile Petroleum Hydrocarbons	0.1	mg/L	0.02888	mg/L	20040427	C	Y	1.0	mg/L	76	110	20	C	Y	1.0	mg/L	66	119	20
2741	Trifluorotoluene						X	Y	0.02	mg/L	53	140	0	X	Y	0.02	mg/L	80	125	0

TAL Reference Data Summary

Structured Analysis Code: **A-15-KJ-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Hydrocarbons, Volatile Petroleum (8015B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6019							Spike List 6020						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2861	Gasoline Range Organics	0.1	mg/kg	0.02888	mg/kg	20040427														
2741	Trifluorotoluene						X	Y	0.02	mg/kg	85	115	0	X	Y	0.02	mg/kg	49	112	0

TAL Reference Data Summary

Structured Analysis Code: A-73-KJ-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP, MeOH EXTRACTION (Solids or Waste
Method: Hydrocarbons, Volatile Petroleum (8015B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6054							Spike List 6055						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2861	Gasoline Range Organics	10	mg/kg	1.566	mg/kg	20060928														
2741	Trifluorotoluene						X	Y	0.02	mg/kg	85	115	0	X	Y	0.02	mg/kg	80	120	0
6205	Gasoline Range Organics						C	Y	1	mg/kg	70	130	20	X	Y	1	mg/kg	70	130	25

TAL Reference Data Summary

Structured Analysis Code: **I-15-QR-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics (8021B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6210							Spike List 6211						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	78	122	20	C	Y	20	ug/L	85	115	20
5604	TOTAL BTEX	5	ug/L	0.60	ug/L	20090530														
1332	Ethylbenzene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	83	116	20	C	Y	20	ug/L	84	115	20
2773	MTBE	5	ug/L	0.135	ug/L	20090530	C	Y	20	ug/L	72	123	20	C	Y	20	ug/L	71	127	20
2489	Toluene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	80	115	20	C	Y	20	ug/L	83	116	20
2940	m-Xylene & p-Xylene	2	ug/L	0.20	ug/L	20090530	C	Y	40	ug/L	83	116	20	C	Y	20	ug/L	85	115	20
2623	o-Xylene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	85	115	20	C	Y	20	ug/L	85	115	20
2627	Xylenes (total)	3	ug/L	0.30	ug/L	20090530														
2741	Trifluorotoluene						X	Y	20	ug/L	62	134	0	X	Y	20	ug/L	74	128	0

TAL Reference Data Summary

Structured Analysis Code: A-15-QR-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics (8021B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6210							Spike List 6211						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	79	120	20	C	Y	20	ug/kg	56	128	30
5604	TOTAL BTEX	5	ug/kg	0.60	ug/kg	20090530														
1332	Ethylbenzene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	78	119	20	C	Y	20	ug/kg	46	136	30
2773	MTBE	5	ug/kg	0.207	ug/kg	20090530	C	Y	20	ug/kg	85	131	20	C	Y	20	ug/kg	83	127	30
2489	Toluene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	73	120	20	C	Y	20	ug/kg	68	121	30
2940	m-Xylene & p-Xylene	2	ug/kg	0.20	ug/kg	20090530	C	Y	40	ug/kg	76	118	20	C	Y	20	ug/kg	47	134	30
2623	o-Xylene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	75	122	20	C	Y	20	ug/kg	67	125	30
2627	Xylenes (total)	3	ug/kg	0.30	ug/kg	20090530														
2741	Trifluorotoluene						X	Y	20	ug/kg	65	126	0	X	Y	20	ug/kg	30	140	0

TAL Reference Data Summary

Structured Analysis Code: **A-4P-QR-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: ENCORE (COLD PRESERVATION)
Method: Volatile Organics (8021B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6210							Spike List 6211						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	79	120	20	C	Y	20	ug/kg	56	128	30
5604	TOTAL BTEX	5	ug/kg	0.60	ug/kg	20090530														
1332	Ethylbenzene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	78	119	20	C	Y	20	ug/kg	46	136	30
2773	MTBE	5	ug/kg	0.207	ug/kg	20090530	C	Y	20	ug/kg	85	131	20	C	Y	20	ug/kg	83	127	30
2489	Toluene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	73	120	20	C	Y	20	ug/kg	68	121	30
2940	m-Xylene & p-Xylene	2	ug/kg	0.20	ug/kg	20090530	C	Y	40	ug/kg	76	118	20	C	Y	20	ug/kg	47	134	30
2623	o-Xylene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	75	122	20	C	Y	20	ug/kg	67	125	30
2627	Xylenes (total)	3	ug/kg	0.30	ug/kg	20090530														
2741	Trifluorotoluene						X	Y	20	ug/kg	65	126	0	X	Y	20	ug/kg	30	140	0

TAL Reference Data Summary

Structured Analysis Code: A-73-QR-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP, MeOH EXTRACTION (Solids or Waste
Method: Volatile Organics (8021B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6276							Spike List 6277						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	125	ug/kg	21.04	ug/kg	20060406	C	Y	2500	ug/kg	81	127	20	C	Y	2500	ug/kg	81	113	30
1332	Ethylbenzene	125	ug/kg	12.28	ug/kg	20060406	C	Y	2500	ug/kg	82	127	20	C	Y	2500	ug/kg	80	117	30
2773	MTBE	625	ug/kg	8.78	ug/kg	20060406		Y	2500	ug/kg	71	135	20		Y	2500	ug/kg	80	123	30
2489	Toluene	125	ug/kg	15.6	ug/kg	20060406	C	Y	2500	ug/kg	88	116	20	C	Y	2500	ug/kg	68	114	30
2940	m-Xylene & p-Xylene	250	ug/kg	17.04	ug/kg	20060406	C	Y	5000	ug/kg	82	126	20	C	Y	5000	ug/kg	72	116	30
2623	o-Xylene	125	ug/kg	8.08	ug/kg	20060406	C	Y	2500	ug/kg	91	120	20	C	Y	2500	ug/kg	60	130	30
2627	Xylenes (total)	375	ug/kg	25.07	ug/kg	20060406		Y	2500	ug/kg	82	126	20		Y	2500	ug/kg	68	120	30
2741	Trifluorotoluene						X	Y	2500	ug/kg	77	128	0	X	Y	2500	ug/kg	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-15-Y8-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics (Iowa OA-1)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6210							Spike List 6211						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	78	122	20	C	Y	20	ug/L	85	115	20
5604	TOTAL BTEX	5	ug/L	0.60	ug/L	20090530														
1332	Ethylbenzene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	83	116	20	C	Y	20	ug/L	84	115	20
2861	Gasoline Range Organics	100	ug/L	10.0	ug/L	20090512	C	Y	1	mg/L	66	123	20	C	Y	1	mg/L	65	104	20
2773	MTBE	5	ug/L	0.135	ug/L	20090530	C	Y	20	ug/L	72	123	20	C	Y	20	ug/L	71	127	20
2489	Toluene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	80	115	20	C	Y	20	ug/L	83	116	20
2940	m-Xylene & p-Xylene	2	ug/L	0.20	ug/L	20090530	C	Y	40	ug/L	83	116	20	C	Y	20	ug/L	85	115	20
2623	o-Xylene	1	ug/L	0.10	ug/L	20090530	C	Y	20	ug/L	85	115	20	C	Y	20	ug/L	85	115	20
2627	Xylenes (total)	3	ug/L	0.30	ug/L	20090530														
2741	Trifluorotoluene						X	Y	20	ug/L	62	134	0	X	Y	20	ug/L	74	128	0

TAL Reference Data Summary

Structured Analysis Code: A-15-Y8-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics (Iowa OA-1)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6210							Spike List 6211						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	79	120	20	C	Y	20	ug/kg	56	128	30
5604	TOTAL BTEX	5	ug/kg	0.60	ug/kg	20090530														
1332	Ethylbenzene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	78	119	20	C	Y	20	ug/kg	46	136	30
2861	Gasoline Range Organics	100	ug/kg	10.0	ug/kg	20090512	C	Y	1	mg/kg	67	88	20	C	Y	1	mg/kg	30	128	30
2773	MTBE	5	ug/kg	0.207	ug/kg	20090530	C	Y	20	ug/kg	85	131	20	C	Y	20	ug/kg	83	127	30
2489	Toluene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	73	120	20	C	Y	20	ug/kg	68	121	30
2940	m-Xylene & p-Xylene	2	ug/kg	0.20	ug/kg	20090530	C	Y	40	ug/kg	76	118	20	C	Y	20	ug/kg	47	134	30
2623	o-Xylene	1	ug/kg	0.10	ug/kg	20090530	C	Y	20	ug/kg	75	122	20	C	Y	20	ug/kg	67	125	30
2627	Xylenes (total)	3	ug/kg	0.30	ug/kg	20090530														
2741	Trifluorotoluene						X	Y	20	ug/kg	65	126	0	X	Y	20	ug/kg	30	140	0

TAL Reference Data Summary

Structured Analysis Code: **A-4P-Y8-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: ENCORE (COLD PRESERVATION)
Method: Volatile Organics (Iowa OA-1)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 0							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	1	ug/kg	0.10	ug/kg	20090530														
5604	TOTAL BTEX	5	ug/kg	0.60	ug/kg	20090530														
1332	Ethylbenzene	1	ug/kg	0.10	ug/kg	20090530														
2861	Gasoline Range Organics	100	ug/kg	10.0	ug/kg	20090512														
2773	MTBE	5	ug/kg	0.207	ug/kg	20090530														
2489	Toluene	1	ug/kg	0.10	ug/kg	20090530														
2940	m-Xylene & p-Xylene	2	ug/kg	0.20	ug/kg	20090530														
2623	o-Xylene	1	ug/kg	0.10	ug/kg	20090530														
2627	Xylenes (total)	3	ug/kg	0.30	ug/kg	20090530														

TAL Reference Data Summary

Structured Analysis Code: A-73-Y8-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP, MeOH EXTRACTION (Solids or Waste
Method: Volatile Organics (Iowa OA-1)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6276							Spike List 6277						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
196	Benzene	125	ug/kg	21.04	ug/kg	20060406	C	Y	2500	ug/kg	81	127	20	C	Y	2500	ug/kg	81	113	30
1332	Ethylbenzene	125	ug/kg	12.28	ug/kg	20060406	C	Y	2500	ug/kg	82	127	20	C	Y	2500	ug/kg	80	117	30
2773	MTBE	625	ug/kg	8.78	ug/kg	20060406		Y	2500	ug/kg	71	135	20		Y	2500	ug/kg	80	123	30
2489	Toluene	125	ug/kg	15.61	ug/kg	20060406	C	Y	2500	ug/kg	88	116	20	C	Y	2500	ug/kg	68	114	30
2940	m-Xylene & p-Xylene	250	ug/kg	17.04	ug/kg	20060406	C	Y	5000	ug/kg	82	126	20	C	Y	5000	ug/kg	72	116	30
2623	o-Xylene	125	ug/kg	8.08	ug/kg	20060406	C	Y	2500	ug/kg	91	120	20	C	Y	2500	ug/kg	60	130	30
2627	Xylenes (total)	375	ug/kg	25.07	ug/kg	20060406		Y	2500	ug/kg	82	126	20		Y	2500	ug/kg	68	120	30
2741	Trifluorotoluene						X	Y	2500	ug/kg	77	128	0	X	Y	2500	ug/kg	70	130	0

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Title: EXTRACTABLE TOTAL PETROLEUM HYDROCARBONS BY GC-FID [SW-846 8015B; IOWA OA-2]

Approvals (Signature/Date):

Weizhe Han FOR 2-15-13	Michael J. Ridenhower 2-15-13
Ben Hicks Date	Michael Ridenhower Date
Organics Manager	Health & Safety Manager / Coordinator
Marti Ward 2.15.13	Elaine Wild 2/15/13
Marti Ward Date	Elaine Wild Date
Quality Assurance Manager	Laboratory Director

This SOP was previously identified as SOP No. ST-GC-0005 Rev. 17

Facility Distribution No.: 0 **Distributed To: See Electronic Distribution Sheet**

1.0 SCOPE AND APPLICATION

1.1 This SOP documents the procedure used to determine extractable petroleum hydrocarbons (EPH), also known as total recoverable petroleum hydrocarbons (TRPH), or TPH in environmental samples by Gas Chromatograph with a Flame Ionization Detector (GC/FID).

1.2 Matrices to which this procedure is applicable are water, water miscible wastes, soil, sludges, oil and miscellaneous solids.

1.3 This procedure is amenable to the determination of common hydrocarbon mixtures which are soluble in methylene chloride, are amenable to gas chromatography, and have boiling points between approximately 150 and 450 °C.

1.4 Carbon ranges from C10 to C40 are detected. Typical hydrocarbons are Diesel, Motor Oil, Kerosene, Jet fuel, Mineral Spirits and Hydraulic Oil.

1.5 Sample preparation techniques are described in SOP ST-OP-0002.

1.6 This SOP is based on SW-846 methods 8000C and 8015C, and the IOWA method OA-2.

1.7 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Laboratory Information Management System (LIMs).

1.7.1 Additional compounds may be amenable to this procedure. The minimum requirement for non-standard analytes is that the reporting limit be set at the lowest required concentration that can actually be detected by the instrument. When an MDL study can not be conducted, the MDL is set equal to the reporting limit.

2.0 SUMMARY OF METHOD

2.1 Organic compounds are extracted from neutral pH environmental samples with methylene chloride. The volume of methylene chloride is concentrated to give an extract of known volume.

2.2 A portion of the extract is analyzed by GC/FID. The GC must be previously calibrated using multi-level calibration standards. The petroleum hydrocarbons are quantified as Diesel Range Organics (DRO) or Oil Range Organics (ORO) unless a specific hydrocarbon product is requested by the client.

3.0 DEFINITIONS

3.1 See the Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

3.2 For method 8015C:

3.2.1 Diesel is defined as hydrocarbon peaks eluting in the carbon range C10-C28.

3.2.2 Motor oil is defined as hydrocarbon peaks eluting in the carbon range C28-C40.

3.3 For method OA-2, hydrocarbons are determined by their elution pattern.

4.0 INTERFERENCES

4.1 Any GC chromatographable compound, organic or inorganic, which gives a flame detector response in the retention time window selected, will be included in the quantification of total petroleum hydrocarbons. The method is non-specific and all co-extracted compounds are detected.

4.2 Solvents, reagents, glassware and other sample processing hardware may yield artifacts and interferences to sample extracts. Strict attention to glassware cleaning and handling and demonstration of solvent purity will lead to minimization of these interferences.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1 The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.2 There are areas of high voltage in both the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen Irritant	25 ppm (TWA) 125 ppm (STEL)	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time weighted average			
STEL – Short term exposure limit			

6.0 EQUIPMENT AND SUPPLIES

6.1 GC/FID system: The lab utilizes an Agilent 6890 with dual flame ionization detector (FID) system with autosampler.

6.1.1 The GC column type, and instrument run conditions are posted in the maintenance log and reside in the Chemstation method.

6.2 Data System – Chemstation for acquisition and Target™ for data processing.

6.3 Amber vials. Crimp top seals.

6.4 Pipettes, disposable

6.5 Micro syringes: 10µL, 250µL, 500µL, 1000µL. Hamilton 1700 Series.

6.6 Analytical Balance, capable of weighing ± 0.01 grams.

6.7 Volumetric flasks, Class A, various volumes

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Primary standards

7.2.1 Standards are either purchased from a commercial vendor or prepared by dilution of neat liquid mixtures in methylene chloride.

7.2.2 Storage: The standards are stored at -20 to 0° C in amber glass vials with Teflon-lined caps.

7.2.3 Shelf life:

7.2.3.1 Unopened ampoules: manufacturer's expiration date.

7.2.3.2 Opened ampoules and Intermediate standards: Manufacturer's expiration date, or 1 year, whichever is sooner.

7.2.3.3 Working standards: Primary standard's expiration date or 6 months, whichever is sooner.

7.2.4 Degradation:

7.2.4.1 If standard degradation is indicated, the standard is discarded, irrespective of its' shelf life.

7.3 o-Terphenyl surrogate

7.4 Calibration Standards

7.4.1 Calibration standards for total petroleum hydrocarbon analysis may vary according to the requests of clients. A diesel #2 standard and motor oil (a mid-weight oil) are used for initial calibrations. Other hydrocarbons, such as Kerosene, Jet Fuel A, Mineral Spirits, and Fuel Oil #6 can be analyzed upon request.

7.4.2 Secondary Standards - Secondary standards for calibration are prepared by dilution in methylene chloride of the primary standards mentioned. The secondary standards are subject to the same storage requirements as the primary standards.

7.4.3 Working Calibration Standards - The working calibration standards are prepared in methylene chloride: diesel and motor oil at a minimum of five concentration levels. One of the concentration levels should be ≤ to the concentration of the reporting limit, and the remaining levels should define the expected range of concentrations in the samples or the linear range of the instrument. All working calibration standards expire after 6 months or at the expiration date of their primary standards, whichever is shorter. Working standards are stored in the freezer.

7.4.4 Second Source for calibration verification (ICV). Purchased from a different vendor than the calibration standards.

7.5 Carbon range retention time marker standard

7.5.1 This marker standard includes C10 (decane), C12 (dodecane), C24, C28 and C40.

7.6 Gases for carrier and make- up: Hydrogen carrier, Nitrogen make-up

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Water samples are unpreserved and refrigerated at 4 ± 2 °C.

8.3 Soil samples are refrigerated at 4 ± 2 °C.

8.4 The extraction holding time for water samples is 7 days.

8.5 The extraction holding time for soil samples is 14 days.

8.6 The extract analysis holding time is 40 days from the date of extraction.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a sample duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.3.1 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) may be performed upon client request, and are noted in the Client Requirement Sheets and Log-in.

9.2 **Method Blank (MB)**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.2.3 DI water is used as the blank matrix for water batches.

9.2.4 Sodium sulfate is used as the blank matrix for solid batches.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.3.3 DI water, spiked with the analytes of interest is used as the LCS for water batches.

9.3.4 Sodium sulfate, spiked with the analytes of interest is used as the LCS for solid batches.

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Procedural Variations/ Nonconformance and Corrective Action**

9.5.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.5.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 External standard calibration is used.

10.2 Marker Standard

10.2.1 Analyze a carbon range retention time marker standard daily.

10.2.2 This marker standard includes C10 (decane), C12 (dodecane), C24, C28 and C40. Additional markers may be analyzed upon client request.

10.3 Initial Calibration

10.3.1 Inject an aliquot of each level of the calibration standard, minimum 5 points, for the target compounds being analyzed (i.e., diesel and/or motor oil). The low level standard should be at or below the reporting limit. The highest level standard defines the working range of the detector. Quadratic (Second order curves) require 6 calibration points.

10.3.1.1 If additional hydrocarbons are requested (e.g. kerosene), a minimum 5 point calibration for SW 8015 or a minimum 3 point calibration for OA-2 is performed, with the low level standard at or below the reporting limit.

10.3.2 A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance (e.g., FID replacement).

10.3.3 Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica corporate policy, "Selection of Calibration Points", CA-T-P-002.

10.3.4 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 20%.

10.3.5 If the %RSD in the initial calibration is > 20%. Linear regression may be used to evaluate the curve or recalibration may be done.

10.3.5.1 If a linear regression curve is used, the intercept of the curve at zero response must be less than the reporting limit for the analyte.

10.3.5.2 If a linear regression curve is used, r^2 must be $\geq$ 0.990

10.3.5.3 Use of 1/Concentration^2 weighting is recommended to improve the accuracy of quantitation at the low end of the curve.

10.4 Initial Calibration Verification (ICV)

10.4.1 The initial calibration verification standard should be from a different standard source than the one used for the initial calibration.

10.4.2 An ICV for the target compounds being analyzed (diesel and/or motor oil) must be performed with every initial calibration.

10.4.2.1 If additional hydrocarbons were requested, an ICV is analyzed for those hydrocarbons.

10.4.3 The ICV performance must be within +/- 20% D criteria for each analyte.

10.4.3.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard.

10.4.3.2 Corrective action must be taken (including reanalysis of the ICV or analysis of a different ICV).

10.4.3.3 Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.5 Continuing Calibration Verification (CCV)

10.5.1 A CCV may be from the same source as the calibration or a second source.

10.5.2 Analyze a CCV for each target hydrocarbon being analyzed. It is not necessary to analyze a CCV for every hydrocarbon having an initial calibration, **only** those being analyzed.

10.5.3 **8015 requirements**

10.5.3.1 Analyte response factors must be verified at the beginning of each analytical run, (by either an ICV or a CCV), after every 10 samples and at the end of the analytical run through the analysis of a mid-level calibration standard.

10.5.3.2 A CCV %D must be within +/- 20% D for each analyte.

10.5.4 **OA-2 requirements**

10.5.4.1 Analyte response factors must be verified on each working day by the measurement of one or more calibration standards. The laboratory runs a calibration standard at the beginning of each analytical run, (by either an ICV or a CCV), after every 10 samples and at the end of the analytical run through the analysis of a mid-level calibration standard.

10.5.4.2 The ending CCV may be omitted for OA-2.

10.5.4.3 A CCV %D must be within +/- 20% D for each analyte.

10.5.5 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument.

10.5.5.1 If this CCV meets criteria then sample analysis may continue; however the preceding samples must be reanalyzed.

10.5.5.2 If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require calibration and all samples run after the last passing CCV must be reanalyzed.

10.6 Retention Time Windows

10.6.1 Retention Time Windows: analytes and surrogate(s):

10.6.1.1 Retention time windows must be determined for all analytes. Make an injection of all analytes of interest each day over a three day period. Calculate the standard deviation of the three retention times for each analyte (relative retention times may also be used). Plus or minus three times the standard deviation of the retention times of each analyte defines the retention time window.

10.6.1.2 The center of the retention time window is the retention time from the last of the three standards. The centers of the windows are updated with the midpoint standard of the initial calibration. The widths of the windows will remain the same until new windows are generated following the installation of a new column.

10.6.1.3 If the retention time window as calculated above is less than +/- 0.015 minutes, use +/- 0.015 minutes as the retention time window. This allows for slight variations in retention times caused by sample matrix.

10.6.1.4 The laboratory must calculate new retention time windows each time a new column is installed. The new windows must be generated within one week of the installation of the new column. Until these standards have been run on the new column, the retention time windows from the old column may be used, updated with the retention times from the new initial calibration.

10.6.2 Retention Time Window for Target Analytes

10.6.2.1 Retention Time windows for hydrocarbons are established daily. The retention time window is based on the retention time of the applicable carbon marker standard.

10.6.3 Corrective Action for Retention Times

10.6.3.1 The retention times of all compounds in each continuing calibration must be within the retention time windows established. If this condition is not met, all samples analyzed after the last compliant standard must be reanalyzed.

11.0 PROCEDURE

11.1 Allow standards, samples and sample extracts to reach ambient temperature before analysis.

11.2 All analysis conditions and injection volumes for samples must be the same as for the calibration standards.

11.3 Sample introduction:

11.3.1 The samples are introduced by direct injection of the extract. Samples, standards, and QC must be introduced using the same procedure.

11.4 Perform all qualitative and quantitative measurements. When the standards and extracts are not being used, refrigerate them at -20 to 0^{o}C and protected from light in screw cap vials equipped with unpierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 External Standard Calculations

12.2.1 Analyte Concentration (µg/L) in sample

Concentration (µg/L):

$$[C] = \frac{A_x * V_t * D}{\overline{CF} * V_i * V_s}$$

Where:

$[C]$	=	*Analyte Concentration in sample (µg/L)*
A_x	=	*Area of peak (response)*
V_t	=	*Total volume of extract (µL)*
D	=	*Dilution factor*
$\overline{CF}$	=	*Calibration factor ($\overline{RF}$ in target) – Response factor*
V_i	=	*Volume of extract injected (µL)*
V_s	=	*Volume of sample extracted*

12.2.2 *On column concentration (ug/mL):*

$$[OC] = \frac{A_x}{\overline{\overline{CF}}}$$

Where:

$[OC]$ = *On Column Concentration [typically expressed in µg/mL (ppm)]*

Then substitute/derive

$$[C] = [OC]\left(\frac{V_t * D}{V_i * V_s}\right)$$

When *on column concentration* $[OC]$ is equal to the *CAL-AMT (calibration amount)* of the low level standard needed to support the *reporting limit (μg/L)* and we solve the equation for *concentration (μg/L)*

Then

$$[C] \equiv RL \equiv [OC]\left(\frac{V_t * D}{V_i * V_s}\right)$$

Where:

RL = Reporting Limit

12.3 Manual Integrations

12.3.1 Identified compounds are reviewed for proper integration. Manual integrations are performed if necessary and are documented by the analyst or automatically by the data system. See TestAmerica policy: CA-Q-S-002, Manual Integration. Manual integrations are denoted with a "M" flag on the Target quantitation report.

12.4 Use the total integrated area that results from a common baseline (include all of the area down to the baseline) between the retention time limits established, to quantify total extractable petroleum hydrocarbons in the sample.

12.5 Quantitation of Hydrocarbons

12.5.1 Total Area Response is the total response in the chosen retention time window.

12.6 Dilutions

12.6.1 If concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample must be diluted and reanalyzed. Dilutions should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the calibration range.

12.6.2 It may be necessary to dilute samples due to matrix.

12.7 Carryover

12.7.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.7.1.1 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

12.7.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 OA-2 evaluation:

13.1.1 For hydrocarbons, the analyst should rely primarily on pattern recognition.

13.1.2 Retention time windows are used for identification, but the "pattern" produced by major peaks of those analytes in the standard is used in tandem with the retention times for identification. The ratios of the areas of the major peaks are also taken into consideration. Identification may be made even if the retention times of the peaks in the sample fall outside of the retention time windows of the standard, if in the analyst's judgment the pattern resembles the standard chromatogram.

13.1.3 Weathering can make pattern determination difficult. Often the early eluting peaks of the hydrocarbon are diminished and peaks may not be in the anticipated ratios. If severe weathering is indicated, the analyst may base hydrocarbon pattern on the general shape of the chromatography (e.g. diesel crown) and later eluting peaks.

13.2 8015 evaluation:

13.2.1 For 8015, evaluation is based on carbon ranges, not pattern. All peaks observed within the prescribed carbon range are used in quantitation.

13.2.2 If the peaks observed appear as a single peak (e.g. PAHs) rather than "hydrocarbon like" (multi-peaks), the analyst may exclude them from quantitation. An NCM is written to document the reason for the exclusion.

13.3 Weathering, single peaks and comments regarding pattern should be documented using the NCM process.

13.4 The data assessment and corrective action process is detailed through the Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. A hardcopy of all the data assessment types and descriptions along with their associated corrective actions is included in the SOP. Below is a subset of the data assessment and QC excursion types.

13.5 Method Blank

13.5.1 Acceptance Criteria:

13.5.1.1 No target analytes may be present in the method blank above the reporting limit.

13.5.1.2 The method blank must have acceptable surrogate recoveries.

13.5.1.3 Corrective Action for Method Blanks not meeting acceptance criteria:

13.5.1.3.1 Method Blank Contamination – Blank contamination above the RL (>1/2 RL for some programs – see specific Client Requirement Memos for details) requires re-prep of batch unless all associated samples are < RL or greater than 10 times the amount detected in the method blank.

13.5.1.3.2 Method Blank Surrogate excursion – If excursion is limited to the blank, data may be reported with an NCM. If surrogates are also outside criteria in samples, re-prep and re-anlaysis is required. In cases where the surrogate recovery is high and the samples are non-detect, the data may be reported with an NCM.

13.6 Laboratory Control Sample (LCS)

13.6.1 Acceptance Criteria: All control analytes must be within established control limits for accuracy (%Recovery) and precision (RPD). Control limits can be found in LIMS.

13.6.1.1 The LCS must have acceptable surrogate recoveries. .

13.6.1.2 Corrective Action for LCS not meeting acceptance criteria:

13.6.1.2.1 LCS Spike Recovery excursion (high) – Samples that are non-detect may be reported with an NCM (unless prohibited by client requirements). Samples with detects for the analyte recovered high in the LCS are re-prepped and re-analyzed. . In cases where the surrogate recovery is high and the samples are non-detect, the data may be reported with an NCM

13.6.1.2.2 LCS Spike Recovery excursion (low) – batch is re-prepped and re-analyzed.

13.6.1.2.3 LCS Surrogate Recovery excursion – If excursion is limited to the LCS, data may be reported with an NCM. If target analytes are in control in the LCS, data may be reported with an NCM. If surrogates are also outside criteria in samples, re-prep and re-analysis is required.

13.6.1.2.4 RPD excursion for LCS/LCSD – If target analytes recoveries are in control, data may be reported with an NCM

13.6.2 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.6.3 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD). Control limits can be found in LIMS.

13.6.4 Corrective Action for MS/MSD not meeting acceptance criteria:

13.6.4.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. If affected analyte concentration in the original sample is greater than four times the amount spiked, percent recovery information is ineffective. Data is reported with an NCM. If the excursion is due to a physically evident matrix interference, the data is reported with an NCM (the physical interference must be described in the NCM). If there is no evidence of interference and the RPD as well as spike recoveries out outside limits out, sample re-prep and re-analysis are required.

13.6.5 Sample result evaluation

13.6.5.1 Dilutions

13.6.5.1.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.6.5.1.1.1 Dilution: Sample– An NCM is written to document the reason for the dilution.

13.6.5.1.1.2 Dilution: Surrogate(s) and/or spike(s) diluted out– An NCM is written to document the reason for the dilution.

13.6.5.2 Carryover

13.6.5.2.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.6.5.2.2 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.6.5.2.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.6.5.3 Insufficient Sample

13.6.5.3.1 For each prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis a narrative comment stating such is included in the report narrative. An NCM is written to document the insufficient volume.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, reporting limits, and QC acceptance limits, are maintained in the LIMs.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 Waste Streams Produced by the Method

16.1.1 The following waste streams are produced when this method is carried out.

16.1.1.1 Solvent waste generated. Solvent waste must be accumulated in the appropriate waste accumulation container, labeled as Drum Type "D".

16.1.1.2 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 SW-846 ,"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Method 8000C

17.2 SW-846 ,"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" Method 8015C.

17.3 IOWA Method OA-2 University Hygienic Laboratory, Iowa City, IA, rev. 07/27/93.

17.4 St. Louis Quality Assurance Manual (QAM), current revision.

17.5 Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.6 TestAmerica Policy CA-Q-S-002, Manual Integration

17.7 TestAmerica Policy CA-T-P-002, Selection of Calibration Points

17.8 Associated SOPs

17.8.1 ST-OP-0001, Labware Preparation for Organic Analysis

17.8.2 ST-OP-0002, Extraction and Cleanup of Organic Compounds from Water and Soils, Based on SW-846 3500 Series, 3600 Series, and 600 Series

17.8.3 ST-PM-0002, Sample Receipt and Chain of Custody

17.8.4 ST-QA-0002, Standard and Reagent Preparation

17.8.5 ST-QA-0005, "Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes."

17.8.6 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts

17.8.7 ST-QA-0016, IDL/MDL Determination

17.8.8 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 MODIFICATIONS FROM REFERENCE METHOD

18.1 Chapter 1 of SW-846 states that the Method Blank should not contain any analyte of interest at or above the Method Detection Limit. Common lab contaminants are allowed to be up to 5 times the reporting limit in the blank following consultation with the client.

19.0 CHANGES TO PREVIOUS SOP REVISION

19.1 No Changes, Annual Review.
19.2 Rev 16;
- 19.2.1 Annual Review, No Changes

19.3 Rev 17:
- 19.3.1 Updated scope in section 1.0.
- 19.3.2 Removed Gasoline Range Organics (GRO) from the section 2.0.
- 19.3.3 Removed the definition for gasoline for method 8015C in section 3.0.
- 19.3.4 Updated equipments and supplies throughout section 6.0.
- 19.3.5 Updated calibration standards in sections 7.4, 7.5 and 7.6.
- 19.3.6 Updated the retention time standard being analyzed daily in section 10.2.
- 19.3.7 Updated initial calibration in section 10.3.
- 19.3.8 Updated ICV and CCV information in sections 10.4 and 10.5.
- 19.3.9 Updated the storage temperature for extracts in section 11.0.
- 19.3.10 Added external calibration calculations to Section 12.2
- 19.3.11 Updated the quantitation of hydrocarbons in section 12.5.
- 19.3.12 Removed the reference to “Quantims” and “Clouseau”.
- 19.3.13 Updated corrective action for non-conformances in section 13.0.
- 19.3.14 Corrected references to Corporate Policies in Sections 17.6 & 17.7.

19.4 Rev 18:
- 19.4.1 Added carbon range retentiontime marker to Section 7
- 19.4.2 Changed “stock” to “primary” for clarification in Section 7
- 19.4.3 Added six point requirement for quadratic curves to Section 10.
- 19.4.4 Added requirement for NCM when excluding peaks to Section 13.
- 19.4.5 Added location of Control Limits (found in LIMS) to Section 13.

Title: ANALYSIS OF METALS BY INDUCTIVELY COUPLED PLASMA / MASS SPECTROMETRY [SW-846 6020A; EPA 200.8]

Approvals (Signature/Date):

Fernando Cruz Inorganics Department Manager	1/18/12 Date	Michael Ridenhower Health & Safety Manager / Coordinator	1/18/12 Date
Marti Ward Quality Assurance Manager	1-18-12 Date	Elaine Wild Laboratory Director	1/18/12 Date

This SOP was previously identified as SOP No. ST-MT-0001 Rev. 19

Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the determination of metals by inductively coupled plasma mass spectrometry (ICP-MS) by EPA SW846 Method 6020A, EPA 200.8 and ASTM Method D5673-03.

1.2 This method is applicable to surface, and saline waters; soil and waste samples.

1.3 The aqueous sample digestion procedure is found in SOP: ST-IP-0013, Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by ICP Spectroscopy, and ICP/MS (Method 3010A, EPA 200.7 and EPA 200.8) and the soil sample digestion procedure is found in SOP: ST-IP-0002, Acid Digestion of Soils, SW846 Method 3050B for ICP, and ICP/MS.

1.3.1 The Technetium-99 soil procedure is found in SOP ST-RC-0125, Determination of Technetium-99 Using Eichrom® Teva Resin, taking the following deviations: Rhenium is used instead of Technetium-99 meta as the tracer, there is no need to let the tracer decay out and the tracer is analyzed on the ICPMS.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

1.4.1 Additional elements may be amendable to this method provided the laboratory has established a MDL and the elements meets the QC requirements as prescribed in the associated preparation and analysis SOP.

2.0 SUMMARY OF METHOD

2.1 Sample digestates are nebulized into a spray chamber where a stream of argon carries the sample aerosol through a quartz torch and injects it into a radio frequency plasma. There the sample is decomposed and desolvated. The ions produces are entrained in the plasma gas and by means of a water-cooled, differentially pumped interface, introduced into a high-vacuum chamber that houses a quadrupole or octoplole mass spectrometer. The ions are sorted according to their mass-to-charge ratio and measured with a channel electron multiplier.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

3.2 EPA and SW methodology use different terminology. Our SOP references the SW 846 terminology:

3.2.1 The ICV satisfies the QCS requirements found in method 200.8 and D5673-03.
3.2.2 The LCS satisfies the requirements of the LFB found in method 200.8 and D5673-03.
3.2.3 The MS satisfies the requirements of the LFM found in method 200.8 and D5673-03.
3.2.4 The CCV satisfies the requirements of the IPC found in method 200.8.
3.2.5 The LLICV satisfies the requirements of the CRI.

3.3 Dissolved Metals: Those elements which pass through a 0.45 um membrane filter. (Sample is acidified <u>after</u> filtration)

3.4 Suspended Metals: Those elements retained by a 0.45 um filter.

3.5 Total Metals: The concentration determined on an unfiltered sample following vigorous digestion.

3.6 Total Recoverable Metals: The concentration determined on an unfiltered sample following treatment with hot, dilute mineral acid.

3.7 Dilution Test – the terminology "dilution test" found in later versions of 200.8 and 6020A is referred to as a Serial Dilution in this SOP.

4.0 INTERFERENCES

4.1 Isobaric elemental interferences: Isobaric elemental interferences associated with naturally occurring isotopes are automatically corrected by the instrument software.

4.2 Isobaric molecular interferences: Corrections for molecular interferences will be applied where appropriate based on known or suspected interferences.

4.3 Common molecular ion interferences are listed in Table 1 of this SOP.

4.4 Matrix interferences: Internal standards are used to correct for some matrix interferences.

4.4.1 Internal standards are added at a level to give approximately 100,000 - 10,000,000 counts of raw signal intensity. The mass of the internal standard used should ideally be within ±50 amu of the mass of the affected analyte.

4.4.2 Severe matrix effects will be monitored by comparing the internal standard intensity in the sample to the internal standard intensity of the initial calibration blank .

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1 The ICP plasma emits strong UV light, harmful to vision. Analysts must avoid looking directly at the plasma.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm (TWA) 4 ppm (STEL)	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm (Ceiling)	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			
STEL – Short Term Exposure Limit			
Ceiling – At no time should this exposure limit be exceeded.			

6.0 EQUIPMENT AND SUPPLIES

6.1 Perkin Elmer/Sciex ELAN 6100 ICP-MS with Autosampler/ Agilent 7500/ Agilent 7700 (all with auto samplers)

6.2 Helium gas: 5.5 trace analytical grade

6.3 Hydrogen gas: ultra high purity grade

6.4 Argon gas: High-purity grade (99.99%)

6.5 Chiller (water cooling device)

6.6 Peristaltic Pump

6.7 Calibrated automatic pipettes or Class A glass volumetric pipettes

6.8 Teflon flasks

6.9 Instrument software: ELAN version 2.3.2 or Mass Hunter version B.01.01.

7.0 REAGENTS AND STANDARD

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Concentrated nitric acid (HNO3), trace metal grade

7.3 Concentrated hydrochloric acid (HCl), trace metal grade

7.4 DI water from the Millipore unit

7.4.1 Water must be free of the analytes of interest as demonstrated through the analysis of method blanks. Water must be shown to have a resistivity greater than or equal to 16.67 Mohm-cm.

7.5 Standards, NIST traceable

7.5.1 Purchased as custom multi-element mixes or as single-element solutions.

7.5.2 All standards must be stored in FEP fluorocarbon or unused polyethylene or polypropylene bottles.

7.5.3 Working calibration and calibration verification solutions may be used for up to 1 week and must be replaced sooner if verification from an independent source indicates a problem. Standards should be prepared in a matrix of 2% hydrochloric and 2% nitric acid.

7.5.4 Internal Standard Solution: Prepare internal standards (Au, Sc, Ge, In, Ho, Li6) when needed.

7.5.5 Tuning solution: Prepare tuning solution (Be, Ba, Ce, Co, In, Pb, Li) when needed.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Aqueous samples for total metals must be digested before analysis using an appropriate digestion procedure, ST-IP-0013.

8.3 Soil or waste samples are digested before analysis using an appropriate digestion procedure. Method 3050B of SW846 is the appropriate digestion procedure, ST-IP-0002.

8.4 Digestate holding time is 6 months from sample collection.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a MS/MSD an LCS Duplicate (LCSD) is prepared and analyzed.

9.2 **Method Blank (MB)**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Serial Dilution**

9.5.1 A dilution test is performed to determine whether significant physical or chemical interferences exist due to the sample matrix.

9.5.2 The test is performed by running a sample at a 5x (1:4) dilution.

9.5.3 Samples identified as field blanks cannot be used for dilution tests.

9.5.4 The serial dilution results shall agree within +\- 10% of the undiluted sample results, if the undiluted sample results are greater than 10 times the reporting limit. There is no criteria for sample results less than 10 times the reporting limit.

9.6 **Post Digestion Spike** (PDS)

9.6.1 Post digestion spike are applicable to 6020A only.

9.6.1.1 A post digestion spike is a sample which has been fortified with target analytes of interest after the digestion process.

9.6.2 The laboratory requires the analysis of a serial dilution for all batches and thus does not perform the intermediate post digestion spike QC step.

9.6.3 The method stipulates that a PDS be performed on the sample chosen for MS/MSD and if the PDS fails to proceed to performing a serial dilution on the sample. If the PDS is acceptable, the laboratory is not required to perform a serial dilution. Since the laboratory has elected to perform the serial dilution routinely, the outcome of the PDS is not critical. There is no qualification made to the data based on the performance of the PDS.

9.6.4 For client project or programs requiring a PDS, the laboratory will include a PDS in the batch in addition to the serial dilution. This requirement is noted by the Project Manager in the client requirement sheet and/or client summary report.

9.6.4.1 If a PDS is performed, the acceptance criteria is 80%-120%, with a spike concentration between 10-100 times the MDL, UNLESS, the project/program criteria is given.

9.7 **Method of Standard Addition** (MSA)

9.7.1 This technique involves adding known amounts of standard to one or more aliquots of the processed sample solution. This technique compensates for a sample interferent that may enhance or depress the analyte signal, thus producing a different slope from that of the calibration standards. It will not correct for additive interferences which cause a baseline shift.

9.7.2 MSA are not required by the method.

9.7.3 MSAs are not considered normal batch QC and if required by the client, must appear on the client requirement sheet or client summary report.

9.8 **Procedural Variations/ Nonconformance and Corrective Action**

9.8.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.8.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Follow the instrument start-up procedure outlined in the Perkin Elmer Elan 6100 Operator's Manual or the Agilent 7500/ 7700 operator's manual.

10.2 Cone Conditioning

10.2.1 Aspirating a 25% tap water solution for at least 1 hour can enhance instrument performance. This procedure 75% ICPMS rinse solution should be used daily after a thorough cleaning of the interface cones or the installation of new cones takes place.

10.3 Rinse Time Determination

10.3.1 Prior to calibration and between each sample/standard the system is rinsed with the calibration blank solution. The minimum rinse time between analytical samples is 60 seconds unless following the protocol outlined in this SOP it can be demonstrated that a shorter rinse time may be used.

10.3.1.1 To determine the appropriate rinse time, a linear range verification standard should be aspirated as a regular sample followed by the analysis of a series of rinse blanks. The length of time required to reduce the analyte signals to < RL will define the rinse time for the system. For some analytes it may be impractical to set the rinse time based on the linear range standard result (i.e., analyte not typically detected in environmental samples at that level and an excessive rinse time would be required at the linear range level). The concentration levels used to establish the rinse time must be taken into consideration when reviewing the data.

10.4 All calibration procedures described in the subsequent subsections of section 10 applies to both detector systems.

10.5 Instrument Tuning (For no gas He and H2 mode)

10.5.1 Frequency:

10.5.1.1 Daily with each initial calibration

10.5.2 Aspirate a 10 ppb tuning solution containing all of the tuning elements. The typical tuning elements for the Perkin Elmer are He, Mg, Rh. Ce, Pb and Ba. For the Agilent the elements are Li, Y, TL, Co, In, Ce, and Tl.

10.5.3 Tune Criteria:

10.5.3.1 Mass calibration and resolution checks must be documented and included as part of the raw data package.

10.5.3.1.1 Resolution must be < 0.9 amu at 10% peak height for method 6020A or produce a peak width of approximately 0.75 amu at a peak height of 5% for method 200.8

10.5.3.1.2 Mass calibration must be within $\pm$ 0.1 amu from the actual value for the tuning elements of interest or the mass calibration must be adjusted.

10.5.3.1.3 Using the Tuning Solution, an Auto-lens calibration is performed to ensure that optimum voltages are being applied to the Auto-lens. The default calibration should range from 4-10 volts (Perkin Elmer Only).

10.5.3.1.4 The tuning elements must have RSDs below 5%. Mg must be at or above 30,000 counts. Pb must be at or above 100,000 counts. Rh must be at or above 150,000 (Perkin Elmer Only). counts and the oxides/polyatomic ions must be below 3.0%. The background must be less than or equal to 30 counts (Perkin Elmer Only).

10.5.3.1.4.1 If any of these conditions are not met repairs or optimization procedures must be performed until these specifications are met.

10.6 **Initial Calibration**

10.6.1 Multi-point Calibration:

10.6.1.1 A calibration curve, consisting of 3 standards and a blank, must be analyzed daily.

10.6.1.2 Calibration criteria:

10.6.1.2.1 Correlation Coefficient of ≥ 0.998

10.6.1.2.2 The low level standard in the curve must be at or below the laboratory's routine reporting limit. See structure and analysis code (SAC) information appended to this SOP.

10.6.1.2.2.1 If a client requested reporting limit is below the laboratory's routine reporting limit and thus below the low level verification standard, the laboratory will discuss with the client, prior to sample analysis, how to proceed with this requirement.

10.7 **Initial Calibration Verification/Initial Calibration Blank** (ICV/ICB)

10.7.1 The initial calibration accuracy is verified by analyzing a second source standard (ICV).

10.7.2 ICV Frequency:

10.7.2.1 Perform with each initial calibration

10.7.3 ICV Criteria:

10.7.3.1 **Method 200.8 and D6573-03**, the ICV result must fall within 10% of the true value for that solution.

10.7.3.2 **Method 6020A**, the ICV must fall within 10% of the true value for that solution.

10.7.3.3 The internal standard intensity must be 70-140% the IS intensity in the instrument standardization solution.

10.7.4 LLICV (Low Level Initial Calibration Verification)

10.7.4.1 Same source as calibration.

10.7.4.2 Perform with each initial calibration.

10.7.4.3 +/- 30% criteria

10.7.4.4 Internal standard should be 70-140%.

10.7.5 ICB Frequency:

10.7.5.1 An ICB is analyzed immediately following the ICV to monitor low level accuracy and system cleanliness.

10.7.6 ICB Criteria:

10.7.6.1 The ICB result must fall within +/- the RL from zero.

10.7.6.2 The internal standard intensity must be 70-140% the IS intensity in the instrument standardization solution.

10.7.7 If either the ICV or ICB fail to meet criteria, the analysis should be terminated, the problem corrected, the instrument recalibrated and the calibration reverified.

10.7.7.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV, or analysis of a different ICV). Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.8 **Continuing Calibration Verification/Continuing Calibration Blank (CCV/CCB)**

10.8.1 Calibration is monitored throughout the analytical run through the analysis of a known standard.

10.8.2 A CCV may be a second source or the same source as the calibration

10.8.3 CCV Frequency:

10.8.3.1 Analyte response factors must be verified at the beginning of each analytical run (by either an ICV or a CCV), after every 10 samples and at the end of the analysis run through the analysis of a mid-level calibration standard.

10.8.4 CCV Criteria:

10.8.4.1 For **200.8**: The CCV must fall within 15% of the true value for that solution.

10.8.4.2 For **6020A and D5673-03**: The CCV must fall within 10% of the true value for that solution.

10.8.4.2.1 If a CCV has failed and the analyst can document the reason for failure (e.g mis-injection, etc.) then a second CCV may be analyzed without any adjustments to the instrument. If this CCV meets criteria then sample analysis may continue; however the preceding 10 samples must be reanalyzed. If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require re-calibration (ie initial calibration).

10.8.4.3 The internal standard intensity must be within 70-140% of the IS intensity in the instrument standardization solution.

10.8.4.3.1 If not, the analyst will review the data. If the sample internal standard recoveries are within control and the CCV is within 10% of its true value and the CCB is <RL, it is apparent that whatever interference affected the internal standard for the QC standards has not affected the element bracketed by that internal standard based upon the criteria being met. If these specific occurrences are met then an NCM will be generating stating why the data is acceptable.

10.8.5 CCB Frequency:

10.8.5.1 A CCB is analyzed immediately following each CCV.

10.8.6 CCB Criteria:

10.8.6.1 The CCB result must fall within +/- RL from zero.

10.8.6.2 The internal standard intensity must be 70-140% of the IS intensity in the instrument standardization solution.

10.8.6.2.1 If not, the analyst will review the data. If the sample internal standard recoveries are within control and the CCV is within 10% of its true value and the CCB is <RL, it is apparent that whatever interference affected the internal standard for the QC standards has

not affected the element bracketed by that internal standard based upon the criteria being met. If these specific occurrences are met then an NCM will be generating stating why the data is acceptable.

10.9 **Interference Check Standard** (ICSA/ICSAB)

10.9.1 Interference check standards are applicable to 6020A only.

10.9.2 The validity of the interelement correction factors is demonstrated through the successful analysis of interference check solutions.

10.9.3 **ICSA**:

10.9.3.1 The ICSA contains only interfering elements. Refer to Table II for the details of ICSA composition.

10.9.3.2 Custom multielement ICS solutions must be used.

10.9.3.3 Elements known to be interferents on a required analyte must be included in the ICPMS run when that analyte is determined. Aluminum, iron, calcium and magnesium must always be included in all ICPMS runs.

10.9.4 **ICSB**:

10.9.4.1 The ICSAB contains analytes and interferents.

10.9.4.2 Refer to Table II for the details of ICSAB composition.

10.9.4.3 Custom multielement ICS solutions must be used.

10.9.5 ICSA/ICSAB Frequency:

10.9.5.1 For **6020A**: The ICSA and ICSAB must run with each initial calibration or every 12 hours whichever is shorter.

10.9.6 ICSA/ICSAB Criteria:

10.9.6.1 The ICSAB results for interferents must fall within 80% – 120% of the true value.

10.9.6.2 ICSA results for the non-interfering elements with RLs < 10 µg/L must fall within ± 2x RL from zero. ICSA results for the non-interfering elements with RLs > 10 µg/L must fall within ± 1xRL from zero.

10.10 Liner Dynamic Range

10.10.1 Prior to running the instrument, the upper limit of quantition must be established for each analyte.

10.10.2 This upper limit is tested by running a standard containing high concentrations of the analytes against a calibration curve.

10.10.3 The LDR standard must recover within ten percent of its true value.

10.10.4 The concentration of the LDR standard is higher than the high calibration standard.

10.10.5 LDR study is performed daily.

10.11 Calibration Sequence

Tuning Standard
Initial Calibration (3 standards plus a blank)
ICV
ICB
LLC
ICSA*
ICSAB*
CCV
CCB
LDR (Client Specific)
CCV
CCB
10 samples (analysis runs)
CCV
CCB
10 samples (repeat every 10 analysis runs)

CCV
CCB
End

* If sequence time is longer than 12 hours, the ICSA and ICSAB standard must be re-analyzed.

11.0 PROCEDURE

11.1 The aqueous sample digestion procedure is found in SOP: ST-IP-0013, Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by ICP Spectroscopy, and ICP/MS (Method 3010A, EPA 200.7 and EPA 200.8)

11.1.4 For 200.8 analyses, dissolved samples must be digested.

11.2 The soil sample digestion procedure is found in SOP: ST-IP-0002, Acid Digestion of Soils, SW846 Method 3050B for ICP, and ICP/MS.

11.3 Instrument conditions, including rinse times, must be the same for all standards and samples.

11.4 Internal standards are introduced to the standards and sample digestates by the instrument.

11.5 Load autosampler with standards and digestates in accordance with the sequence given in section 10.

11.6 Analyze samples.

11.7 When analysis is completed, return unused digestate to proper storage area.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 All measurements must fall within the defined linear range where spectral interference correction factors are valid.

12.2.1 Dilute and reanalyze all samples for required analytes that exceed the linear range.

12.2.2 Acid strength must be maintained in the dilution of samples.

12.3 The mass ions used for determination of the element of interest is given in Table 1 of this SOP

12.4 Internal Standard recovery

12.4.1 Internal Standard Criteria:

12.4.1.1 For **6020A**: Recovery 70%-140% of the intensity of that internal standard in the initial calibration standard for all samples and QC standards.

12.4.1.2 For **200.8 and D5673-03**: Recovery 60-125% of the response in the calibration blank for all samples and QC standards.

12.4.2 If this criteria is not met, the sample should be diluted and re-analyzed until the IS recoveries are within specified limits.

12.5 Tracer Calculations

12.5.1 Tracer Recovery: The measured concentration and the actual concentration for the tracer is entered into spreadsheet SL-INORG-0128. This spreadsheet uses the following formula:

$$\frac{\text{Measured Tracer Concentration}}{\text{Actual Tracer Concentration}} = \text{Final Recovery}$$

12.5.1.1 Tracer Criteria: The tracer recovery must fall within 40-110%.

12.5.2 Final concentration (corrected for tracer): the Technetium-99 measured concentration and the tracer recovery is entered into spreadsheet SL-INORG-0128. This spreadsheet uses the following formula:

$$\frac{\text{Measured Sample Concentration}}{\text{Tracer Recovery}} = \text{Final SampleConcentration}$$

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target analytes present above ½ RL), will be noted on the client requirements sheet.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action (e.g. re-prep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).
Corrective Action for LCS not meeting acceptance criteria:

13.3.1.2 <u>LCS Spike Recovery excursion (high)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.1.3 <u>LCS Spike Recovery excursion (low)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3.1.4 <u>RPD Duplicate excursion</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.2.1 <u>MS/MSD Spike Rec. excursion</u> may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Sample result evaluation

13.5.1 Dilutions

13.5.1.1 If the response for any compound exceeds the calibration range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.5.1.2 <u>Dilution: Sample</u>– See Clouseau NCM for corrective action.

13.5.2 Insufficient Sample

13.5.2.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Acidic sample waste generated. All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type “A” or “B.”

16.2.1.2 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 6020A

17.2 Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma/Mass Spectrometry Method 200.8

17.3 ASTM Method D 5673-03, “Standard Test Method for Elements in Water by Inductively Coupled

Plasma-Mass Spectrometry”, 2003

17.4 Perkin Elmer ELAN 6000 Inductively Coupled Plasma Mass Spectrometer Hardware Guide

17.5 TestAmerica Quality Assurance Manual (QAM), current revision

17.6 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.7 Associated SOPs, current revisions

17.7.1 ST-IP-0002, Acid Digestion of Soils, SW846 Method 3050B for ICP, and ICP/MS
17.7.2 ST-IP-0013, Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by ICP Spectroscopy, and ICP/MS (Method 3010A, EPA 200.7 and EPA 200.8)
17.7.3 ST-QA-0002, Standard and Reagent Preparation
17.7.4 ST-PM-0002, Sample Receipt and Chain of Custody
17.7.5 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.7.6 ST-QA-0016, IDL/MDL Determination
17.7.7 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

18.1 The post spike is not performed per batch. Internal standards are used to monitor matrix interferences in all samples. Post spikes are done per specific QAPP or program requirements. Post-spikes using analytes other than the internal standards may be used if an analyst encounters a new or unusual matrix.

18.2 Method 6020A requires a single point plus a blank for initial calibration. Rather than assume linearity across the instrument range, TestAmerica St. Louis uses a multi-point calibration (3 standards plus a blank) to establish linearity.

18.3 (Lower limit of quantitation check) The LLQC sample is analyzed annually with the MDL study.

18.4 Method 6020 requires the analysis of a Lower Limit Quantitation Check Sample (LLQC) to establish and confirm the lowest quantitation limit. TestAmerica St. Louis fills this requirement with the running of a MDL verification standard which is taken through the entire sample preparation procedure. The method suggested recovery criteria of ± 30% is not applied.

18.5 Method 6020 suggests the analysis of a Low Level Continuing Calibration Verification (LLCCV) standard. This standard should be at the laboratory limit of quantitation and be run periodically throughout an analytical sequence. TestAmerica St. Louis runs this standard only at the beginning of each analytical run.

18.6 Method SW846 1311 requires that the Method Standard Addition (MSA) be used when matrix spike recovery is less than 50% and the measured sample results is within the range of 80-120% of the Toxicity Characteristics Limit. TestAmerica St. Louis does not run an MSA. Spike results outside QC limits are flagged and noted in the case narrative.

19.0 CHANGES TO PREVIOUS REVISION

19.1 Updated formatting and spelling errors throughout SOP.
19.2 Updated section 4.4 referring to the amount of an internal standard being used.
19.3 Added new instrument and gases used in section 6.0.
19.4 Added Lithium to section 7.0 as part of the new reagents and standards used.
19.5 Made reference to new instruments for calibration in section 10.0.
19.6 Add new list of tuning element for both instruments in section 10.5.
19.7 Updated the internal standard intensity throughout section 10.7 and section 10.8

19.8 Added new elements to table 2.

19.9 Rev. 18;

19.9.1 Added LLICV to definitions in section 3.2.

19.9.2 Removed Hydrogen Peroxide from Safety Section (included in prep SOP's.)

19.9.3 Added tuning solution to section 7.5.5.

19.9.4 Updated cone conditioning solution, make up and frequency of use.

19.9.5 Added clarification to tuning section 10.5.

19.9.6 Added Low Level initial calibration verification standards plus criteria to section 10.0.

19.9.7 Updated tables 1 and 2, added analytes, updated concentrations.

19.9.8 Added method 1311 MSA requirements information to section 18.0.

19.9.9 Spelling and grammatical corrections.

19.10 Rev. 19:

19.10.1 Updated Table III regarding QC Criteria limits.

19.11 Revision 20:

19.11.1 Updated section 1.3 adding reference to the Technetium-99 soil procedure.

19.11.2 Added formulas for determining the Tracer Recovery and the Final tracer Corrected Concentration to section 12.5.

19.11.3 Added instrument software and hardware to section 6.0.

19.11.4 Updated the PDS acceptance criteria in section 9.6.

Table 1
ANALYTICAL ISOTOPES

ELEMENT	Tune Step	7500	Tune Step	7700	6100
Li	3	7	3	7	7
Be	3	9	3	9	9
B	3	11	3	11	10
Na	2	23	2	23	23
Mg	2	24	2	24	24
Al	2	27	2	27	27
Si	3	28	1	28	28
P	2	31	3	31	31
S	3	34	3	34	34
K	2	39	2	39	39
Ca	3	44	1	44	44
Ti	3	47	3	47	47
V	2	51	2	51	51
Cr	2	52	2	52	52
Mn	2	55	2	55	55
Fe	2	57	2	57	57
Co	2	59	2	59	59
Ni	2	60	2	60	60
Cu	2	63	2	63	65
Zn	2	66	2	66	66
As	2	75	2	75	75
Se	2	78	2	78	82
Sr	3	88	3	88	86
Y	2	89	2	89	89
Zr	2	90	2	90	90
Nb	2	93	2	93	93
Mo	3	95	3	95	97
Ru	2	101	2	101	102
Rh	2	103	2	103	103
Pd	2	105	2	105	105
Ag	3	107	3	107	107
Cd	3	111	3	111	111
Sn	3	118	3	118	118
Sb	3	121	3	121	123
Te	2	125	2	125	130
Cs	2	133	2	133	133
Ba	3	137	3	137	135
La	2	139	2	139	N/A
Ce	2	140	2	140	140
Pr	2	141	2	141	N/A
Nd	2	146	2	146	N/A
Sm	3	147	3	147	147
Hf	2	178	2	178	180
Ta	2	181	2	181	181
W	2	182	2	182	182
Pt	2	195	2	195	194
Tl	3	205	3	205	205
Pb	3	208	3	208	208
Bi	2	209	2	209	209

Th	3	232	3	232	232
Tc					99
U	3	236	3	236	236
U	3	235	3	235	235
U	3	234	3	234	234
U	3	233	3	233	233
U	3	238	3	238	238

Tune Step 1; Hydrogen gas
Tune Step 2: Heluim
Tune Step 3: No Gas (argon only)

COMMON MOLECULAR ION INTERFERENCES IN ICP-MS

BACKGROUND MOLECULAR IONS

Molecular Ion	Mass	Element Interferences*
NH^+	15	
OH^+	17	
OH_2^+	18	
C_2^+	24	
CN^+	26	
CO^+	28	
N_2^+	28	
N_2H^+	29	
NO^+	30	
NOH^+	31	
O_2^+	32	
O_2H_+	33	
$^{36}ArH^+$	37	
$^{38}ArH^+$	39	
$^{40}ArH^+$	41	
CO_2^+	44	
CO_2H^+	45	Sc
ArC^+, ArO^+	52	Cr
ArN^+	54	Cr
$ArNH^+$	55	Mn
ArO^+	56	
$ArOH^+$	57	
$^{40}Ar^{36}Ar^+$	76	Se
$^{40}Ar^{38}Ar^+$	78	Se
$^{40}Ar_2^+$	80	Se

* Method elements or internal standards affected by the molecular ions.

MATRIX MOLECULAR IONS * No gas Mode Only

CHLORIDE

Molecular Ion	Mass	Element Interference
$^{35}Cl0^+$	51	V
$^{35}Cl0H^+$	52	Cr
$^{37}Cl0^+$	53	Cr
$^{37}Cl0H^+$	54	Cr
$Ar^{35}Cl^+$	75	As
$Ar^{37}Cl^+$	77	Se

SULFATE

Molecular Ion	Mass	Element Interference
$^{32}SO^+$	48	
$^{32}SOH^+$	49	
$^{34}SO^+$	50	V, Cr
$^{34}SOH^+$	51	V
SO_2^+, S_2^+	64	Zn
$Ar^{32}S^+$	72	
$Ar^{34}S^+$	74	

PHOSPHATE

Molecular Ion	Mass	Element Interference
PO^+	47	
POH^+	48	
PO_2^+	63	Cu
ArP^+	71	

GROUP I, II METALS

Molecular Ion	Mass	Element Interference
$ArNa^+$	63	Cu
ArK^+	79	
$ArCa^+$	80	

MATRIX OXIDES*

Molecular Ion	Mass	Element Interference
TiO	62-66	Ni, Cu, Zn
ZrO	106-112	Ag, Cd
MoO	108-116	Cd

* Oxide interferences will normally be very small and will only impact the method elements when present at relatively high concentrations. Some examples of matrix oxides are listed of which the analyst should be aware. It is recommended that Ti and Zr isotopes are monitored in solid waste samples, which are likely to contain high levels of these elements. Mo is monitored as a method analyte.

Table II Interference Check Sample Concentrations

Element	ICSA (ug/L)	ICSAB (ug/L)
Aluminum	50,000	50,000
Antimony	-	50
Arsenic	-	100
Barium	-	100
Beryllium	-	100
Bismuth	-	100
Boron	-	200
Cadmium	-	100
Calcium	50,000	50,000
Carbon	100,000	100,000
Chromium	-	100
Chlorine	500,000	500,000
Cobalt	-	100
Copper	-	100
Iron	50,000	50,000
Lead	-	100
Lithium	-	100
Magnesium	50,000	50,000
Manganese	-	100
Molybdenum	1,000	1,000
Nickel	-	100
Niobium	-	100
Palladium	-	25
Platinum	-	25
Phosphorus	50,000	50,000
Potassium	50,000	50,000
Samarium	-	100
Selenium	-	100
Silicon	-	500
Silver	-	20
Sodium	50,000	50,000
Strontium	-	100
Sulfur	50,000	50,000
Thallium	-	100
Thorium	-	100
Tin	-	100
Titanium	1,000	1,000
Tungsten	-	100
Uranium	-	100
Vanadium	-	100
Zinc	-	100
Zirconium	-	100
Hafnium	-	100
Cesium	-	100
Yttrium	-	100
Tantalum	-	100
Tellurium	-	100
Rhodium	-	100
Ruthenium	-	100
Cerium	-	100

Lanthanum	-	100
Praseodymium	-	100
Neodymium	-	100
Technetium	-	0.233
U233	-	0.958
U234	-	1.786
U235	-	3.761
U236	-	0.162
U238	-	0.436

* Clients may request higher concentrations (LANL, Pantex), See client requirements memo.

Table III, QC Criteria

Methods	**6020A**	**200.8**
Corr Coeff.	>0.998	
Tuning Res	<0.9amu	≈ 0.75amu
Int Std	>70%	60-125%
LCS	80-120%	85-115%
ICV	90-110%	90-110%
CCV	90-110%	85-115%
PDS	80-120%	N/A
MS	75-125%	70-130%
LLICV	70-130%	N/A

TAL Reference Data Summary

Structured Analysis Code: **I-JX-QV-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: ICP-Mass Spectrometry (200.8)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6226							Spike List 6227						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
128	Antimony	5	ug/L	1.67	ug/L	20110110	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
194	Barium	2	ug/L	0.196	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
313	Boron	50	ug/L	10.0	ug/L	20110110	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
643	Copper	1	ug/L	0.097	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1616	Lithium	5	ug/L	0.674	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110110	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
3924	Niobium	25	ug/L	2.23	ug/L	20100115														
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115														
2200	Phosphorus	20.0	ug/L	8.23	ug/L	20100108								C	Y	1000	ug/L	70	130	20
2209	Platinum	1	ug/L	0.060	ug/L	20100108														
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
3927	Rhenium	1	ug/L	0.578	ug/L	20060328														
5936	Ruthenium 101	0.5	ug/L	0.00155	ug/L	20051128														
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	70	130	20
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2602	Tungsten	5	ug/L	0.839	ug/L	20100108								C	Y	1000	ug/L	70	130	20

Structured Analysis Code: I-JX-QV-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: ICP-Mass Spectrometry (200.8)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6226							Spike List 6227						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3827	Uranium	1	ug/L	0.14	ug/L	20110110	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227														
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227														
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227														
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227														
4133	Uranium 238	0.05	ug/L	0.0016	ug/L	20071227														
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: I-GJ-MH-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	12.9	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
128	Antimony	5	ug/L	1.67	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
194	Barium	2	ug/L	0.203	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.350	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
307	Bismuth	20.0	ug/L	0.732	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
313	Boron	50	ug/L	10.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.10	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
413	Calcium	100	ug/L	68.1	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3489	Cerium	10	ug/L	0.886	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3488	Cesium	0.10	ug/L	0.053	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2952	Chromium	10	ug/L	3.26	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
643	Copper	1	ug/L	0.451	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3917	Hafnium	10	ug/L	1.13	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3922	Lanthanum	2	ug/L	0.051	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1616	Lithium	5	ug/L	0.694	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.245	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1906	Molybdenum	5	ug/L	1.00	ug/L	20110624	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3490	Neodymium	2	ug/L	0.104	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.40	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
3925	Palladium	1	ug/L	0.059	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.53	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.079	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2214	Potassium	100	ug/L	41.6	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3926	Praseodymium	2	ug/L	0.042	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3927	Rhenium	1	ug/L	0.025	ug/L	20110906	C	Y	100	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3928	Rhodium	10	ug/L	0.817	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3930	Ruthenium	10	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3931	Samarium	10	ug/L	0.326	ug/L	20110124														
2281	Selenium	5	ug/L	1.59	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20110124	C	Y	5000	ug/L	80	120	20	C	Y	5000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20

Structured Analysis Code: I-GJ-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224								Spike List 6225							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2315	Sodium	50	ug/L	15.0	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2353	Strontium	5	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2876	Sulfur	5000	ug/L	333	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3742	Tellurium	10.0	ug/L	0.536	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2477	Thallium	2	ug/L	0.55	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2479	Tin	2	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2482	Titanium	5	ug/L	2.1	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2602	Tungsten	5	ug/L	2.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3827	Uranium	1	ug/L	0.231	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20110124	C	Y	0.386	ug/L	80	120	20	C	Y	0.386	ug/L	75	125	20
4129	Uranium 234	0.05	ug/L	0.0021	ug/L	20110124	C	Y	0.175	ug/L	80	120	20	C	Y	0.175	ug/L	75	125	20
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20110124	C	Y	0.228	ug/L	80	120	20	C	Y	0.228	ug/L	75	125	20
5385	Uranium 236	0.05	ug/L	0.0015	ug/L	20110124	C	Y	1.75	ug/L	80	120	20	C	Y	1.75	ug/L	75	125	20
4133	Uranium 238	1.0	ug/L	0.0082	ug/L	20110124	C	Y	33.6	ug/L	80	120	20	C	Y	33.6	ug/L	75	125	20
2607	Vanadium	10	ug/L	2.37	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2726	Yttrium	5	ug/L	0.212	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2649	Zinc	10	ug/L	8.29	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: I-JX-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6224								Spike List 6225							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	12.9	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
128	Antimony	5	ug/L	1.67	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
194	Barium	2	ug/L	0.203	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.350	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
313	Boron	50	ug/L	10.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.10	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
413	Calcium	100	ug/L	68.1	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3489	Cerium	10	ug/L	0.886	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3488	Cesium	0.10	ug/L	0.053	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128	C	Y	500	ug/L	80	120	20	C	Y	10.00	ug/L	75	125	20
2952	Chromium	10	ug/L	3.26	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
643	Copper	1	ug/L	0.451	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1616	Lithium	5	ug/L	0.694	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.245	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1906	Molybdenum	5	ug/L	1.00	ug/L	20110624	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.40	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
3925	Palladium	0.5	ug/L	0.059	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.53	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.079	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2214	Potassium	100	ug/L	41.6	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2281	Selenium	5	ug/L	1.59	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20110124	C	Y	5000	ug/L	80	120	20	C	Y	5000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2315	Sodium	50	ug/L	15.0	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2353	Strontium	5	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2479	Tin	2	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2482	Titanium	5	ug/L	2.1	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2602	Tungsten	5	ug/L	2.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

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Structured Analysis Code: I-JX-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3827	Uranium	1	ug/L	0.231	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20110124	C	Y	0.386	ug/L	80	120	20	C	Y	0.386	ug/L	75	125	20
4129	Uranium 234	0.05	ug/L	0.0021	ug/L	20110124	C	Y	0.175	ug/L	80	120	20	C	Y	0.175	ug/L	75	125	20
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20110124	C	Y	0.228	ug/L	80	120	20	C	Y	0.228	ug/L	75	125	20
5385	Uranium 236	0.05	ug/L	0.0015	ug/L	20110124	C	Y	1.75	ug/L	80	120	20	C	Y	1.75	ug/L	75	125	20
4133	Uranium 238	0.05	ug/L	0.0082	ug/L	20110124	C	Y	33.6	ug/L	80	120	20	C	Y	33.6	ug/L	75	125	20
2607	Vanadium	10	ug/L	2.37	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2649	Zinc	10	ug/L	8.29	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: **I-JV-MH-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
194	Barium	2	ug/L	0.196	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
313	Boron	50	ug/L	7.47	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	200	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
643	Copper	1	ug/L	0.097	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20100115														
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	Y	250	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.060	ug/L	20100108														
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	Y	250	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2602	Tungsten	5	ug/L	0.839	ug/L	20100108														
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227														
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227														

Structured Analysis Code: I-JV-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227														
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227														
4133	Uranium 238	0.05	ug/L	0.0016	ug/L	20071227														
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: A-GK-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	5.0	mg/kg	1.67	mg/kg	20110125	C	Y	9780	mg/kg	44	155	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	0.5	mg/kg	0.164	mg/kg	20110125	C	Y	121	mg/kg	21	251	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	1.0	mg/kg	0.203	mg/kg	20110125	C	Y	109	mg/kg	70	131	20	C	Y	100	mg/kg	75	125	30
194	Barium	2.0	mg/kg	0.057	mg/kg	20110125	C	Y	325	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.1	mg/kg	0.017	mg/kg	20110125	C	Y	92	mg/kg	74	126	20	C	Y	100	mg/kg	75	125	30
307	Bismuth	2.0	mg/kg	0.151	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
313	Boron	10	mg/kg	3.34	mg/kg	20110125	C	Y	142	mg/kg	63	136	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.05	mg/kg	0.016	mg/kg	20110125	C	Y	110	mg/kg	73	139	20	C	Y	100	mg/kg	75	125	30
413	Calcium	50	mg/kg	5.82	mg/kg	20110125	C	Y	6700	mg/kg	74	125	20	C	Y	1000	mg/kg	75	125	30
3489	Cerium	1.0	mg/kg	0.035	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3488	Cesium	0.01	mg/kg	0.005	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	50	mg/kg	75	125	30
2952	Chromium	1.0	mg/kg	0.45	mg/kg	20110125	C	Y	93.4	mg/kg	69	130	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	0.2	mg/kg	0.043	mg/kg	20110125	C	Y	133	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
643	Copper	1.0	mg/kg	0.064	mg/kg	20110125	C	Y	74.7	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
1464	Gold	0.50	mg/kg	0.05	mg/kg	20111019								C	Y	100	mg/kg	75	125	30
3917	Hafnium	1.0	mg/kg	0.302	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1539	Iron	5.0	mg/kg	3.30	mg/kg	20110125	C	Y	13100	mg/kg	32	167	20	C	Y	1000	mg/kg	75	125	30
3922	Lanthanum	0.2	mg/kg	0.05	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1605	Lead	0.30	mg/kg	0.10	mg/kg	20110125	C	Y	152	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
1616	Lithium	1	mg/kg	0.30	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	mg/kg	3.80	mg/kg	20110125	C	Y	2980	mg/kg	66	134	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	0.5	mg/kg	0.077	mg/kg	20110125	C	Y	443	mg/kg	77	124	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	0.5	mg/kg	0.077	mg/kg	20110125	C	Y	82.5	mg/kg	69	138	20	C	Y	100	mg/kg	75	125	30
3490	Neodymium	0.2	mg/kg	0.03	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1956	Nickel	0.5	mg/kg	0.0822	mg/kg	20110125	C	Y	109	mg/kg	72	126	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	2.5	mg/kg	0.38	mg/kg	20110125	C	Y	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.1	mg/kg	0.011	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	mg/kg	1.36	mg/kg	20110125	C	Y	500	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2209	Platinum	0.1	mg/kg	0.013	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	10	mg/kg	3.00	mg/kg	20110125	C	Y	2770	mg/kg	61	138	20	C	Y	1000	mg/kg	75	125	30
3926	Praseodymium	0.2	mg/kg	0.023	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3927	Rhenium	1.0	mg/kg	0.022	mg/kg	20110906	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3928	Rhodium	1.0	mg/kg	0.037	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3930	Ruthenium	1.0	mg/kg	0.043	mg/kg	20110125	C	Y	50.0	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3931	Samarium	1.0	mg/kg	0.0700	mg/kg	20110125														
2281	Selenium	0.5	mg/kg	0.158	mg/kg	20110125	C	Y	207	mg/kg	69	131	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	25	mg/kg	7.12	mg/kg	20110125	C	Y	754	mg/kg	80	120	20	C	Y	500	mg/kg	75	125	30

Structured Analysis Code: A-GK-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2285	Silver	20	mg/kg	6.67	mg/kg	20110624	C	Y	52	mg/kg	66	133	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	20	mg/kg	6.67	mg/kg	20110624	C	Y	724	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	0.5	mg/kg	0.212	mg/kg	20110125	C	Y	111	mg/kg	70	128	20	C	Y	100	mg/kg	75	125	30
2876	Sulfur	500	mg/kg	55.9	mg/kg	20110125	C	Y	1000	mg/kg	80	120	20	C	Y	1000	mg/kg	75	125	30
3933	Tantalum	1.0	mg/kg	0.156	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3742	Tellurium	1.0	mg/kg	0.109	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2477	Thallium	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	171	mg/kg	68	131	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	0.2	mg/kg	0.078	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	135	mg/kg	59	140	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	2340	mg/kg	29	171	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	0.10	mg/kg	0.0199	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.005	mg/kg	0.0015	mg/kg	20110125	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.005	mg/kg	0.00067	mg/kg	20110125	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30
4131	Uranium 235	0.005	mg/kg	0.00203	mg/kg	20110125	C	Y	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.005	mg/kg	0.00078	mg/kg	20110125	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	0.1	mg/kg	0.00055	mg/kg	20110125	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	1.0	mg/kg	0.735	mg/kg	20110125	C	Y	110	mg/kg	67	132	20	C	Y	100	mg/kg	75	125	30
2726	Yttrium	1.0	mg/kg	0.034	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2649	Zinc	5.0	mg/kg	1.33	mg/kg	20110125	C	Y	299	mg/kg	71	128	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	1.0	mg/kg	0.104	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: A-JV-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
194	Barium	2	ug/L	0.196	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
313	Boron	50	ug/L	7.47	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	200	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
643	Copper	1	ug/L	0.097	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1616	Lithium	5	ug/L	0.674	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20100115														
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	250	ug/L	80	120	200	C	Y	250	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.060	ug/L	20100108														
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	Y	250	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2602	Tungsten	5	ug/L	0.839	ug/L	20100108	C	Y	2500	ug/L	80	120	20							
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	N	2000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227														

Structured Analysis Code: A-JV-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227														
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227														
5385	Uranium 236	0.05	ug/L	0.00012;	ug/L	20071227														
4133	Uranium 238	0.05	ug/L	0.0016	ug/L	20071227														
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: A-MV-MH-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; 2% HCl
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6428								Spike List 6225							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	5.0	mg/kg	1.67	mg/kg	20110125	C	Y	9780	mg/kg	44	155	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	0.5	mg/kg	0.164	mg/kg	20110125	C	Y	121	mg/kg	21	251	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	1.0	mg/kg	0.203	mg/kg	20110125	C	Y	109	mg/kg	70	131	20	C	Y	100	mg/kg	75	125	30
194	Barium	2.0	mg/kg	0.057	mg/kg	20110125	C	Y	325	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.1	mg/kg	0.017	mg/kg	20110125	C	Y	92	mg/kg	74	126	20	C	Y	100	mg/kg	75	125	30
307	Bismuth	2.0	mg/kg	0.151	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
313	Boron	10	mg/kg	3.34	mg/kg	20110125	C	Y	142	mg/kg	63	136	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.05	mg/kg	0.016	mg/kg	20110125	C	Y	110	mg/kg	73	139	20	C	Y	100	mg/kg	75	125	30
413	Calcium	50	mg/kg	5.82	mg/kg	20110125	C	Y	6700	mg/kg	74	125	20	C	Y	1000	mg/kg	75	125	30
3488	Cesium	0.01	mg/kg	0.005	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	50	mg/kg	75	125	30
2952	Chromium	1.0	mg/kg	0.45	mg/kg	20110125	C	Y	93.4	mg/kg	69	130	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	0.2	mg/kg	0.043	mg/kg	20110125	C	Y	133	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
643	Copper	1.0	mg/kg	0.064	mg/kg	20110125	C	Y	74.7	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
3917	Hafnium	1.0	mg/kg	0.302	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1539	Iron	5.0	mg/kg	3.30	mg/kg	20110125	C	Y	13100	mg/kg	32	167	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	0.30	mg/kg	0.10	mg/kg	20110125	C	Y	152	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
1616	Lithium	1	mg/kg	0.30	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	mg/kg	3.80	mg/kg	20110125	C	Y	2980	mg/kg	66	134	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	0.5	mg/kg	0.074	mg/kg	20110125	C	Y	443	mg/kg	77	124	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	0.5	mg/kg	0.077	mg/kg	20110125	C	Y	82.5	mg/kg	69	138	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	0.5	mg/kg	0.0822	mg/kg	20110125	C	Y	109	mg/kg	72	126	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	2.5	mg/kg	0.38	mg/kg	20110125	C	Y	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.1	mg/kg	0.011	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	mg/kg	1.36	mg/kg	20110125	C	Y	500	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2209	Platinum	0.1	mg/kg	0.013	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	10	mg/kg	3.00	mg/kg	20110125	C	Y	2770	mg/kg	61	138	20	C	Y	1000	mg/kg	75	125	30
3928	Rhodium	1.0	mg/kg	0.037	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2281	Selenium	0.5	mg/kg	0.158	mg/kg	20110125	C	Y	207	mg/kg	69	131	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	25	mg/kg	7.12	mg/kg	20110125	C	Y	754	mg/kg	80	120	20	C	Y	500	mg/kg	75	125	30
2285	Silver	0.2	mg/kg	0.0139	mg/kg	20110125	C	Y	52	mg/kg	66	133	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	20	mg/kg	6.67	mg/kg	20110624	C	Y	724	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	0.5	mg/kg	0.212	mg/kg	20110125	C	Y	111	mg/kg	70	128	20	C	Y	100	mg/kg	75	125	30
2876	Sulfur	500	mg/kg	55.9	mg/kg	20110125	C	Y	1000	mg/kg	80	120	20	C	Y	1000	mg/kg	75	125	30
3933	Tantalum	1.0	mg/kg	0.156	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3742	Tellurium	1.0	mg/kg	0.109	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2477	Thallium	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	171	mg/kg	68	131	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	0.2	mg/kg	0.078	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

Structured Analysis Code: A-MV-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; 2% HCl
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2479	Tin	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	135	mg/kg	59	140	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	2340	mg/kg	29	171	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	0.10	mg/kg	0.0199	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.005	mg/kg	0.0015	mg/kg	20110125	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.005	mg/kg	0.00067	mg/kg	20110125	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30
4131	Uranium 235	0.005	mg/kg	0.00203	mg/kg	20110125	C	Y	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.005	mg/kg	0.00078	mg/kg	20110125	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	0.1	mg/kg	0.00055	mg/kg	20110125	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	1.0	mg/kg	0.735	mg/kg	20110125	C	Y	110	mg/kg	67	132	20	C	Y	100	mg/kg	75	125	30
2726	Yttrium	1.0	mg/kg	0.034	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2649	Zinc	5.0	mg/kg	1.33	mg/kg	20110125	C	Y	299	mg/kg	71	128	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	1.0	mg/kg	0.104	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: A-MY-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85) - 18 hour; 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	N	6320	mg/kg	58	142	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	N	81.5	mg/kg	10	150	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	N	161	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
194	Barium	2	ug/L	0.196	ug/L	20100108	C	N	252	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	N	94.4	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
313	Boron	50	ug/L	7.47	ug/L	20100108	C	N	136	mg/kg	56	144	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	N	128	mg/kg	81	119	20	C	Y	100	mg/kg	75	125	30
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	N	3320	mg/kg	79	121	20	C	Y	1000	mg/kg	75	125	30
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	N	69.5	mg/kg	78	121	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	N	35.2	mg/kg	73	127	20	C	Y	100	mg/kg	75	125	30
643	Copper	1	ug/L	0.097	ug/L	20100112	C	N	148	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	N	11200	mg/kg	57	143	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	N	142	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	N	2040	mg/kg	77	123	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	N	408	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	N	84.1	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	N	147	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	25	ug/L	2.23	ug/L	20100115	C	N	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	500	mg/kg	85	115	30	C	Y	100	mg/kg	75	125	30
2209	Platinum	1	ug/L	0.060	ug/L	20100108	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	N	1250	mg/kg	71	129	20	C	Y	1000	mg/kg	75	125	30
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	N	64.2	mg/kg	76	124	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	N	754	mg/kg	10	150	20	C	Y	500	mg/kg	75	125	30
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	N	130	mg/kg	53	147	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	N	1250	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	N	84.0	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	N	84	mg/kg	76	125	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	N	61.0	mg/kg	58	142	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	N	310	mg/kg	40	150	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	5	ug/L	0.839	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30

Structured Analysis Code: A-MY-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85) - 18 hour; 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227	C	N	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	1.0	ug/L	0.0016	ug/L	20071227	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	N	97.3	mg/kg	75	125	20	C	Y	100	mg/kg	75	125	30
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	N	165	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **A-M6-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: KD leach/2% HCl 3010
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224								Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	N	6320	mg/kg	58	142	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	N	81.5	mg/kg	10	150	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	N	161	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
194	Barium	2	ug/L	0.196	ug/L	20100108	C	N	252	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	N	94.4	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
313	Boron	50	ug/L	7.47	ug/L	20100108	C	N	136	mg/kg	56	144	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	N	128	mg/kg	81	119	20	C	Y	100	mg/kg	75	125	30
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	N	3320	mg/kg	79	121	20	C	Y	1000	mg/kg	75	125	30
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	N	69.5	mg/kg	78	121	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	N	35.2	mg/kg	73	127	20	C	Y	100	mg/kg	75	125	30
643	Copper	1	ug/L	0.097	ug/L	20100112	C	N	148	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	N	11200	mg/kg	57	143	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	N	142	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	N	2040	mg/kg	77	123	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	N	408	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	N	84.1	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	N	147	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	25	ug/L	2.23	ug/L	20100115	C	N	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2209	Platinum	1	ug/L	0.060	ug/L	20100108	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	N	1250	mg/kg	71	129	20	C	Y	1000	mg/kg	75	125	30
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	N	64.2	mg/kg	76	124	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	N	754	mg/kg	10	150	20	C	Y	500	mg/kg	75	125	30
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	N	130	mg/kg	53	147	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	N	1250	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	N	84.0	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	N	84	mg/kg	76	125	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	N	61.0	mg/kg	58	142	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	N	310	mg/kg	40	150	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	5	ug/L	0.839	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227	C	N	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30

Structured Analysis Code: A-M6-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: KD leach/2% HCl 3010
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	1.0	ug/L	0.0016	ug/L	20071227	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	N	97.3	mg/kg	75	125	20	C	Y	100	mg/kg	75	125	30
2649	Zinc	5	ug/L	3.74	ug/L	20100112	C	N	165	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: A-3E-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85)-18 hour > Digestion/Inorg
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	N	6320	mg/kg	58	142	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	N	81.5	mg/kg	10	150	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	N	161	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
194	Barium	2	ug/L	0.196	ug/L	20100108	C	N	252	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	N	94.4	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
313	Boron	50	ug/L	7.47	ug/L	20100108	C	N	136	mg/kg	56	144	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	N	128	mg/kg	81	119	20	C	Y	100	mg/kg	75	125	30
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	N	3320	mg/kg	79	121	20	C	Y	1000	mg/kg	75	125	30
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	N	69.5	mg/kg	78	121	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	N	35.2	mg/kg	73	127	20	C	Y	100	mg/kg	75	125	30
643	Copper	1	ug/L	0.097	ug/L	20100112	C	N	148	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	N	11200	mg/kg	57	143	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	N	142	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	N	2040	mg/kg	77	123	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	N	408	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	N	84.1	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	N	147	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	25	ug/L	2.23	ug/L	20100115	C	N	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	500	mg/kg	85	115	30	C	Y	100	mg/kg	75	125	30
2209	Platinum	1	ug/L	0.060	ug/L	20100108	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	N	1250	mg/kg	71	129	20	C	Y	1000	mg/kg	75	125	30
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	N	64.2	mg/kg	76	124	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	N	754	mg/kg	10	150	20	C	Y	500	mg/kg	75	125	30
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	N	130	mg/kg	53	147	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	N	1250	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	N	84.0	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	N	84	mg/kg	76	125	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	N	61.0	mg/kg	58	142	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	N	310	mg/kg	40	150	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	5	ug/L	0.821	ug/L	20100222	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30

Structured Analysis Code: A-3E-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85)-18 hour > Digestion/Inorg
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227	C	N	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	1.0	ug/L	0.0016	ug/L	20071227	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	N	97.3	mg/kg	75	125	20	C	Y	100	mg/kg	75	125	30
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	N	165	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **I-GJ-MH-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	12.9	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
128	Antimony	5	ug/L	1.67	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
194	Barium	2	ug/L	0.203	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.350	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
307	Bismuth	20.0	ug/L	0.732	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
313	Boron	50	ug/L	10.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.10	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
413	Calcium	100	ug/L	68.1	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3489	Cerium	10	ug/L	0.886	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3488	Cesium	0.10	ug/L	0.053	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2952	Chromium	10	ug/L	3.26	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
643	Copper	1	ug/L	0.451	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3917	Hafnium	10	ug/L	1.13	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3922	Lanthanum	2	ug/L	0.051	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1616	Lithium	5	ug/L	0.694	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.245	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1906	Molybdenum	5	ug/L	1.00	ug/L	20110624	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3490	Neodymium	2	ug/L	0.104	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.40	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
3925	Palladium	1	ug/L	0.059	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.53	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.079	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2214	Potassium	100	ug/L	41.6	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3926	Praseodymium	2	ug/L	0.042	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3927	Rhenium	1	ug/L	0.025	ug/L	20110906	C	Y	100	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3928	Rhodium	10	ug/L	0.817	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3930	Ruthenium	10	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3931	Samarium	10	ug/L	0.326	ug/L	20110124														
2281	Selenium	5	ug/L	1.59	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20110124	C	Y	5000	ug/L	80	120	20	C	Y	5000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20

Structured Analysis Code: I-GJ-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2315	Sodium	50	ug/L	15.0	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2353	Strontium	5	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2876	Sulfur	5000	ug/L	333	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3742	Tellurium	10.0	ug/L	0.536	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2477	Thallium	2	ug/L	0.55	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2479	Tin	2	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2482	Titanium	5	ug/L	2.1	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2602	Tungsten	5	ug/L	2.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3827	Uranium	1	ug/L	0.231	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20110124	C	Y	0.386	ug/L	80	120	20	C	Y	0.386	ug/L	75	125	20
4129	Uranium 234	0.05	ug/L	0.0021	ug/L	20110124	C	Y	0.175	ug/L	80	120	20	C	Y	0.175	ug/L	75	125	20
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20110124	C	Y	0.228	ug/L	80	120	20	C	Y	0.228	ug/L	75	125	20
5385	Uranium 236	0.05	ug/L	0.0015	ug/L	20110124	C	Y	1.75	ug/L	80	120	20	C	Y	1.75	ug/L	75	125	20
4133	Uranium 238	1.0	ug/L	0.0082	ug/L	20110124	C	Y	33.6	ug/L	80	120	20	C	Y	33.6	ug/L	75	125	20
2607	Vanadium	10	ug/L	2.37	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2726	Yttrium	5	ug/L	0.212	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2649	Zinc	10	ug/L	8.29	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

Title: PREPARATION AND ANALYSIS OF MERCURY IN SOLID SAMPLES BY COLD VAPOR ATOMIC ABSORPTION SPECTROSCOPY [SW-846 7471B]

Approvals (Signature/Date):

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Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This procedure describes the preparation and analysis of mercury by Cold Vapor Atomic Absorption (CVAA) Spectroscopy using SW-846 Method 7471B.

1.2 CVAA analysis provides for the determination of total mercury (organic and inorganic). The combination of the oxidants, potassium permanganate, has been found to give 100% recovery with both types of compounds. Detection limits, sensitivity and optimum concentration ranges for mercury analysis will vary with the matrices, instrumentation and volume of sample used.

1.3 Method 7471B is applicable to the preparation and analysis of mercury in soils, sediments, bottom deposits and sludge-type materials. All matrices require sample preparation prior to analysis.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 This SOP describes a technique for the determination of mercury in solution. The procedure is a physical method based on the absorption of radiation at 253.7 nm by mercury vapor. A representative portion of the sample is digested in hydrochloric and nitric acids. Organic mercury compounds are oxidized with potassium permanganate and the mercury reduced to its elemental state with stannous chloride and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance is measured as a function of mercury concentration. Concentration of the analyte in the sample is determined by comparison of the sample absorbance to the calibration curve (absorbance vs. concentration).

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

4.0 INTERFERENCES

4.1 Potassium permanganate, which is used to breakdown organic mercury compounds, also eliminates possible interferences from sulfide. Concentrations as high as 20 mg/L of sulfide as sodium sulfide do not interfere with the recovery of inorganic mercury from reagent water.

4.2 Copper has also been reported to interfere with recovery of mercury; however, copper concentrations as high as 10 mg/L had no effect on the recovery of mercury from spiked samples.

4.3 Interference from certain volatile organic materials that absorb at this wavelength may also occur. If suspected, a preliminary run without stannous chloride can determine if this type of interference is present. While the possibility of absorption from certain organic substances present in the sample does exist, this problem is not routinely encountered. This is mentioned only to caution the analyst of the possibility. If this condition is found to exist, the mercury concentration in the sample can be determined by subtracting the result of the sample run without the reducing reagent (stannous chloride) from that obtained with the reducing reagent.

4.4 Samples containing high concentrations of oxidizable organic materials, as evidenced by high COD levels, may not be completely oxidized by this procedure. When this occurs the recovery of mercury will be low. The problem can be eliminated by reducing the volume of original sample used.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1 Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Mercury (1,000 PPM in Reagent)	Oxidizer Corrosive Poison	0.1mg/M3 for Hg Compounds (Ceiling)	Extremely toxic. Causes irritation to the respiratory tract. Causes irritation. Symptoms include redness and pain. May cause burns. May cause sensitization. Can be absorbed through the skin with symptoms to parallel ingestion. May affect the central nervous system. Causes irritation and burns to eyes. Symptoms include redness, pain, and blurred vision; may cause serious and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm (TWA) 4 ppm (STEL)	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrochloric Acid	Corrosive Poison	5 ppm (Ceiling)	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Potassium Permanganate	Oxidizer	5 mg/M3 for Mn Compounds (Ceiling)	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Dry crystals and concentrated solutions are caustic causing redness, pain, severe burns, brown stains in the contact area and possible hardening of outer skin layer. Diluted solutions are only mildly irritating to the skin. Eye contact with crystals (dusts) and concentrated solutions causes severe irritation, redness, and blurred vision and can cause severe damage, possibly permanent.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time weighted average			
STEL – Short term exposure limit			
Ceiling – At no time should this exposure limit be exceeded			

6.0 EQUIPMENT AND SUPPLIES

6.1 Temperature controlled hot block (capable of maintaining a temperature of 95 ± 3°C).

6.2 Leeman Labs Mercury Analyzer.

6.3 Hydra II AA software: Envoy version 2.8

6.4 Hydra AA software: WinHg version 1.4

6.5 150 ml plastic containers, or equivalent.

6.6 Argon gas supply, welding grade or equivalent.

6.7 Pipettes

6.8 Volumetric flasks, class A

6.9 Top-loading balance, capable of reading +/- 0.01 g

6.10 Thermometer (capable of reading 95 ± 3°C).

6.11 Disposable cups or tubes.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 DI Water, obtained from the Milli-Q unit

7.3 Nitric acid (HNO_3), concentrated, trace grade

7.4 Hydrochloric Acid (HCl), concentrated, trace grade

7.5 Aqua Regia: Prepare immediately before use by carefully adding three volumes of concentrated HCl to one volume of concentrated HNO_3.

7.6 Stannous chloride - Dissolve 100g of stannous chloride into 1000 ml of 10% HCl.

7.7 Hydroxylamine sulfate/12% Sodium hydroxide solution, a certified stock standard is purchased
NOTE: Hydroxylamine hydrochloride (12%) may be used in place of Hydroxylamine sulfate. (120g →1000mL)

7.8 Potassium permanganate, 5% solution (w/v) -certified stock reagent is purchased.
7.8.1 Alternately, dissolve 5 g of potassium permanganate for every 100 mL of DI water.

7.9 Mercury standard – NIST traceable standard (100 ppm)

7.9.1 Intermediate mercury standard (0.1 ppm): Add 2ml of concentrated HNO_3 to a 100 m1 volumetric flask. Add 0.1 mL of the stock ICV mercury standard and dilute to a 100 mL final volume in DI water.

7.9.1.1 The intermediate standard must be made daily.

7.9.1.2 Mercury calibration standards must be prepared fresh daily from the intermediate standard by transferring 0, 0.2, 0.5, 1.0, 5.0 and 10.0 mL aliquots of the intermediate mercury standard into sample prep bottles and proceeding as specified in Section 11.1

7.10 Mercury standard – ICV Stock (100 ppm) in 5% HNO_3 , NIST traceable standard

7.10.1 The initial calibration verification (ICV) standard must be made from a different stock solution than that of the calibration standards.

7.10.2 ICV Intermediate mercury standard (0.1 ppm) - Add 2ml of concentrated HNO_3 to a 100 m1 volumetric flask. Add 0.1 mL of the stock mercury standard and dilute to a 100 mL final volume in DI water.

7.10.2.1 The ICV intermediate standard must be made daily.

7.10.2.1.1 ICV mercury standard must be prepared fresh daily from the intermediate standard by transferring 2.5ml aliquots of the ICV intermediate mercury standard into sample prep bottles and proceeding as specified in Section 11.1

7.10.3 All standards must be processed through the entire analytical procedure including sample preparation.

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 The sample holding time for mercury is 28 days from time of collection to the time of analysis.

8.3 Soil samples do not require chemical preservation but must be stored at 4° C ± 2° C until the time of analysis.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents. Where no preparation method exists (e.g. water sample volatile organics, water sample anion analysis) the batch is comprised of a maximum of 20 environmental samples which are analyzed together with the same process, lots of reagents and personnel.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, an Laboratory Control Sample (LCS), and Matrix Spike (MS) and Matrix Spike Duplicate (MSD) In the event that there is insufficient sample to analyze a MS/MSD, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.3.1 At the instrument, a Serial dilution is performed with every batch.

9.1.4 Samples having different QC codes, due to non-standard client specific QC requirements, must be batched separately in the LIMS. A method blank and LCS may be shared across QC codes provided the actual "sample batch" does not exceed 20 environmental samples. Duplicates (and MS/MSD if applicable) must be performed for each separate QC code.

9.2 **Method Blank**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.2.3 For Soil analyses, the method blank is comprised of glass beads.

9.3 **Laboratory Control Sample**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.3.3 For Soil analyses, the LCS is a commercially prepared purchased solid reference material containing mercury.

9.3.3.1 Alternately, the LCS may be comprised of glass beads fortified with mercury, if client requirements request or QC criteria dictate such.

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.4.2 MS/MSD samples do not count towards the 20 environmental samples in a sample batch.

9.4.3 MS/MSD samples must be performed with every sample batch and every LIMS batch.

9.4.3.1 If there is insufficient sample to perform a MS and/or MSD, a duplicate LCS is analyzed. A NCM is written to document the insufficient volume and the utilization of a LCSD to demonstrate precision.

9.5 **Sample Duplicate (SD)**

9.5.1 A Sample Duplicate is an additional aliquot of a field sample taken through the entire analytical process to demonstrate precision.

9.5.1.1 Certain client project requirements may request a sample duplicate in lieu of a MSD. Please check client requirements.

9.6 **Serial Dilution**

9.6.1 A sample digestate is diluted 1:5 and reanalyzed to assess the present of a matrix interference.

9.6.2 A serial dilution is performed with every analytical batch.

9.6.3 Agreement within 10% between the concentration for the undiluted sample and five times the concentration for the diluted sample indicates the absence of interferences.

9.7 **Post Digestion Spikes (PDS)**

9.7.1 A known amount of mercury is added to the sample chosen for MS/MSD to bring the concentration of mercury to 2 to 5 times the original concentration. If the sample's mercury concentration is below the detection limit, spike at a concentration between the low and mid-level standard.

9.7.2 At client's request, a post digestion spike is performed when MS/MSD fails.

9.7.2.1 Post digestion spike recovery criteria: 85%-115%.

9.8 **Method of Standard Addition (MSA)**

9.8.1 This technique involves adding known amounts of standard to one or more aliquots of the processed sample solution. This technique compensates for a sample interferent that may enhance or depress the analyte signal, thus producing a different slope from that of the calibration standards. It will not correct for additive interferences which cause a baseline shift.

9.8.2 MSAs are not considered normal batch QC and if required by the client, must appear on the Client Requirement Sheet.

9.9 **Procedural Variations/ Nonconformance and Corrective Action**

9.9.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.9.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Initial Calibration

10.1.1 Calibration standards must be processed through the preparation procedure, section 11.

10.1.1.1 Due to the differences in preparation protocols, separate calibration and calibration verification standards must be prepared for aqueous and solid matrices.

10.1.1.2 Record the prep of the calibration standard on the digestion record.

10.1.2 Calibration must be performed daily (every 24 hours) and each time the instrument is set up.

10.1.3 Set up the instrument with the operating parameters recommended by the manufacturer.

10.1.4 Allow the instrument to become thermally stable before beginning calibration.

10.1.5 Calibrate the instrument according to instrument manufacturer's instructions, using a minimum of five standards and a blank.

10.1.5.1 One standard must be at the reporting limit. . The other standards define the working range of the detector, with the highest level standard establishing the linear range of the instrument.

10.1.5.2 Analyze standards in ascending order beginning with the blank.

10.1.6 Calibration criteria:

10.1.6.1 A correlation coefficient must be $\geq$0.995

10.1.6.2 If the calibration curve does not meet method requirements, perform maintenance and perform another calibration curve.

10.2 Initial Calibration Verification (ICV)

10.2.1 An ICV is a second source verification of the calibration.

10.2.2 An ICV must be performed with every calibration.

10.2.3 ICV criteria:

10.2.3.1 ICV recovery must be +/- 10% of the known true value.

10.2.3.1.1 If the ICV fails to meet criteria ($\pm$10%), the analysis is terminated, the problem corrected, the instrument recalibrated and the calibration re-verified.

10.2.3.1.2 If it is suspected that the failure was attributed to a poor sample introduction to the instrument, the ICV may be rerun once, provided no samples have been analyzed after the failing ICV. If the second ICV is acceptable, analysis may continue.

10.3 Initial Calibration Blank (ICB)

10.3.1 Analyze the initial continuing calibration blank (ICB) immediately following the ICV.

10.3.2 ICB criteria:

10.3.2.1 The absolute value of the ICB result must be less than or equal to the reporting limit (RL).

10.3.2.1.1 If the result is not within the control level, terminate the analysis, correct the problem, and recalibrate the instrument if necessary

10.3.2.1.2 Certain client programs may require more stringent ICB criteria, please see Client Requirement sheets.

10.4 Low Level Check (LLC) aka CRA (when requested by client)

10.4.1 An LLC is analyzed at the beginning of each analytical run.

10.4.2 The LLC must fall within 30% of the known value.

10.4.3 LLC must be spiked at RL.

10.4.4 If the result is not within the control level, terminate the analysis, correct the problem and recalibrate.

10.4.5 If it is suspected that the failure was attributed to a poor sample introduction to the instrument, the CCV may be rerun once, provided no samples have been analyzed after the failing CCV. If the second CCV is acceptable, analysis may continue.

10.5 Continuing Calibration Verification (CCV)

10.5.1 A CCV is analyzed after every 10 samples and at the end of the analytical sequence run.

10.5.2 CCV criteria:

10.5.2.1 The CCV must fall within 20% of the known true value.

10.5.2.1.1 If the CCV does not meet QC criteria, the analysis must be terminated, the problem corrected, the instrument recalibrated, and the preceding 10 samples reanalyzed.

10.5.2.1.2 If it is suspected that the failure was attributed to a poor sample introduction to the instrument, the CCV may be rerun once, provided no samples have been analyzed after the failing CCV. If the second CCV is acceptable, analysis may continue.

10.6 Continuing Calibration Blank (CCB)

10.6.1 Analyze a continuing calibration blank (CCB) immediately following the CCV.

10.6.2 CCB criteria:

10.6.2.1 The absolute value of the ICB result must be less than or equal to the reporting limit (RL).

10.6.2.1.1 If the result is not within the control level, terminate the analysis, correct the problem, and recalibrate the instrument if necessary

10.6.2.1.2 Certain client programs may require more stringent ICB criteria, please see Client Requirement sheets.

11.0 PROCEDURE

11.1 Sample Preparation:

11.1.1 Pipette 0, 0.2, 0.5, 1.0, 5.0 and 10.0 mL aliquots of the curve intermediate standard into a series of sample digestion bottles. Bring up all to 10mL final volume with DI water.

11.2 To Prepare a ICV,

11.2.1 Pipette 2.5ml of QC intermediate into a sample digestion bottle and bring up to a 10ml final volume with DI water

11.3 To Prepare a LLC,

11.3.1 Pipette 0.2 ml calibration into a digestion bottle and bring up to a final volume of 10ml.

11.4 To prepare a CCV,

11.4.1 To prepare the CCV, pipette 5.0 ml of QC intermediate into a sample digestion bottle and bring up all to a 10ml final volume with DI water.

11.4.2 Transfer 0.6g of well mixed sample to a clean sample digestion bottle.

11.4.2.1 Reduced sample size can be used as long as a representative sample can be obtained and the reagent levels are adjusted to maintain the sample to reagent ratio.

11.4.3 Hot Block protocol:

11.4.3.1 Spike MS/MSD with 1ml of the QC intermediate.

11.4.3.2 To each **standard** bottle: Add 5 mL of aqua regia.

11.4.3.3 To each **sample** bottle: Add 5 mL of reagent water and 5 mL of aqua regia.

11.4.3.4 Heat for 2 minutes in a hot block at 95 ± 3°C.
11.4.3.5 Cool.
11.4.3.6 Add 50 mL of DI water.
11.4.3.7 Add 15 mL of potassium permanganate solution, mix thoroughly
11.4.3.8 Let stand until purple color persists for 15 minutes, adding additional portions of permanganate solution if needed. If additional portions of permanganate solution are needed, an equivalent portion must also be added to all QC and client samples being prepped. Amount must be equal to that of the highest amount added to any sample.
11.4.3.9 Heat for 30 minutes in the hot block at 95 ± 3°C.
11.4.3.10 Cool.
11.4.3.11 Add 6 mL of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate.
11.4.3.12 Bring sample to a final volume of 100mL with DI water.

11.5 Sample Analysis:

11.5.1 The samples must be allowed to cool to room temperature prior to analysis or a decrease in the response signal can occur.
11.5.2 Follow instructions provided by instrument manufacturer.
11.5.3 Baseline correction is acceptable as long as it is performed after every sample or after the CCV and CCB; resloping is acceptable as long as it is immediately preceded and followed by a compliant CCV and CCB.
11.5.4 Analytical sequence:
Instrument Initial Calibration (5 standard plus a blank)
ICV
ICB
LLC
CCV
CCB
Maximum 10 samples
CCV
CCB
Repeat sequence of 10 samples between CCV/CCB pairs as required to complete run.
CCV
CCB

NOTE: Samples include the method blank, LCS, LCS dup, MS, MSD, duplicate, field samples and sample dilutions.

NOTE: Analytical sequence must close with a CCV/CCB pair.

NOTE: If the instrument stops during the sequence, the instrument may be restarted. When restarting the instrument, the run must begin with an acceptable CCV/CCB.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 Sample results are reported to three significant figures in accordance with the significant figure policy.

All measurements must fall within the defined calibration range to be valid. Dilute and reanalyze all samples for analytes that exceed the highest calibration standard.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. A hardcopy of all the data assessment types and descriptions along with their associated corrective actions is included in the SOP. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank
- 13.2.1 Acceptance Criteria:
  - 13.2.1.1 No target analytes may be present in the method blank above the reporting limit.
- 13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:
  - 13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action.

13.3 Laboratory Control Sample (LCS)
- 13.3.1 Acceptance Criteria:
  - 13.3.1.1 All control analytes must be within established control limits for accuracy (%Recovery) and precision (RPD).
- 13.3.2 Corrective Action for LCS not meeting acceptance criteria:
  - 13.3.2.1 <u>LCS Spike Recovery excursion (high)</u> – See Clouseau NCM for corrective action.
  - 13.3.2.2 <u>LCS Spike Recovery excursion (low)</u> – See Clouseau NCM for corrective action.

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)
- 13.4.1 Recovery (%)
  - 13.4.1.1 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).
  - 13.4.1.2 Corrective Action for MS/MSD not meeting acceptance criteria:
    - 13.4.1.2.1 Perform a Post Digestion Spike, see section 9.
    - 13.4.1.2.2 Write NCM referencing MS/MSD failure and PDS corrective action.
- 13.4.2 RPD (%D)
  - 13.4.2.1 <u>% D excursion for sample/sample duplicate</u> – See Clouseau NCM for corrective action.

13.5 Post Digestion Spike (PDS)
- 13.5.1 Post digestion spike (PDS) recovery criteria: 85%-115%.
  - 13.5.1.1 If PDS recoveries exceed this, perform a serial dilution.
  - 13.5.1.2 Write NCM referencing PDS failure and serial dilution corrective action.

13.6 Serial Dilution
- 13.6.1 Agreement within 10% between the concentration for the undiluted sample and five times the concentration for the diluted sample indicates the absence of interferences.
- 13.6.2 Write NCM for serial dilution excursion – See Clouseau NCM for narration.

13.7 Sample result evaluation
- 13.7.1 Analyses must fall within the calibration range.
- 13.7.2 Analyses are performed using duplicate injections.
  - 13.7.2.1 The absorbance and/or concentration of each injection must be reported in the raw data as well as the average absorbance and/or concentration value. Average concentration values are to be used for reporting purposes.
- 13.7.3 Dilutions
  - 13.7.3.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.7.3.1.1 <u>Dilution: Sample</u>– See Clouseau NCM for corrective action.
13.7.3.1.2 <u>Dilution: Spike(s) diluted out</u>– See Clouseau NCM for corrective action.

13.7.4 Carryover

13.7.4.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.7.4.2 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.7.4.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.8 Insufficient Sample

13.8.1 For each prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis a narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATIONS OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

16.2 Waste Streams Produced by this Method

16.2.1 Acidic sample waste

16.2.1.1 All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type “A” or “B.”

16.2.1.2 Contaminated disposable glass or plastic materials utilized in this analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste and disposed of by the EH&S Coordinator.

17.0 REFERENCES

17.1 Test Methods for Evaluating Solid Waste , Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, January 1998, Method 7471B (Mercury).

17.2 TestAmerica St. Louis Quality Assurance Manual (QAM), current revision.

17.3 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (ST-HS-0002), current revisions.

17.4 Associated SOPs: current revisions

17.4.1 ST-QA-0002, Standard and Reagent Preparation
17.4.2 ST-QA-0005, Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes
17.4.3 ST-QA-0016, IDL/MDL Determination
17.4.4 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.4.5 ST-QA-0036, Non-conformance Memorandum (NCM) Process
17.4.6 ST-PM-0002, Sample Receipt and Chain of Custody
17.4.7 ST-IP-0004, Labware Preparation for Inorganic and Trace Metals Analysis

18.0 CLARIFICATIONS, MODIFICATIONS AND ADDITIONS TO REFERENCE METHOD

18.1 Stannous chloride is used in place of Stannous sulfate.

18.2 TestAmerica-St.Louis uses less DI water in steps 11.1.5.12 and 11.1.5.13 than the method suggests. The laboratory considers the volume of 15ml km mot to be significant enough to render compensation/adjustment when diluting sample to final volume. The lab has adjusted the final volume of the standards and samples by 15ml.

18.3 TestAmerica uses an ERA solid reference material for the LCS. Control limits supplied by ERA are used to determine acceptability of the LCS recovery.

18.4 Method SW846 1311 requires that the Method Standard Addition (MSA) be used when matrix spike recovery is less than 50% and the measured sample results is within the range of 80-120% of the Toxicity Characteristics Limit. TestAmerica St. Louis does not run an MSA. Spike results outside QC limits are flagged and noted in the case narrative.

19.0 CHANGES TO PREVIOUS REVISION

19.1 Removed sulfuric acid from section 5.0. It is no longer used in this method.
19.2 Updated section 10.0 by adding Low Level Check (LLC)
19.3 Added instructions on how to prepare an ICV, LLC and CCV in section 11.0
19.4 Added LLC, CCV and CCB to the list of analytical sequences in section 11.2.
19.5 Rev. 10;

19.5.1 Updated post digestion spike section 9.7; removed serial dilution requirements.
19.5.2 Updated MSA section 9.8; removed suggested criteria for MSA analysis.
19.5.3 Added Method 1311 MSA requirements, section 18.4.

19.6 Rev. 11:

19.6.1 Added instrument hardware and software to section 6.0.

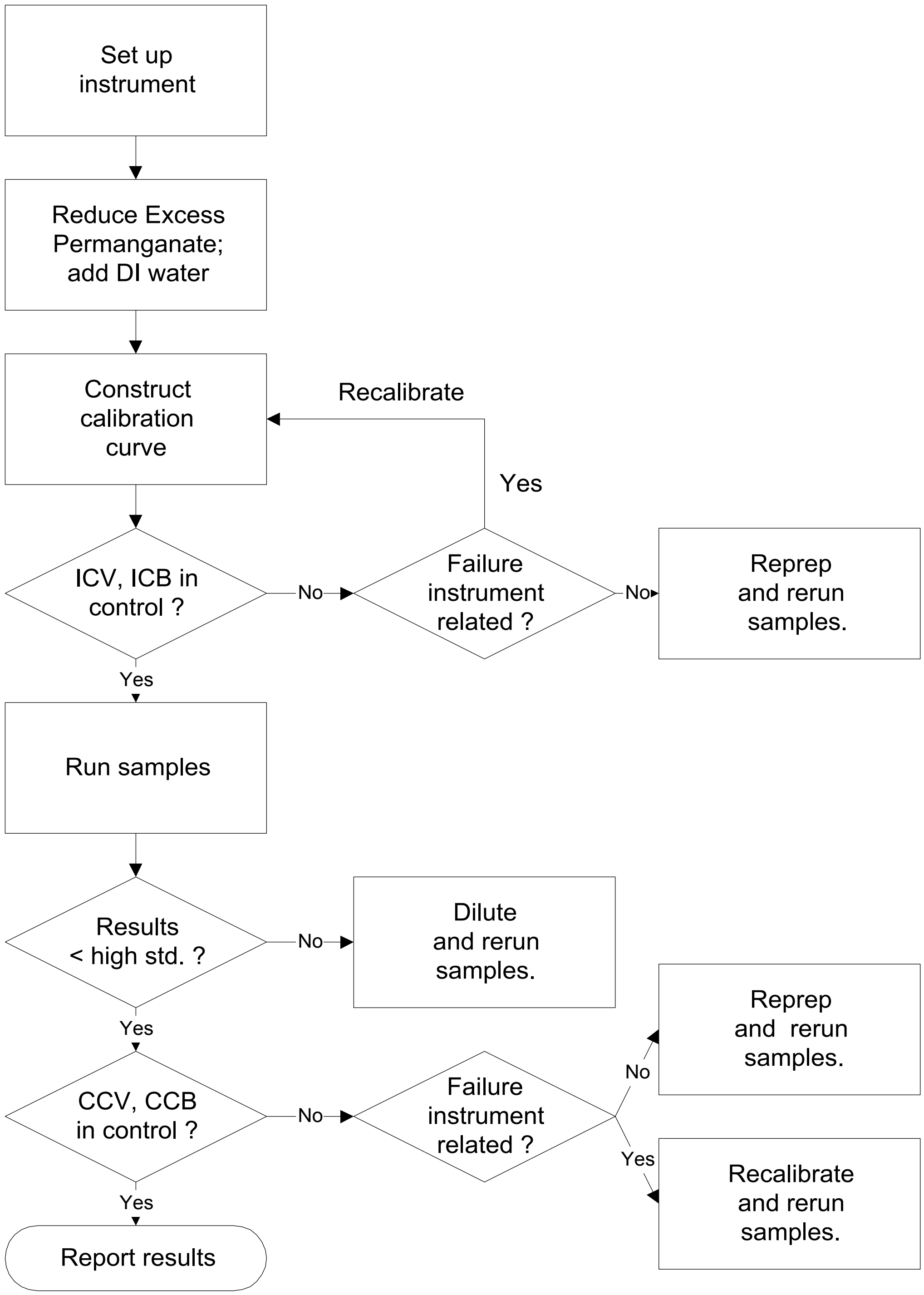
19.6.2 Added requirement to document preparation of calibration standard to section 10.1.

19.6.3 Clarified instructions on addition of permanganate solution in section 11.4.

19.7 Rev: 12:

19.7.1 Updated requirement for prepping all client and QC samples in section 11.4.3.8.

CVAA Mercury Analysis



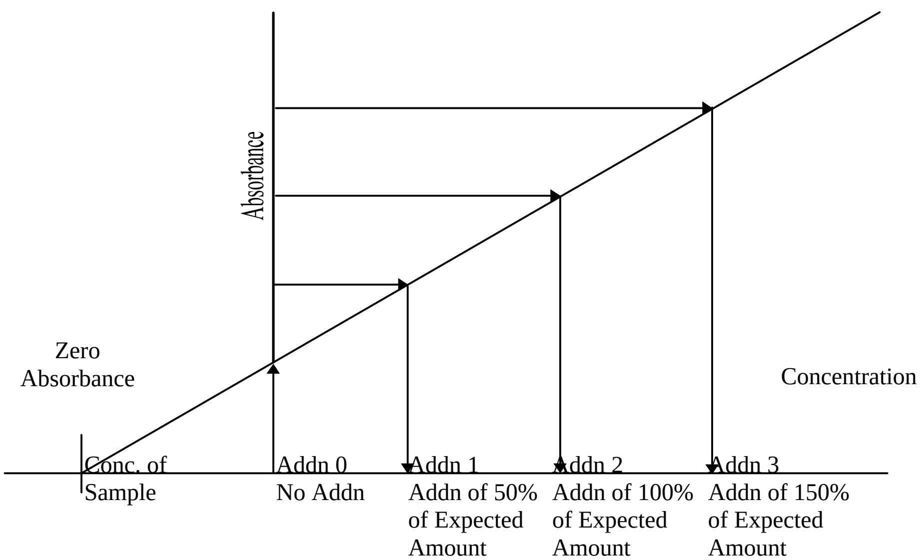
MSA GUIDANCE

Method of Standard Addition

Four equal volume aliquots of sample are measured and known amounts of standards are added to three aliquots. The fourth aliquot is the unknown and no standard is added to it. The concentration of standard added to the first aliquot should be 50% of the expected concentration. The concentration of standard added to the second aliquot should be 100% of the expected concentration and the concentration of standard added to the third aliquot should be 150% of the expected concentration. The volume of the unspiked and spiked aliquots should be the same (i.e., the volume of the spike added should be negligible in relation to the volume of sample).

To determine the concentration of analyte in the sample, the absorbance (or response) of each solution is determined and a linear regression performed. On the vertical axis the absorbance (or response) is plotted versus the concentrations of the standards on the horizontal axis using 0 as the concentration of the unspiked aliquot. An example plot is shown in Figure 1. When the resulting line is extrapolated back to zero absorbance, the point of interception of the horizontal axis is the concentration of the unknown. Calculate the correlation coefficient (r) and the x-intercept (where y=0) of the curve. The concentration in the digestate is equal to the negative x-intercept.

Figure



- For the method of standard additions to be correctly applied, the following limitations must be taken into consideration.
- The plot of the sample and standards must be linear over the concentration range of concern. For best results, the slope of the curve should be similar to that of a plot of the aqueous standard curve.
- The effect of the interference should not vary as the ratio of the standard added to the sample matrix changes.

TAL Reference Data Summary

Structured Analysis Code: **A-70-O9-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: METALS, TOTAL (Method Exclusive) - Solids
Method: Mercury (7471A, Cold Vapor) - Solids
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.033	mg/kg	0.0112	mg/kg	20110111	C	Y	16.3	mg/kg	51	148	30	C	Y	0.1667	mg/kg	80	120	30

TAL Reference Data Summary

Structured Analysis Code: **A-MX-O9-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Mercury
Method: Mercury (7471A, Cold Vapor) - Solids
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.033	mg/kg	0.0112	mg/kg	20110111	C	Y	16.3	mg/kg	51	148	30	C	Y	0.1667	mg/kg	80	120	30

Title: PREPARATION AND ANALYSIS OF MERCURY IN AQUEOUS SAMPLES BY COLD VAPOR ATOMIC ABSORPTION [SW846 7470A; MCAWW 245.1]

Approvals (Signature/Date):

3/19/12		3/20/12	
Fernando Cruz Inorganics Department Manager	Date	Michael Ridenhower Health & Safety Manager / Coordinator	Date
3.19.12		3/19/12	
Marti Ward Quality Assurance Manager	Date	Elaine Wild Laboratory Director	Date

This SOP was previously identified as SOP No. ST-MT-0005 Rev. 11

Facility Distribution No.: 0	**Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This procedure describes the preparation and analysis of mercury (Hg, CAS # 7439-97-6) by Cold Vapor Atomic Absorption Spectroscopy (CVAA) using SW-846 Method 7470A and MCAWW Method 245.1.

1.2 CVAA analysis provides for the determination of total mercury (organic and inorganic).

1.3 Method 7470A is applicable to the preparation and analysis of mercury in ground water, aqueous samples, wastes, TCLP, EP and other leachates/extracts. All matrices require sample preparation prior to analysis.

1.4 Method 245.1 is applicable to the determination of mercury in drinking, surface and saline waters, domestic and industrial wastes. All matrices require sample preparation prior to analysis.

1.5 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 This SOP describes a technique for the determination of mercury in solution. The procedure is a physical method based on the absorption of radiation at 253.7 nm by mercury vapor. A representative portion of the sample is digested in sulfuric and nitric acids. Organic mercury compounds are oxidized with potassium permanganate and potassium persulfate and the mercury reduced to its elemental state with stannous chloride and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance is measured as a function of mercury concentration. Concentration of the analyte in the sample is determined by comparison of the sample absorbance to the calibration curve (absorbance vs. concentration).

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

3.2 Dissolved Metals: Those elements which pass through a 0.45 um membrane. (Sample is acidified after filtration).

3.3 Suspended Metals: Those elements which are retained by a 0.45 um membrane.

3.4 Total Metals: The concentration determined on an unfiltered sample following digestion.

3.5 EPA and SW methodology use different terminology. This SOP references the SW 846 terminology:

- 3.5.1 The ICV satisfies the QCS requirements found in method 245.1.
- 3.5.2 The LCS satisfies the requirements of the LFB found in method 245.1.
- 3.5.3 The CCV satisfies the requirements of the IPC found in method 245.1.

4.0 INTERFERENCES

4.1 Chemical and physical interferences may be encountered when analyzing samples using this method.

4.2 Potassium permanganate which is used to breakdown organic mercury compounds also eliminates possible interferences from sulfide. Concentrations as high as 20 mg/L of sulfide as sodium sulfide do not interfere with the recovery of inorganic mercury from reagent water.

4.3 Copper has also been reported to interfere; however, copper concentrations as high as 10 mg/L had no effect on the recovery of mercury from spiked samples.

4.4 Chlorides can cause a positive interference. Seawaters, brines and industrial effluents which are high in chlorides require additional permanganate (as much as 25 mL) because, during the oxidation step, chlorides are converted to free chlorine, which also absorbs radiation at 253.7 nm. Care must be taken to ensure that free chlorine is absent before the mercury is reduced and swept into the cell. This is accomplished by adding excess hydroxylamine reagent (25 mL) and purging the sample headspace before stannous chloride

is added. Both inorganic and organic mercury spikes have been quantitatively recovered from seawater using this technique.
Note: Sufficient addition of permanganate is apparent when the purple color persists at least 15 minutes. Some samples may require dilution prior to digestion due to extremely high concentrations of chloride.

4.5 Interference from certain volatile organic materials that absorb at this wavelength may also occur. If suspected, a preliminary run without stannous chloride can determine if this type of interference is present. While the possibility of absorption from certain organic substances present in the sample does exist, this problem is not routinely encountered. This is mentioned only to caution the analyst of the possibility. If this condition is found to exist, the mercury concentration in the sample can be determined by subtracting the result of the sample run without the reducing reagent (stannous chloride) from that obtained with the reducing reagent.

4.6 Samples containing high concentrations of oxidizable organic materials, as evidenced by high COD levels, may not be completely oxidized by this procedure. When this occurs the recovery of mercury will be low. The problem can be eliminated by reducing the volume of original sample used.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 Specific Safety Concerns or Requirements

5.2.1 Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.3 Primary Materials Used

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limits (2)	Signs and Symptoms of Exposure
Nitric Acid	Corrosive Poison Oxidizer	2 ppm (TWA) 4 ppm (STEL)	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage. Contact with other material may cause fire. Liquid and mist cause severe burns to all body tissue.
Sulfuric Acid	Corrosive	1 Mg/M3-	Inhalation produces damaging effects on the mucous

Material (1)	Hazards	Exposure Limits (2)	Signs and Symptoms of Exposure
	Oxidizer Dehydrator Poison	(TWA)	membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness. Sulfuric acid is extremely corrosive. Liquid and mist cause severe burn to all body tissue.
Hydrochloric Acid	Poison Corrosive	5 ppm (Ceiling)	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage. Hydrochloric acid is corrosive. Liquid and mist causes severe burn to all body tissue.
Potassium permanganate	Oxidizer	5 mg/m3 (Ceiling)	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Dry crystals and concentrated solutions are caustic causing redness, pain, severe burns, brown stains in the contact area and possible hardening of outer skin layer. Diluted solutions are only mildly irritating to the skin. Eye contact with crystals (dusts) and concentrated solutions causes severe irritation, redness, and blurred vision and can cause severe damage, possibly permanent. Contact with other materials may cause fire. Causes burns to any area of contact. Harmful if swallowed or inhaled.
Hydroxylamine Hydrochloride	Poison Corrosive	None established	Inhalation symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache nausea and vomiting. Skin contact may cause irritation and burns. Eye contact may cause severe irritation and corneal damage. Causes burns to any area of contact. Harmful if swallowed of inhaled.
Mercury	Poison Corrosive	0.1 mg/m3 (TWA)	Inhalation symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Skin contact produces redness and pain. May be absorbed through skin with symptoms paralleling those of inhalation. Eye contact symptoms include redness, pain, and blurred vision. Causes burns to skin, eyes, and respiratory tract. May be fatal if swallowed or inhaled. Harmful if absorbed through skin.
Potassium Persulfate	Oxidizer	0.1 mg/m3 (TWA)	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Causes irritation to skin and eyes. Symptoms include redness, itching, and pain. May cause dermatitis, burns, and moderate skin necrosis. Contact with other material may cause fire. Harmful if swallowed.

1 – Always add acid to water to prevent violent reactions.
2 – Exposure limit refers to the OSHA regulatory exposure limit.
STEL – Short Term Exposure Limit
TWA – Time Weighted Average
Ceiling – At no time should this limit be exceeded.

6.0 EQUIPMENT AND SUPPLIES

6.1 Temperature controlled hot block (capable of maintaining a temperature of 90-95 °C).

6.2 Leeman Labs Mercury Analyzer

6.3 50 ml plastic containers, or equivalent

6.4 Argon gas supply, welding grade or equivalent.

6.5 Calibrated automatic pipettes or Class A glass volumetric pipettes.

6.6 Class A volumetric flasks.

6.7 Thermometer (capable of accurate readings at 95 °C).

6.8 Disposable cups or tubes.

6.9 Hydra II AA software: Envoy Version 2.8

6.10 Hydra AA Software: WinHg Version 1.4

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 Reagent water must be produced by a Millipore DI system or equivalent. Reagent water must be free of the analytes of interest as demonstrated through the analysis of method blanks.

7.3 Nitric acid (HNO_3), concentrated, analytical reagent grade (AR) or better.

7.4 Hydrochloric acid concentrated, analytical reagent grade (AR) or better

7.5 Sulfuric acid (H_2SO_4), concentrated, analytical reagent grade (AR) or better

7.6 Stannous chloride: Dissolve 100g of stannous chloride into 1000 mL of 10% HCl.

7.7 Sodium chloride-hydroxylamine sulfate solution: Add 12 g of sodium chloride and 12 g of hydroxylamine sulfate to every 100 mL of reagent water or a certified stock reagent may be purchased from a vendor.

7.8 Potassium permanganate, 5% solution (w/v): Dissolve 5 g of potassium permanganate for every 100 mL of reagent water or a certified stock reagent may be purchased from a vendor.

7.9 Potassium persulfate, 5% solution (w/v): Dissolve 5 g of potassium persulfate for every 100 mL of reagent water or a certified stock reagent may be purchased from a vendor.

7.10 Stock (100 ppm) mercury standards (in 5% HNO_3) are purchased as custom solutions. All standards must be stored in FEP fluorocarbon or previously unused polyethylene or polypropylene bottles. Stock standard solutions must be replaced prior to the expiration date provided by the manufacturer. If no expiration date is provided, the stock solutions may be used for up to one year and must be replaced sooner if verification from an independent source indicates a problem.

7.11 Intermediate mercury standard (0.1 ppm): Take 0.1 mL of the stock mercury standard and dilute to 100 mL with reagent water. The intermediate standard must be made daily and must be prepared in a matrix of 2% HNO_3 . This acid (2 mL of concentrated HNO_3) must be added to the flask/bottle before the addition of the stock standard aliquot.

7.12 The calibration standards must be prepared fresh daily from the intermediate standard by transferring 0, 0.06, 0.15, 0.3, 1.5 and 3.0 mL aliquots of the intermediate mercury standard into 30 mL flasks and diluting to volume with reagent water.

Note: Alternate approaches to standard preparation may be taken and alternate volumes of standard may be prepared. For example, automated mercury systems do not require 100 mL of standard and therefore smaller volumes may be generated to reduce waste generation.

7.13 The initial calibration verification standard must be made from a different stock solution than that of the calibration standards.

7.14 All standards must be processed through the entire analytical procedure including sample preparation (for 245.1)

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002. Sample collection is not performed by the laboratory for this analysis.

8.2 Sample shipments received by the laboratory will be reviewed against the Sample Acceptance Policy described in SOP ST-PM-0002, "Sample Receipt and Chain of Custody."

8.3 The sample holding time for mercury is 28 days from time of collection to the time of analysis.

8.4 Aqueous samples are preserved with nitric acid to a pH of <2 and may be stored in either plastic or glass. Refrigeration is not required. Preservation must be verified prior to analysis.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 Definition: environmental samples, which are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of a similar matrix, meeting the above mentioned criteria. Where no preparation method exists (example, volatile organics, water) the batch is defined as environmental samples that are analyzed together with the same process and personnel, using the same lots of reagents, not to exceed 20 environmental samples. An analytical batch is composed of prepared environmental samples, extracts, digestates or concentrates that are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

9.1.2 Conditions must be the same for all standards, samples and QC samples.

9.1.3 Each analytical batch may contain up to 20 environmental samples, a method blank, and a single Laboratory Control Sample (LCS), and Matrix Spike/Matrix Spike Duplicate (MS/MSD). In the event that there is insufficient sample to analyze a duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.4 Samples that have assigned QC limits different than the standard limits contained in QuantIMS QC code 01 must be batched separately, but can share the same QC samples.

9.2 **Method Blank**

9.2.1 Definition: a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.2.2 A method blank must be included with each batch of samples. The matrix for aqueous is reagent (DI) water.

9.2.3 A method blank must be prepared with every batch (20 or fewer samples of the same matrix).

9.3 **Laboratory Control Sample**

9.3.1 Definition: a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every batch.

9.3.3 The water LCS is reagent (DI) water fortified with mercury.

9.4 **Matrix Spike/Matrix Spike Duplicate**

9.4.1 Definition: Two aliquots of a field sample to which a known amount of target analyte(s) is added.

9.4.2 Additional MS/MSDs do not count towards the 20 samples in an analytical batch.

9.4.3 Matrix spikes are performed every 10 samples for EPA 245.1.

9.5 **Sample Duplicates**

9.5.1 Definition: Sample Duplicate – a separate aliquot of a field sample taken through the entire analytical process.

9.5.2 Additional Sample Duplicates do not count towards the 20 samples in an analytical batch.

9.5.3 If there is insufficient sample to perform a Sample Duplicate, a duplicate LCS is analyzed.

9.6 **Serial Dilution**

9.6.1 Definition: a sample is diluted 1:5 and reanalyzed to assess the present of a matrix interference.

9.6.2 A serial dilution is performed with every analytical batch.

9.6.3 Agreement within 10% between the concentration for the undiluted sample and five times the concentration for the diluted sample indicates the absence of interferences.

9.7 **Post Digestion Spikes**

9.7.1 Definition: A known amount of mercury is added to the sample chosen for serial dilution to bring the concentration of mercury to 2 to 5 times the original concentration. If the sample's mercury concentration is below the detection limit, spike at 20 times the detection limit.

9.7.2 At client's request, a post digestion spike is performed when the serial dilution test fails.

9.7.2.1 Post digestion spike recovery criteria: 85%-115%.

9.8 **Method of Standard Addition (MSA)**

9.8.1 Definition: This technique involves adding known amounts of standard to one or more aliquots of the processed sample solution. This technique compensates for a sample interferent that may enhance or depress the analyte signal, thus producing a different slope from that of the calibration standards. It will not correct for additive interferences which cause a baseline shift.

9.8.1.1 Client Requirement Checklists - Certain clients may require specific project or program QC which may supersede the SOP requirements. These are documented on the client Requirement Checklist or Client Requirement Memos.

9.8.2 MSAs are not considered normal batch QC and if required by the client, must appear on the Client Requirement Checklist.

9.9 **Procedural Variations/ Nonconformance and Corrective Action**

9.9.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.9.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Initial Calibration

10.1.1 Calibration standards must be processed through the preparation procedure.

10.1.2 Due to the differences in preparation protocols separate calibration and calibration verification standards must be prepared for aqueous and solid matrices.

10.1.3 Calibration must be performed daily (every 24 hours) and each time the instrument is set up. The instrument calibration date and time must be included in the raw data.

10.1.4 Set up the instrument with the operating parameters recommended by the manufacturer. Allow the instrument to become thermally stable before beginning calibration .

10.1.5 Calibrate the instrument according to instrument manufacturer’s instructions, using a minimum of five standards and a blank. One standard must be at the reporting limit. Analyze standards in ascending order beginning with the blank.

10.1.6 The calibration curve must have a correlation coefficient of ≥0.995 or the instrument shall be stopped and recalibrated prior to running samples. Sample results can not be reported from a curve with an unacceptable correlation coefficient.

10.1.7 If the calibration curve does not meet method requirements, another calibration curve should be performed.

10.2 Initial Calibration Verification (ICV)

10.2.1 An ICV is a second source verification of the initial calibration.

10.2.2 An ICV must be performed with every initial calibration.

10.2.3 If the ICV fails to meet criteria ±5% for Method 245.1 or ±10% for method 7470A, the analysis should be terminated, the problem corrected, the instrument recalibrated and the calibration reverified.

10.2.4 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV, or analysis of a different ICV).

10.3 Initial Calibration Blank (ICB)

10.3.1 Analyze the initial continuing calibration blank (ICB) immediately following the ICV.

10.3.2 The absolute value of the result must be less than or equal to the reporting limit (RL). If the result is not within the control level, terminate the analysis, correct the problem, and recalibrate the instrument if necessary.

10.4 Low Level Check (LLC) aka CRA (When requested by client)

10.4.1 Can be the same source as your calibration.

10.4.2 Must be performed with every initial calibration.

10.4.3 Must fall within 30% of the true value.

10.4.4 Must be spiked at RL

10.4.5 If the LLC does not meet QC criteria, the analysis must be terminated, the problem corrected and the instrument recalibrated

10.5 Continuing Calibration Verification (CCV)

10.5.1 A CCV is analyzed after every 10 samples and at the end of the analytical sequence run.

10.5.2 The CCV for EPA 7470A must fall within 20% of the true value for that solution; for EPA 245.1, the CCV must fall within 10% of the true value.

10.5.3 If the CCV does not meet QC criteria, the analysis must be terminated, the problem corrected, the instrument recalibrated, and the preceding 10 samples reanalyzed.

10.6 Continuing Calibration Blank (CCB)

10.6.1 Analyze a continuing calibration blank (CCB) immediately following the CCV.

10.6.2 The absolute value of the result must be less than or equal to the reporting limit (RL). If the result is not within the control level, terminate the analysis, correct the problem, and recalibrate the instrument if necessary.

11.0 PROCEDURE

11.1 All calibration and calibration verification standards (ICV, ICB, LLC, CCV, CCB) are processed through the digestion procedure as well as the field samples.

11.2 Calibration Standard/Verification Standard Preparation:

11.2.1 Transfer 0, 0.06, 0.15, 0.3, 1.5, 3.0 mL aliquots of the intermediate standard onto a series of sample digestion bottles, and bring to 30 mL final volume with DI water.

11.2.2 Transfer 0.75 of QC intermediate for ICV, and bring to 30 mL final volume with DI water.

11.2.3 Transfer 1.5 ml of QC intermediate for CCV, and bring to 30 mL final volume with DI water.

11.2.4 Transfer 0.06ml of calibration intermediate for LLC and bring to 30ml to final volume with DI.

11.3 Sample and Batch QC Preparation:

11.3.1 Transfer 30 mL aqueous sample, 6mls for TCLP leachate, or 1 ml for CWET leachate to a pre-labled sample centrifuge tube. If not already at 30 mL, bring up to a final volume of 30 mls with DI water.

11.3.1.1 Spike the aqueous MS/MSD aliquots with 0.3 mL of the intermediate mercury standard.

11.3.1.2 Spike the TCLP or CWET MS/MSD aliquot with 1.5 mL of the intermediate mercury standard..

11.3.2 For the aqueous method blank, transfer 30 mL DI water to a pre-labeled sample centrifuge tube. For TCLP and CWET method blanks, use 30 ml of the appropriate leaching fluid.

11.3.2.1 Use 6mls of TCLP fluid diluted to 30mls with DI water.

11.3.2.2 Use 1ml of c-wet fluid diluted to 30mls with DI water.

11.3.3 For the aqueous LCS, spike 0.3 mL of the QC intermediate mercury standard into a pre-labeled centrifuge tube and bring to a 30 mL final volume with DI water. For TCLP and CWET LCS, spike 1.5 mL of QC the intermediate mercury standard into a pre-labeled centrifuge tube and bring to a 30 mL final volume with the appropriate leaching fluid.

11.4 Digestion:

11.4.1 Add 1.5 ml (5ml if 100 ml final volume) of concentrated H_2SO_4 and .75 ml (2.5 ml if 100 ml final volume) of concentrated HNO_3 mixing after each addition.

11.4.2 Add 4.5 ml (15 ml if 100 ml final volume) of potassium permanganate solution.

11.4.2.1 Permanganate color must persist for at least 15 minutes. Additional permanganate may be added. Shake and add additional portions of permanganate solution until a purple color persists for at least 15 minutes. If additional portions of permanganate solution are needed, an equivalent portion must also be added to all QC and client samples being prepped to match the highest amount added to any one sample. If after the addition of up to 25 mL additional permanganate the color does not persist, sample dilution prior to reanalysis may be required.

11.4.2.2 When performing analyses using automated vs. manual techniques the sample dilution resultant from the addition of more than the original aliquot of permanganate solution must be compensated for by the addition of the same volume of permanganate to all other associated samples and standards in the run. *In instances, where this is not feasible, the addition of additional reagent can be achieved without effecting the sample volume through the addition of small portions, 0.5g aliquots, of solid potassium permanganate.*

11.4.3 Add 2.4 mL (8 ml if 100 ml final volume) of potassium persulfate solution and heat for two hours in a hot block at 95 °C.

11.4.4 Cool samples.

11.4.5 The samples must be allowed to cool to room temperature prior to analysis or a decrease in the response signal can occur.

11.5 Sample Analysis:

11.5.1 Add 2 mL of sodium chloride-hydroxylamine sulfate solution (6ml if 100ml final volume is utilized) to the samples to reduce the excess permanganate (the permanganate has been reduced when no purple color remains).

11.5.2 Automated determination: Follow instructions provided by instrument manufacturer.

11.5.3 Check Stannous chloride solution volume is sufficient to cover sample run.

11.5.3.1 Stannous chloride is introduced to the sample by the instrument.

11.5.4 The following analytical sequence must be used with 7470A and 245.1:

Instrument Calibration (5pt plus blank)
ICV
ICB
LLC
CCV
CCB
Repeat sequence of 10 samples between CCV/CCB pairs as required to complete run
CCV
CCB

11.5.5 If the instrument analysis is stopped for any reason, the run may be resumed. The resumed run must begin with CCV/CCB only if the run has been stopped for more than 2 hours.

11.5.6 Baseline correction is acceptable as long as it is performed after every sample or after the CCV and CCB; re-sloping is acceptable as long as it is immediately preceded and followed by a compliant CCV and CCB.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis LQM.

12.2 Appropriate factors must be applied to sample values if dilutions are performed.

12.3 Sample results should be reported with up to three significant figures in accordance with the significant figure policy.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. A hardcopy of all the data assessment types and descriptions along with their associated corrective actions is included in the SOP. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact “type” line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank

13.2.1 Acceptance Criteria:

13.2.1.1 No target analytes may be present in the method blank above the reporting limit.

13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action.

13.3 Laboratory Control Sample (LCS)

13.3.1 Acceptance Criteria:

13.3.1.1 All control analytes must be within established control limits for accuracy (%Recovery) and precision (RPD).

13.3.2 Corrective Action for LCS not meeting acceptance criteria:

13.3.2.1 LCS Spike Recovery excursion (high) – See Clouseau NCM for corrective action.

13.3.2.2 LCS Spike Recovery excursion (low) – See Clouseau NCM for corrective action.

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.4.1 All analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.4.2 Matrix spike recovery acceptance criteria for EPA 245.1 is 70-130%.

13.4.3 Matrix spike recovery acceptance criteria for 7470A is 75-125%

13.4.4 Corrective Action for MS/MSD not meeting acceptance criteria:

13.4.4.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Post-digestion Spike

13.5.1 A post digestion spike should be performed on one sample per prep batch. Spike recovery results that fall outside of the 85-115% recovery window will be narrated in an NCM.

13.6 Sample result evaluation

All measurements must fall within the defined calibration range to be valid. Dilute and reanalyze all samples for analytes that exceed the highest calibration standard.

13.6.1 Dilutions

13.6.1.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.6.1.1.1 Dilution: Sample– See Clouseau NCM for corrective action.

13.6.1.1.2 Dilution: Spike(s) diluted out– See Clouseau NCM for corrective action.

13.6.2 Carryover

13.6.2.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.6.2.2 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.6.2.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.7 RPD (%D)

13.7.1 % D excursion for sample/sample duplicate – See Clouseau NCM for corrective action.

13.8 Insufficient Sample

13.8.1 For each prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATIONS OF CAPABILITY

14.1 Method performance data, reporting limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of capability

14.2.1 Initial and continuing Demonstrations of Capability requirements are established in the QAM.

14.3 Training qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial Demonstration of Capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Acidic sample waste generated. All acidic waste will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "A" or "B."

16.2.1.2 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 Test Methods for Evaluating Solid Waste , Physical/Chemical Methods, SW-846, 3rd Edition, Final Update II, Revision I, September 1994, Method 7470A (Mercury). (Source method.)

17.2 "Methods for the Chemical Analysis of Water and Wastes", EPA-600/4-79-020, U.S. EPA Method 245.1, Revision 3.0 (1994). (Source method.)

17.3 TestAmerica St. Louis Quality Assurance Manual (QAM), current revision

17.4 Corporate Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.5 Associated SOPs, current revisions

17.5.1 ST-IP-0004, Labware Preparation for Inorganic and Trace Metals Analysis

17.5.2 ST-PM-0002, Sample Receipt and Chain of Custody

17.5.3 ST-QA-0002, Standard and Reagent Preparation

17.5.4 ST-QA-0005, Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes

17.5.5 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts

17.5.6 ST-QA-0016, IDL/MDL Determination

17.5.7 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 CLARIFICATIONS, MODIFICATIONS TO THE REFERENCE METHOD

18.1 Modifications/Interpretations from reference method.

18.2 Modifications from both 7470A and 245.1.

18.2.1 The 200 series methods and Chapter 1 of SW846 specify the use of reagent water with a purity equivalent to ASTM Type II water. This SOP specifies the use of a Millipore DI system or equivalent to produce reagent water. This SOP requires that reagent water must be free of the analytes of interest as demonstrated through the analysis of method blanks.

18.2.2 This SOP allows for the use of reduced sample volumes to decrease waste generation. Reagent levels are adjusted to maintain the same ratios as stated in the source methods. According to a letter from Robert Booth of EPA EMSL-Cinn to David Payne of EPA Region V, "Reduction in sample size and appropriate corresponding reduction in sample volume is not considered a significant change in the methodology."

18.3 Modifications from Method 7470A

18.3.1 Chapter 1 of SW-846 states that the method blank should not contain any analyte of interest at or above the MDL. This SOP states that the method blank must not contain any analyte of interest at or above the reporting limit.

18.4 Modifications from 245.1

18.4.1 Method 245.1 Section 9.3 states concentrations should be reported as follows: Between 1 and 10 ug/L, one decimal; above 10 ug/L, to the nearest whole number. TestAmerica reports all Hg results under this SOP to two significant figures.

18.5 Method SW846 1311 requires that the Method Standard Addition (MSA) be used when matrix spike recovery is less than 50% and the measured sample results is within the range of 80-120% of the Toxicity Characteristics Limit. TestAmerica St. Louis does not run an MSA. Spike results outside QC limits are flagged and noted in the case narrative.

19.0 CHANGES FROM PREVIOUS REVISION

19.1 Updated section 10.0 by adding Low Level Check instructions.

19.2 Added section 11.2.4, pre of Low Level Calibration Check.

19.3 Added Low Level Checks to the Instrument Calibration list in section 11.5.4.

19.4 Rev. 9;

19.4.1 Updated post digestion spike section 9.7; removed MSA requirements

19.4.2 Removed section 18.3.2: redundant ICV criteria.

19.4.3 Added Method 1311 MSA requirements, section 18.5.

19.5 Rev. 10;

19.5.1 Updated the spike recovery acceptance criteria for methods EPA 245.1 and 7470A in section 13.4.

19.6 Rev. 11:

19.6.1 Updated instrument software used in section 6.0.

19.6.2 Updated permanganate solution needed for method blank and LCS in section 11.4.

19.7 Rev. 12:

19.7.1 Updated requirement for prepping all client and QC samples in section 11.4.2.1.

TROUBLESHOOTING GUIDE

Problem	**Possible Cause**
Poor or No Absorbance or Sensitivity Check failed	Incorrect wavelength Dirty windows Window loose Etched or dirty optics Bad lamp Not enough or no sample introduced Empty sample cup Incorrectly made standards Gas leak
Erratic Readings	Source lamp not aligned properly Lamp not prewarmed Contaminated reagents Contaminated glassware Drying tube saturated Bad lamp Leak in sample tubing Power fluctuations Air bubbles in tubing
Standards reading twice or half normal absorbance or concentration	Incorrect standard used Incorrect dilution performed Dirty cell

TAL Reference Data Summary

Structured Analysis Code: **I-19-BL-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL (Method exclusive) - Waters
Method: Mercury (245.1, Cold Vapor)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6109							Spike List 6110						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.050	ug/L	20051026	C	Y	1.0	ug/L	85	115	20	C	Y	1.0	ug/L	85	115	20

TAL Reference Data Summary

Structured Analysis Code: I-77-BL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED (DISS) -> TOTAL (Method exclusive)
Method: Mercury (245.1, Cold Vapor)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6109							Spike List 6110						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.050	ug/L	20051026	C	Y	1.0	ug/L	85	115	20	C	Y	1.0	ug/L	85	115	20

TAL Reference Data Summary

Structured Analysis Code: **I-0K-O8-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E(1312) -> METALS, TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6113							Spike List 6114						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	1.0	ug/L	0.079	ug/L	20091211	C	Y	5.0	ug/L	80	120	20	C	Y	25	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: **I-0L-O8-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312) -> METALS, TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6113							Spike List 6114						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	1.0	ug/L	0.079	ug/L	20091211	C	Y	5.0	ug/L	80	120	20	C	Y	25	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: **I-0M-O8-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> METALS, TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6113							Spike List 6114						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	1.0	ug/L	0.079	ug/L	20091211	C	Y	5.0	ug/L	80	120	20	C	Y	25	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: I-19-O8-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL (Method exclusive) - Waters
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.06	ug/L	20110624	C	Y	1.0	ug/L	80	120	20	C	Y	1.0	ug/L	80	120	20

TAL Reference Data Summary

Structured Analysis Code: **I-77-O8-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED (DISS) -> TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.06	ug/L	20110624	C	Y	1.0	ug/L	80	120	20	C	Y	1.0	ug/L	80	120	20

Bienkowski, Lisa

To: Bienkowski, Lisa
Subject: SOP signature

From: Glenn Massey [mailto:gmassey@amerisci.com]
Sent: Thursday, November 15, 2012 3:42 PM
To: Bienkowski, Lisa
Subject: Re: Asbestos SOP with signatures

Lisa,

When we give a customer or compliance agency an SOP for review, we no longer have control over it, so it called an uncontrolled document. We can only control what's inside our building. The annual review is handled primarily in our corporate office, though we do review it with our annual internal audits. For years, and probably decades now, the versions have been approved and released without the signatures. Our compliance officer did clarify that the asbestos SOP released to a customer without signatures is to indicate that it's an uncontrolled document and should be accepted as the current and reviewed document we operate under. That's the policy and why you received it that way. Review notes are part of other internal records that we don't release, and no further changes have been made to the version you have.

Glenn

AmeriSci Group. Standard Operating Procedures

SECTION III - A

Analysis of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM)

(40 CFR Ch. I (1-1-87 edition) Pt 763, Subpt. F, App. A, pages 293-299)

1. Principle and Application

1.1. Application

This method of analysis is useful for the qualitative identification of asbestos and the semi-quantitative determination of asbestos content of bulk samples, which is useful information to characterize the potential hazard of a given material with regard to asbestos. This method is strictly applicable to friable building materials only. Quantitative removal of matrix and other non-asbestos components sensitive to heat and/or acid treatment may provide additional information for selected samples (see section III-A.6). Non-friable materials are addressed in other portions of Section III (see III-B and III-C). Asbestos is a fibrous, fire-resistant mineral once widely used in building materials and now known to be a human carcinogen. Hazardous materials must be identified so that necessary safety precautions may be taken when the material is handled.

1.2. Principle

1.3. Accessory Methods for Problem Samples

Some types of friable samples and most non-friable samples present a series of problems of varying difficulty for the asbestos analyst. Typical problem materials include matrix coated materials including plaster samples, joint compound, roofing samples, mastic, vinyl or asphalt floor tiles, cement products, caulking, rubberized coatings, paints and other materials. Coatings on asbestos bundles which prevent the proper observation of characteristic optical properties may be removed by mechanical, chemical (HCl treatment) or thermal (ashing at 480C) treatment. Great care must be taken when applying matrix modification or removal in order to track the processes quantitatively by Gravimetric Reduction (section III-A-6.). Analysis of non-friable materials and other special materials is addressed in Section III-C. Materials such as floor tiles, plasters, or paints suspected of having substantial quantities of fibers with diameters thinner than 0.25 micrometers (optical limitation of the light microscope) should be referred for TEM preparation and examination (section VII). Foreign soil samples are subject to special handling requirements (USDA Circular Q-330.300-2) and disposal treatments (section XXII-A). The CARB 435 method requires 400 pt ct analysis of samples with <10% asbestos content by visual estimate.

2. Equipment and Materials

2.1. Microscope, polarized light, and:

2.1.1. 10 x oculars with cross-hair reticule

2.1.2. Objectives such as 4x, 10x, 20x, and 40x

2.1.3. Polarizer placed parallel to the reticule cross-line and analyzer capable of being placed at 90° angle to polarizer.

2.1.4. Accessory slot for wave plate and analyzer

2.1.5. Retardation plate (red I compensator plate), 550 nm retardation with known fast and slow vibration directions

2.1.6. 360° rotatable stage

2.1.7. Substage condenser with iris diaphragm

2.1.8. Light source with iris diaphragm and blue day-light filter

2.2. Microscope slides: 75 mm x 25 mm

2.3. Cover slips: 18 mm x 18 mm, No 1 1/2

2.4. HEPA-filtered hood

2.5. Mortar and pestle

2.6. Stereomicroscope, ca. 10x to 45x, with incandescent light source

2.7. Mini-hot plate

2.8. Tweezers, dissecting needles, spatulas, probes, and scalpels

2.9. Pencils, #2

2.10. Glassine weighing papers or plastic weighing boats

2.11. Analytical balance readable to one milligram

2.12. 10 ml Pyrex beakers

2.13. Muffle furnace capable of 500° C

2.14. Filters, 0.4 µm pore size polycarbonate

2.15. Petri dishes, disposable (locking and non-locking)

2.16 Glass filtration assembly with vacuum pump

2.17. Drying oven

2.18. Desiccator with silica gel

2.19 10 ml graduated pipettes

2.20. 500 ml volumetric flasks

2.21. Nalgene wash bottles

2.22. Ultrasonic bath

2.23 Timers

2.24. Wrist action grinder with removable cups

2.25. High temperature thermometer (500 C) readable to 5° C

2.26. Room temperature thermometer readable to 2° C

2.27. Chalkley point count reticule

2.28. Monochromatic filter - 589.3 nm (orange)

2.29. Alcohol burner lamp

2.30. 200 Tyler mesh sieve

3. Reagents

3.1. Refractive index (RI) liquids 1.490-1.570 high dispersion and 1.580-1.720 in increments of 0.005 or less

3.2 Asbestos reference samples such as SRM #1866 and #1867, available from the National Institute of Standards and Technology

3.3 Calibrated refractory glasses for verifying refractive indices

3.4 Distilled water

3.5. Concentrated HCl and NaCl, reagent grade

4. Sample Collection and Identification Procedure

4.1. A sample size of 1 to 10 grams is recommended, although sufficient sample size is sample-type dependent. Sample size should be adjusted to ensure that it is representative of the parent material. Samples should be submitted in a carefully sealed and labeled sample container and packed to prevent damage or sample loss.

4.2. A sample submitted for testing should contain all layers of a material and should be relatively undisturbed so that the analyst may view the sample in its original form. Since each layer must be analyzed as a separate sample, separable layers should be separated and identified in the field if possible. If not separable, an identifier should be used which will allow later identification by orientation, position, color, texture, etc. If identifiable, the outside or top of a sample should be labeled as the first layer.

4.3 When logged into the AmeriSci data base each sample or separable layer must be labeled with and thereafter referred to by the unique lab assigned job/sample number consisting of an 9 digit job number followed by sequential digits which serve as the specific sample identifier within the job (ex. 1-0201-1523-27). For layered samples not addressed by unique client identifiers at Log-in the job/sample number may be further subdivided by creation of a decimal addition to the sample specific digit such that each of the decimals relate to the original client identifier. For example, the third layer from the top in a roofing sample would be identified as 1-0201-1523-27.3 unless specified differently by the client. As an alternative procedure, different materials combined under a single client sample number may be identified by a Letter suffix rather than a decimal. For example, a floor tile, mastic group identified by a single client number might be identified by AmeriSci as 1-0201-1523-27T and 1-0201-1523-27M. Letters available for use as suffixes include: M, T, C and F which may be followed by sequencing digits for more that one occurrence of a material in a sample bag such as -27T, -27M1 and 27M2.

5. Sample Slide Preparation Procedure

5.1. Examine the paperwork for necessary client information regarding processing and reporting of the samples. Samples may be analyzed individually after preparation or prepped and analyzed as a job batch depending on analyst preference. Prepare a QC-blank test slide with standard non-asbestos particulate material after every 19 client samples in a job batch (see 5.20.). Record any sample modification or treatment must be on the sample worksheet (or directly in the LIMS using comment/footnote).

5.2. If the sample has been selected for quality control analysis place the sample container in the analyst specific quality control bin after completion of primary analysis.

5.3. Visually examine samples with a low-magnification stereomicroscope under a ventilation hood with HEPA filtration. Samples should only be opened for examination under a properly operating HEPA hood.

5.3.1. Observe and note the following on the sample worksheet (or directly into the LIMS):

5.3.1.1. AmeriSci job/sample number (decimal sample number indicates layered sample)

5.3.1.2. Homogeneity

5.3.1.3. Color

5.3.1.4. Texture

5.3.1.5. Semi-quantitative estimation of amount of fibrous material present

5.4. If the sample appears to be wet, transfer to a labeled petri dish and dry in a low temperature drying oven at 60C. Cool before proceeding.

5.5. Label a slide with the sample's AmeriSci number (job # plus individual sample #).

5.6. Under the hood, remove a portion of the sample and examine the edges for emergent fibers. If any layers are observed they should be addressed as individual samples for analysis and reporting purposes if possible.

5.7. If there are obvious separable layers, analyze and report each layer separately using a suffix (decimal or letter identifier added to the AmeriSci job/sample number). If not entering analysis directly into the LIMS package add the suffix to the sample number on the analysis sheet and use a blank analysis sheet for each additional layer/material. Attach the additional layer sheets to the original sample sheet.

> **Note:** Under EPA guidelines (40 CFR 61, FR 59.3.542) single, combined analyses may not be reported except for a joint compound / wallboard system. OSHA does not allow combined analyses.

5.8 Forceps and a scalpel may be used to cut the sample layers into smaller pieces after placing it in the RI liquid on the slide. The scalpel blade may also be used to "scrape" coatings from fiber bundles in order to remove interference effects.

5.9 Grind non-homogeneous samples in a mortar until thoroughly mixed.

5.10. If the sample has large hard particles, grind in a mortar to reduce grain size to less than 200 Tyler mesh to facilitate accurate quantitation (required by CARB 435).

5.11. Place a small drop of 1.550 HD dispersion staining fluid on appropriately labeled slide.

5.12. Using forceps, randomly transfer a small pinch sample from the homogenized sample to the mounting medium on the slide.

5.13. Evenly disperse the sample throughout the fluid using needles or a mincing action with forceps and a scalpel.

5.14. Using needles, scalpel and forceps tease homogenous samples not previously ground to facilitate separation of fibers from matrix materials. Bundles of fibers should be "scraped" with a scalpel to remove adhering particulate which causes a "milky way effect" when observed by PLM/DS. Pretreatment with dilute HCl may aid removal.

5.15. Place a coverslip over preparation. Add more refractive index fluid if necessary by dropping liquid on slide rather than touching the slide. Note: This must be done cautiously since the RI fluid may be easily contaminated at this point.

5.16. An even dispersion of sample should cover the entire area under the cover slip. If necessary, a clean pencil eraser may be used to grip the coverslip while sliding it over the preparation to thin and evenly distribute the material. Mild heating may assist separation of binder materials.

5.17. For those samples which will have quantitation by EPA 400 pt. (or 1000 pt.) point-counting, eight (twenty) or more sub-samples must be mounted on labeled microscope slides under separate coverslips. A maximum of 50 points per mount should be counted. Two mount/coverslips may be mounted on the same slide.

5.18. Prepare additional subsamples as necessary in specified RI fluid by repeating steps 5.7 through 5.17.

5.19. If specified, QC slides for duplicate and replicate analysis may be prepared by repeating steps 5.7. through 5.17.

5.20. Prepare a QC-Blank slide by placing small pinch sample of blank fiberglass or NaCl on a slide following steps 5.11. through 5.16. (See “SOP for Housekeeping”, Section V.4. for further information concerning QC-blank sample evaluation.)

5.21. Thoroughly clean work area, mortar and pestle and all other mounting tools between each sample preparation.

5.23. Repeat sample preparation steps for all samples in the client’s job request and all QC samples indicated by the accompanying paperwork.

6. Gravimetric Reduction (Point Count or TEM preparation - modified Chatfield)

This procedure is not part of the standard procedure for friable samples. This method is particularly useful to reduce the possibly of false negatives if thin fibers below the resolution limit of the light microscope are suspected and to provide additional quantitative data for samples which contain low levels of asbestos. Such samples when requested, may be gravimetrically reduced prior to PLM slide preparation. A Gravimetric Reduction Worksheet must be completed for each job. All Non-friable Organically Bound (NOB) samples are addressed by Section III-B or III-C.

6.1 Examine the paperwork for necessary client information regarding processing and reporting of the samples. Using a scalpel or other tool, shave or break off approximately 300 to 500 mg (100 minimum)of homogenous sample into a marked, pre-weighed 10 ml beaker and weigh. Non-homogenous, layered and mixed type samples must be separated as previously described in sections 4 & 5.

6.2. Record sample color, morphology and weight on appropriate Gravimetric Reduction (GR) worksheet as described in section 5. Maintain GR worksheet with job folder.

6.3. Cover and place in a muffle furnace at 480°C for 6-12 hours or until sample weight stabilizes. Record temp/time into and out of the furnace on the GR worksheet.

6.4. Cool in a desiccator with silica gel (Do Not use Drierite due to contaminating dust).

6.5 Reweigh and record weight on appropriate worksheet.

6.6. Add approximately 5 ml of 6:1 HCl and using a spatula or probe break up any lumps or residue in beaker.

6.7. Cover and place sample in ultrasonic bath for approximately 10 minutes.

6.8. Preweigh a plastic petri dish and 0.4 µm polycarbonate filter for each sample. A locking petri dish should be used if the sample is to be saved, shipped or for PLM.

6.9. When all obvious signs of reaction (bubbling) have stopped, pour sample solution into filtration apparatus containing a pre-weighed 0.4 µm polycarbonate filter.

6.10. Using distilled water, thoroughly rinse beaker into filtration apparatus and rinse down the inside of the apparatus. Record treatment time on GR worksheet.

6.11. When filtration is complete, carefully transfer filter and residue to the appropriate pre-weighed petri dish.

6.12. Dry filter and residue (in petri dish) in drying oven. The presence of any large grains of aggregate material must be noted on the Gravimetric Reduction Worksheet (Rocks Y/N) and accounted for quantitatively.

6.13. Re-weigh filter and residue in petri-dish. Record weight on appropriate work sheet.

6.14. If residue weight is less than 1% of original subsample weight, analysis may be halted and sample reported as a non-ACM. Note: Unless analysis termination is requested at this point by the client, analysis should continue in order to make client aware of potential site or personal contamination by low level , non-regulated, asbestos containing material.

6.15. If residue weight is ≥ 1% of original subsample weight, transfer petri-dish to a HEPA filtered preparation hood for PLM analysis.

6.16. Cut the filter in half. Retain one undisturbed half in the petri-dish. Detach a section of residue from the second half filter and mount random pinch samples on 2 separate, clearly labeled slides making 2 coverslip preparations on each slide using steps 5.11 thru 5.17. Additional mounts may be necessary. During analysis compare the sample to 2 known standards with similar type and amount of asbestos, if available.

6.17. Save the remaining half filter in the petri-dish for possible TEM confirmation.

6.18. Thoroughly clean filtration apparatus between each sample.

7. Sample Analysis Procedure - Qualitative Assessment

7.1. Microscope Setup: Refer to "SOP for Calibration and Maintenance of Equipment - Asbestos" for details on daily microscope calibration and setup.

7.2. Inspect the sample macroscopically and note the color and bulk morphology on the analyst's worksheet (either hard copy or computer file). Prepare slides as necessary for PLM examination following procedures outlined in Section III.A.5.

7.3. Examine the slide under PLM. All fibrous components in the sample must be identified.

7.3.1. If matrix material coats the fibers, place a pencil eraser on the coverslip to press and slide the coverslip until the fibers are freed, (heating may assist). Some coatings may require "scraping" with a scalpel blade or solvent treatment prior to applying the coverslip.

7.3.2. Asbestos fibers must be positively identified by observing each of the following criteria. If not entering data directly into the LIMS package record all observations in the appropriate space on the analyst's worksheet for each sample analyzed.

7.3.2.1. Scan the preparation using crossed polars with the first order red compensator inserted. For each type of suspected asbestos fiber found, observe and record the following on the analyst's worksheet.

7.3.2.2. Morphology: refer to EPA Test Method Table 2-2 for optical properties of asbestos fibers.

7.3.2.3. Sign of elongation: note as either + (positive) or - (negative) on analyst's worksheet.

7.3.2.4. Remove the first order red compensater and observe extinction characteristics. Note angle of extinction as parallel, or in degrees if different from parallel, on analyst's worksheet.

7.3.2.5. Remove the analyzer and observe under plane polarized light for color and pleochroism. Record observations on analyst's worksheet.

7.3.2.6. Insert the dispersion staining objective and observe dispersion staining colors parallel and perpendicular to the fiber length. Record these colors in that order on worksheet. Refer to EPA Test Method Table 2-3 for typical central stop dispersion staining colors.

7.3.2.7. Record index of refraction (RI) parallel and perpendicular to the fiber length. Note: See Reference- Single Liquid Method - for assistance in determining RI values by Dispersion Staining Method; record all RI values to 4 significant figures.

7.3.2.7.1 Most samples are originally mounted in 1.550 HD refractive index (RI) oil. It will be necessary to mount subsamples of original bulk materials with suspect amphiboles in other RI oils.

7.3.2.7.1.1 Mount suspected amosite samples in 1.680 RI oil.

7.3.2.7.1.2 Mount suspected crocidolite samples in 1.680 and 1.700 RI oil.

7.3.2.7.1.3. Mount suspected anthophyllite, actinolite, or tremolite samples in 1.605 RI oil.

7.3.2.7.2. Dispersion staining colors along with temperature may be used to establish refractive indices of chrysotile, amosite, and crocidolite. Alternatively, refractive indices may be established by observation of Becke lines under plane polarized light.

7.3.2.8. Record Birefringence on analyst's worksheet as none (isotropic), high, med. (medium), or low.

7.3.3. All fibrous components of the sample must be positively identified as asbestiform or non-asbestiform. Check synthetic "chrysotile" look-likes by heating with mini-hot plate, they should melt at 300-500 F. Only one distinguishing characteristic for each non-asbestos fiber type needs to be recorded. Refer to EPA Test Method Tables 2-4 and 2-5 for optical properties of non-asbestos fibers.

7.4. Man Made Vitreous Fibers - Some non-asbestos fibers such as man made vitreous fibers (MMVFs) and in particular refractory ceramic fibers (RCFs) may be identified by a combination of physical and PLM optical methods which are not addressed in the EPA methods.

7.4.1. Vitreous fibers are fibers which are isotropic (glass) and may be either natural or synthetic. Refractory ceramic fibers (RCFs) are synthetic, vitreous fibers which may be separated from other MMVFs such as glass wool, mineral wool, rock wool or slag wool based upon refractive index measurements and a flame test as follows (Buetow, 1998):

7.4.1.1. Isotropic MMVFs may be separated into rock/slag/mineral wool and glass wool/RCFs based upon refractive index either above or below 1.600 respectively. RCFs exhibit indices of refraction between 1.54 and 1.59. Glass wool fibers generally have indices between 1.51 and 1.54. Rock/Slag wool have higher indices in the range of 1.6 to 1.8.

7.4.1.2. Hold a bundle of suspect fibers in the flame of an alcohol lamp (about 1050 C) for at least 60 seconds. Vitreous Refractory ceramic fibers (RCFs which have a melting point above 1500 C) will glow red but will not melt. Fiberglass, rock, mineral and slag wool should melt at temperatures over 100 degrees below the temperature of the alcohol flame.

7.4.1.3. Suspect RCFs from a positive flame test should be referred to chemical composition testing by TEM/EDS for identification as to RCF type.

8. Sample Analysis Procedure - Quantitative Assessment

8.1 Semi Quantitation by Visual Estimation

8.1.1. Estimate the content of the asbestos type present in the sample using the 1.550 RI preparation. Do not use HCl or heat treated samples unless losses were quantified.

8.1.2. Express the estimate as an area percent of all material present, taking into account the loading and distribution of all sample material on the slide. Use permanently mounted, in-house calibration standards to aid in arriving at an estimate, if available. Alternatively, for samples in ranges where no in-house standard are yet available, refer to Appendix B “Visual Estimation Comparators”, also see illustrations in NIOSH 9002 document.

8.1.3. If additional unidentified fibers are present in the sample, continue with the qualitative assessment (Section III.A.7.).

8.1.4. Record on the analyst’s worksheet estimated percentages of all other materials identified which are present at greater than trace levels. The sum of expressed percentages should equal 100% of material observed. Note: If evaluating inert residue from matrix reduction process the expressed percentages should equal the inert residue percentage.

8.1.5. The quantity of asbestos by visual estimation is reported as **trace** if six or more asbestos fibers are observed in a minimum of three slides. The background level has been determined to be a single fiber in a minimum of three slides. Four fibers are required to be considered statistically significant above background, for a total of six fibers in a minimum of three slides.

8.1.6. Indicate calibrated visual estimation (CVES) as the method of quantitation

8.2 Quantitation by Point Counting (EPA 400 pt or 1000 pt)

8.2.1. Summary and Application

Samples with less than 10% asbestos by visual estimation need further quantification using either the 400 or 1000 point count method, which may be extended in order to provide lower detection limits as appropriate. Point counting may be performed only on friable materials or those non-friable materials having undergone gravimetric reduction.

8.2.2. Point Counting Criteria

A **Point** is a discrete point (as on a Chalkley Reticule) or the intersection of two mutually perpendicular lines in the eyepiece reticule. A non-empty point is the visual superimposition of such a **Point** over any material in the slide preparation. Empty points are those points which lie over areas containing no materials.

8.2.2.1. A non-empty point must be noted as one of the following:

8.2.2.1.1. Specific asbestos varieties

8.2.2.1.1.1. CH: chrysotile
8.2.2.1.1.2. AM: amosite
8.2.2.1.1.3. CR: crocidolite
8.2.2.1.1.4. TR/AC: tremolite/actinolite
8.2.2.1.1.5. AN: anthophyllite

8.2.2.1.2. Specific non-asbestos fibers (optional)

8.2.2.1.2.1. CF: cellulose fiber
8.2.2.1.2.2. FG: fibrous glass (mineral/glass wool)
8.2.2.1.2.3. SF: synthetic fiber
8.2.2.1.2.4. WL: wollastonite
8.2.2.1.2.5. OF: other fiber (talc, brucite, etc.)

8.2.2.1.3. Non-fibrous material

8.2.2.3. Before beginning analysis for a particular sample, scan each preparation and thin or re-prepare as necessary. Ideally, slides should contain approximately 50% non-empty points with a minimum of clumping.

8.2.2.4. Moving to new fields of view must always be done at random, with the analyst looking away temporarily while moving the slide. The slide must never be deliberately moved to preferred fields of view under the reticule.

8.2.2.5. If the **point** lies over an area of heavy clumping, randomly move the slide to another area to avoid attempting to count multiple layers under a point. Record only one point if two or more points are positioned over some particle or fiber.

8.2.2.6. If two particles are occasionally superimposed under a **point**, count both particles as separate points.

8.2.3. Point Counting Rules

8.2.3.1. All counting must be done at 100x magnification, usually between crossed polars with the first order red compensator inserted in the 45° port above the slide. (In some situations where extremely fine asbestos fibers are present, it may be preferable to analyze the sample between slightly uncrossed polars without the compensator. Other situations may warrant point counting in a dispersion-staining mode.)

8.2.3.2. For each of the coverslip preparations, count until 50 non-empty points are counted.

8.2.3.3. Continue counting until 400 (or 1000) non-empty points have been counted on eight (or twenty) preparations (mounts). When extending the points counted, maintain the system with a maximum of 50 points per slide..

8.2.3.4. Utilize a uniform scan pattern (i.e. always begin with upper left point in NW quadrant and end with lower right point in SW quadrant counting each point between in a systematic pattern) so that an asbestos fiber is not always the first point counted in a field.

8.2.3.5. If asbestos appears in a field of view but not directly under a point, the analyst must note this on the sheet and "trace asbestos" must be noted on the final report.

8.2.3.6. If the analyst suspects asbestos from the macroscopic examination but none is detected during the point count analysis, the analyst must retrieve the original bulk material, remove any suspicious fibers, mount them in an appropriate medium, and determine their identity. If the fibers are confirmed as asbestos, this is noted on the analysis sheet. Although these observations will not be used for quantitation, they will be incorporated into the final report to prevent false negatives.

8.3 Continue qualitative and quantitative analysis for each sample in the work order until all samples for that order including appropriate Quality Control samples (duplicates and blanks) have been completed. The final report will not be released until replicate QC samples have been completed.

8.4. Analyze QC samples in-line with other samples if available. For each QC sample, record on a separate "Intralaboratory QC Bulk Analysis Worksheet" (or directly in the appropriate LIMS QA job) all information recorded for initial analyses (Section

III-A.7 - 7.3.3).

8.5. Contamination Testing - Blank Slides - Note that any material (asbestos or non-asbestos) should be considered contamination.

Analyze QC-Blank slides in-line with other samples (after nineteen samples). If suspected contamination may have occurred, a blank slide may be prepared at any time. Note that any fibrous material (asbestos or non-asbestos) must be identified and may be considered contamination. Record the following in the appropriate "Contamination Check" spaces of the Calibration logbook.

8.5.1. Initials of analyst (or analysts) analyzing blank slide

8.5.2. Date of analysis

8.5.3. Note "none" if no fibrous contamination is apparent. Note percentage and type of contamination detected if found. Cease analyses until the source of the contamination is resolved. Notify the laboratory supervisor for necessary corrective action.

8.5.3.1. If non-asbestos, fibrous contamination is detected, clean all tools and workspace. Mount and analyze samples of NaCl until the source of the contamination is resolved. Reanalyze any samples analyzed after the previous clean blank, which may have been affected by the contamination.

8.5.3.2. If asbestos contamination is detected, clean all tools and workspace. Mount and analyze samples of Reference fiberglass until the source of the contamination is resolved. Reanalyze any samples analyzed after the previous clean blank, which may have been affected by the contamination.

8.5.3.3. Document completely the sequence of events leading to the contamination event and its resolution. Report the event in its entirety to the Quality Control Officer.

9. <u>Calculations</u>

9.1. Point Count (EPA 400 point or 1000 point)

9.1.1. The percentage of each asbestos type, non-asbestos fiber types, and non-fibrous components are calculated by dividing the number of non-empty points of that component by the total non-empty points counted for that sample.

If AP = 0 report "NAD" (no asbestos detected)

If 0 < AP ≤ 3 report "<1% asbestos"

If AP ≥ 4 calculate the % Asbestos as follows

Thus: % Asbestos = (AP / TP) 100%

Where: AP = number of points counted for a specific asbestos type
TP = total number of non-empty points counted (400 or 1000)

9.1.2. For example, if point counting yielded 15 chrysotile points and amosite was counted as 4 points, then:

TP = 400 (total non-empty points counted) or 1000 (total non-empty points counted)

<u>AP for chrysotile</u> = 15 (total chrysotile points counted) ;
thus (15 / 400) X 100% = 3.75% chrysotile
or (15/1000) X100% = 1.50% chrysotile

<u>AP for amosite</u> = 4 (total amosite points counted);
thus (4 / 400) X 100% = 1.00% amosite
or (4/1000) X 100% = 0.40% amosite

<u>AP for total asbestos</u> = 4 (amosite) + 15 (chrysotile) = 19 (total);
thus (19 / 400) X 100% = 4.75% asbestos
or (19/1000) X 100% = 1.90% asbestos

9.2 Gravimetric Reduction

9.2.1. Percent Asbestos for samples which have undergone gravimetric reduction is calculated using the following formula:

$$\% \text{ Asbestos} = (W_{Res}/W_{Orig.}) \times \text{Asb\%}$$

where: W_{Res} = Weight of residue after furnace and acid treatments (mg)
W_{Orig} = Weight of original subsample (mg)
Asb% = Mean percentage of asbestos (versus inorganic residue) in

final slide preparations

10. Calibration and Quality Control Measures

10.1 Contamination Control

10.1.1. Blank slides prepared within the work flow from verified non-ACM (NaCl, Reference fiberglass or NIST 1866 fiberglass) are analyzed at a rate of one after every nineteen client samples.

10.2 Calibration of Equipment and Supplies

10.2.1. **Refractive Index Media**

10.2.1.1. The refractive index of the dispersion staining oils currently in use are checked monthly, when any bottle is first opened or refilled from a larger bottle, or when in question for any reason. If a bottle is used after a period of non-use longer than a month the bottle must be calibrated in order to verify the reference value.

10.2.1.2. Refer to SOP for Calib. and Maint. - Asbestos for details on RI verification.

10.2.2. Polarized Light Microscope

10.2.2.1. Check PLM calibration daily and document the calibration in the microscope log book.

10.2.2.2. See SOP for Equip. Calib. and Maint. - Asbestos for calibration details.

11. Available Reference Standards

11.1. NIST Standard 1866 for chrysotile, amosite, crocidolite, and fibrous glass, and the NIST Standard 1867 for anthophyllite, actinolite, and tremolite. Low level ACM standards and slides are available.

11.2. All NIST and other proficiency testing materials are retained for use as reference standards and training materials.

11.3. Cargille Optical Glass reference sets (M-8 and M-25) are available for verifying refractive index oils.

11.4. Reagent grade NaCl, Reference fiberglass and SRM 1866 fiberglass are available for use as contamination testing materials.

11.5. Various samples of industrial grade materials such as mineral wool, talc, cellulose, etc. are available for comparison.

12. Bulk Asbestos Quality Control

12.1. Because quality control for bulk samples is difficult to quantify, the QC for bulk asbestos samples is based on a error classification scheme in which various differences between two analyses of the same bulk material are denoted by an error category and an error type.

12.2. There are two error categories: major and minor.

12.2.1. A major error requires immediate attention to determine if the analysis was invalid.

12.2.2. Minor errors are not considered significant unless repeated frequently by an analyst.

12.3. The various error types are given in the table below:

Error Category	Error Type	Meaning
Major	False positive	A substance was found in the original analysis but not in the QC analysis. Note: Trace vs NAD is considered a Minor quantitation error.
Major	False negative	A substance was found in the QC analysis but not in the original analysis. Note: Trace vs NAD is considered a Minor quantitation error.
Major	Mis-ID	An asbestos mineral was found in the original analysis but a different asbestos mineral was found in the QC analysis (except for actinolite-tremolite; see below).
Major	Quantitation	The quantity of a substance found in the original sample analysis differs 30% or more from the quantity of the same substance found in the QC analysis.
Minor	Mis-ID	Actinolite was found in the original sample but tremolite was found in the QC analysis, or vice versa.
Minor	Quantitation	The quantity of a substance found in the original analysis differs 15% to 29% from the quantity of the same substance found in the QC analysis. Note: Trace vs NAD is considered a Minor quantitation error.

12.4. The only analytes considered in the classification scheme are the asbestos minerals.

12.5. **Intralaboratory Quality Control**

12.5.1. Intralaboratory quality control is used to estimate the variability of bulk asbestos identification within the laboratory. One out of every ten bulk samples is chosen to be analyzed blind in duplicate and/or replicate. A QC-blank sample is prepared after every nineteen client samples.

12.5.1.1. Duplicate: one sample is blindly analyzed two times by the same analyst; monitoring analyst precision.

12.5.1.2. Replicate: one sample is blindly analyzed by two different analysts; monitoring intralaboratory precision and accuracy.

12.5.2. Corrective action: If a major error is found (by either duplicate or replicate QC evaluations), the Laboratory Supervisor will have the sample reanalyzed, preferably by someone other than the original analyst. The sample will continue to be reanalyzed until at least two analyses do not have any major errors. All other like samples (as described in the Sample Identification field of the sample submittal form) within the work order will also be reanalyzed. If the error is NSD vs Trace or a low asbestos percentage TEM verification may be requested.

12.5.2.1. Contaminated Blanks: If fibrous material (asbestos or non-asbestos) is detected in a QC-blank sample, the prep area and equipment are cleaned and new blanks analyzed until the problem is resolved (see Section III.A.8.5. for a detailed discussion). All samples analyzed since the previous clean blank will also be reanalyzed.

12.5.3. If subsequent analysis shows that an error has been reported prior to the final report being issued, the report is corrected without an amended note (since the data faxed is marked preliminary) and the client contact notified of the change from the preliminary data. If for any reason the final report has been issued an amended report is issued and the client contact notified of the change prior to it being sent. With approval by the laboratory director the client may receive credit for the invoice if already issued.

12.5.4. The Quality Control Coordinator will on at least a monthly basis provide a blank sample and a known asbestos containing sample for blind analysis. Additional samples may be provided at any time if deemed necessary.

12.5.4.1. SRM 1866, Reference fiberglass or other asbestos standards are submitted as a blind sample at least once per month.

12.6. Interlaboratory Quality Control

12.6.1. Interlaboratory quality control is performed by Round Robin analyses in order to provide a comparison of AmeriSci analysts and analysts at other accredited laboratories.

12.6.2. NVLAP Proficiency Testing Program

Samples are prepared semi-annually by a NVLAP contractor. The results of all analyses of these materials and the comparison of AmeriSci's analysis with NIST's analysis are maintained in AmeriSci's QC files. Additionally, individual analyst's results are reviewed with NIST's analysis to monitor individual performance. These samples are available and used for training and QA/QC purposes

12.6.3. Round Robin Programs

AmeriSci participates with other accredited laboratories by analyzing submitted samples semi-annually. Participating laboratories rotate the responsibility of initiating samples and summarizing the analysis results. The round robin program gives AmeriSci an external QC check on samples typical of those analyzed on a daily basis.

12.7. Monthly Summaries

The Quality Control Coordinator at each facility will provide monthly summaries of QA analyses, including results from: blanks, duplicates, replicates, proficiency testing and interlaboratory testing as available. The report will also include discussion of any deficiency corrections addressed during the month. Overall accuracy and precision for each analyst will be maintained in individual personnel folders and addressed in the monthly report.

13. Evaluation of Method

13.1 Interferences

Other fibers with optical properties similar to the asbestos minerals may give positive interferences. Optical properties of asbestos fibers may be obscured by coatings on the fibers. Fibers finer than the resolving power of the microscope (ca. 0.25 µm) will not be detected. Heat and acid treatment may alter the index of refraction of asbestos and change its color.

13.2. Limitations

The method is useful for the qualitative identification of asbestos and the semi-quantitative determination of asbestos content of bulk samples, expressed as a percent of projected area. The method measures percent asbestos as perceived by the analyst in comparison to the standards which include real calibration samples, projections, photos, and drawings. The method is not applicable to samples containing large amounts of fine fibers below the resolution of the light microscope.

Since some samples may contain fibers too small to be resolved by PLM (<0.25 µm in diameter), quantitation of total fibers in such samples may not be possible without use of transmission electron microscopy (TEM).

13.3 Range and Limit of Detection (may be extended by gravimetric reduction and/or point counting)

13.3.1. Range of Detection: 1% to 100% asbestos

13.3.2. Estimated Limit of Detection:
<1% asbestos for CVES
< 0.25% for 400 points counted
< 0.10% for 1000 points counted

14. Evaluation of Analysis Results

Any material containing asbestos at any level is considered to be a potential health hazard and must be handled with applicable precautions.

15. Safety Considerations

Standard laboratory safety should be observed during all benchwork procedures. Lab coats should be worn at all times. All sample inspection and mounting procedures should be conducted under the exhaust hood. More extensive safety guidelines can be found in the AmeriSci Health & Safety Manual and Chemical Hygiene Plan.

16. References

Buetow, D.H. 1998, "The Identification of Refractory Ceramic Fibers in Bulk Building Materials by Optical and Physical Methods", EIA Technical Monographs, Vol 4, 8 pages.

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Su, Shu-Chun 1996, "Rapidly and Accurately Determining Refractive Indices of Asbestos by Using Dispersion Staining Method", References for Bulk Asbestos Identification by PLM, 1997 NVLAP Asbestos Regional Meeting, Boston, MA

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USEPA: "Method for the Determination of Asbestos in Bulk Building Materials", EPA/600R-93/116, July 1993

Title: HERBICIDE GAS CHROMATOGRAPHIC ANALYSIS [SW-846 8151A]

Approvals (Signature/Date):

Ben Hicks	5/31/12	Michael Ridenhower	5/31/12
Organics Manager	Date	Health & Safety Manager / Coordinator	Date
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Quality Assurance Manager	Date	Laboratory Director	Date

This SOP was previously identified as SOP No. ST-GC-0017 Rev. 11

Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This SOP describes procedures to be used for the analysis of Herbicides by GC/ECD.

1.2 Sample preparation techniques are described in SOP ST-OP-0007.

1.3 This SOP is based on EPA SW-846 Method 8000B, 8000C and 8151A.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

1.4.1. Additional compounds may be amendable to this method. The minimum requirement for non-standard analytes is that the reporting limit be set at the lowest required concentration that can actually be detected by the instrument, and when an MDL study can not be conducted, the MDL be set equal to the reporting limit.

2.0 SUMMARY OF METHOD

2.1 Aqueous samples are separatory funnel extracted in diethylether, hydrolyzed and esterified with TMS diazomethane. Solid samples are sonicator extracted in methylene chloride/acetone and esterified with TMS diazomethene. Waste samples are extracted using the waste dilution procedure followed by esterification.

2.2 After the initial preparation step, the sample is introduced to the instrument equipped with capillary columns and dual Electron Capture Detectors (ECD). Concentrations of target analytes are measured by the detector response within a defined retention time window, relative to the response to standard concentrations. The external standardization procedure is used.

2.3 Herbicides are spiked and prepared as methyl acid and analyzed as their methyl esters.

3.0 DEFINITIONS

3.1 See the TestAmerica ST. Louis Quality Assurance Manual (QAM) for a glossary of common laboratory terms and data reporting qualifiers.

4.0 INTERFERENCE

4.1 Organic acids, especially chlorinated acids, interfere with the determination by methylation. Phenols, including chlorophenols, may also interfere with this procedure. Alkaline hydrolysis and subsequent extraction of the basic solution removes many chlorinated hydrocarbons and phthalate esters that might otherwise interfere with the ECD. The hydrolysis may result in the loss of dinoseb and the formation of aldol condensation products if any residual acetone remains from the extraction of solids.

4.2 Interferences co-extracted from samples will vary considerably from source to source. The presence of interferences may raise quantitation limits for individual samples. Specific cleanups may be performed on the sample extracts, including florisil cleanup (Method 3620), Gel Permeation Chromatography (Method 3640), and Sulfur cleanup (Method 3660).

4.3 Contamination by carryover can occur when a low concentration sample is analyzed after a high concentration sample. Co-elution of target analytes with non-targets can occur, resulting in false positives or biased high results.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1. The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.2. There are areas of high voltage in both the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.3 PRIMARY MATERIALS USED

5.3.1. The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	**Hazards**	**Exposure Limit (2)**	**Signs and symptoms of exposure**
Hexane	Flammable Irritant	500 ppm (TWA)	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methanol	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			
TWA – Time Weighted Average			

6.0 EQUIPMENT AND SUPPLIES

6.1 GC/ECD system: The lab utilizes a Hewlett Packard GC 5890 dual ECD system and an Agilent GC 6890 dual micro ECD system

6.1.1. GC column type, and instrument run conditions are posted on the individual GC instruments.

6.1.2. Columns used: Restek RTX Pest 1 and Pest 2 with guard.

6.2 Amber vials. Crimp top seals.

6.3 Disposal pipettes

6.4 Micro syringes- 10µL, 250µL, 500µL, 1000µL. Hamilton 1700 series.

6.5 Volumetric flasks, Class A

6.6 Analytical Balance, capable of weighing ± 0.01 grams.

7.0 REAGENTS AND STANDARDS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision.

7.2 See recipes for standards and QC samples in the Standards Log program.

7.3 Herbicide stock standard solutions must be replaced after 6 months or manufacturer's expiration date whichever is shorter. Calibration solutions must be refrigerated at $\leq 6^{o}$C and protected from light. Intermediate and working standards must be replaced at least every six months, or the stock solutions expiration date, whichever is sooner. Additionally standards are discarded if comparison with check standards indicates a problem.

7.4 ICV standards, NIST traceable:

7.4.1. The Herbicide ICV standard is a second source from the calibration standard.

7.4.2. ICV standard is prepared and stored in the same way as calibration standards.

7.5 Standards used in calibration are the methyl ester forms, as opposed to the methyl acids used for spiking in the extraction process. The methyl esters are corrected for the difference in the molecular weight of the acid herbicide.

7.5.1. Herbicide calibration may be performed using either derivatized herbicide acids or using the methyl ester compounds. Calibrations requiring compliance with SW846 methods are to be derivatized from the free acid form to the methyl ester form in the laboratory.

7.6 Derivitization of Standards

7.6.1. Add 1mL of room temperature standard to a 10mL certified, calibrated or class A concentrator tip.

7.6.2. Add 0.5mL of Ether.

7.6.3. Bring up to 4mL with hexane and mix with a pipet.

7.6.4. Add 0.5mL of Diazomethane and stir until mixture is yellow.

7.6.4.1 Diazomethane should be kept in a refrigerated location.

7.6.5. Let sit 1 hour.

7.6.6. Bring up to 10mL with hexane.

7.6.6. Add solid salicic acid until it reaches the 3 mL mark of the tube.

7.6.7. Let standard sit until bubbling stops and acid settles.

7.6.8. Vial and label standard.

7.6.9. Standards are good for six months.

7.7 Gases for carrier and make-up: Hydrogen carrier, Nitrogen make-up

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 Water samples are unpreserved and stored at 4 ± 2°C.

8.3 Soil samples are refrigerated at 4 ± 2°C.

8.4 Extraction is initiated within 7 days of the sampling date for aqueous samples, 14 days for solid samples.

8.5 For TCLP leachates, the extraction is initiated within seven days of the completion of TCLP leach tumbling, excluding the filtration step.

8.6 Extracts must be refrigerated at <6° and analyzed within 40 days of the start of extraction.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1. A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2. Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3. For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Matrix Spike Duplicate (MSD). In the event that there is insufficient sample to analyze a MS/MSD, an LCS Duplicate (LCSD) is prepared and analyzed.

9.2 **Method Blank (MB)**

9.2.1. A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2. A method blank must be prepared with every sample batch.

9.3 **Laboratory Control Sample (LCS)**

9.3.1. An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2. An LCS must be prepared with every sample batch.

9.4 **Matrix Spike (MS) /Matrix Spike Duplicate (MSD)**

9.4.1. A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Surrogate**

9.5.1. A surrogate is a non-target analyte similar in chemical composition and behavior, which mimics the target analytes during preparation, extraction and analysis.

9.5.2. Surrogate(s) is added to every field sample, method blank, LCS and MS/MSD for analysis at the beginning of the sample preparation process.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1. Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2. Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 External standard calibration is used.

10.2 Herbicide calibration may be performed using either derivatized herbicide acids or using the methyl ester compounds. Calibrations requiring compliance with SW846 methods are to be derivatized from the free acid form to the methyl ester form in the laboratory.

10.2.1. If calibration is performed using herbicide acid calibration standards, the standards have to have been analyzed in the same manner as the samples. TestAmerica St. Louis uses derivative acids for the initial calibration. (Section 7.6)

10.2.2. If calibration is performed using methyl ester standards, then the calculation of concentration must include a correction for the molecular weight of the methyl ester versus the acid herbicide.

10.3 Initial Calibration

10.3.1. Prepare a Herbicide standard at a minimum of five concentration levels. The low level standard should be at or below the reporting limit. The other standards define the working range of the detector.

10.3.2. A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include new columns, any significant changes in instrument operating parameters, and major instrument maintenance (e.g., ECD replacement).

10.3.3. Except in specific instances, it is NOT acceptable to remove points from a calibration curve for the purpose of meeting criteria. Refer to the TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

10.3.4. Sample peak areas are compared to peak areas of the standards. The ratio of the detector response to the amount concentration of analyte in the calibration standard is defined as the response factor (RF) or calibration factor (CF).

10.3.5. SW-846 chromatographic methods allow the use of both linear and non-linear models for the calibration data.

10.3.5.1 The first way is to begin with the simplest approach, the linear model through the origin, and then progress through other options until the calibration acceptance criteria are met. The second way is to use technical knowledge of the detector response to the target compound to choose the calibration model.

10.3.5.2 The option for non-linear calibration may be necessary to address specific instrumental techniques. However, it is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance.

10.3.5.3 For SW846 Method 8000B, the curve must not be forced through zero.

10.3.6. **Linear calibration using the average response factor**

10.3.6.1 The Relative Standard Deviation (RSD) of the calibration points from the curve used must be $\leq$ 20% for each target analyte.

10.3.6.2 If the %RSDs in the initial calibration is > 20%, then calibration using a linear regression may be employed.

10.3.7. **Linear calibration using a least squares regression**

10.3.7.1 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.3.7.2 r (correlation coefficient) must be $\geq$ 0.995 OR r^2 (coefficient of difference) must be $\geq$ 0.990.

10.3.7.3 **Linear calibration using a least squares regression, forcing thru zero**

10.3.7.3.1 Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration. In essence, if the curve is forced through zero, the intercept is set to 0 *before* the regression is calculated, thereby setting the bias to favor the low end of the calibration range by “pivoting” the function around the origin to find the best fit and resulting in one less degree of freedom. It may be appropriate to force the regression though zero for some calibrations.

10.3.7.3.2 Curve must still meet criteria in 10.4.3.1 and 10.4.3.2.

10.3.7.4 **Linear calibration using a least squares regression, weighting of data points**

10.3.7.4.1 In linear, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. For this reason it may preferable to increase the weighting of the lower concentration points. 1/Concentration^2 weighting (often called $1/X^2$ weighting) to improve accuracy at the low end of the curve.

10.3.7.4.2 Curve must still meet criteria in 10.4.3.1 and 10.4.3.2.

10.3.8. **Non-linear calibration**

10.3.8.1 In situations where the analyst knows that the instrument response does not follow a linear model over a sufficiently wide working range, or when the other approaches have not met the acceptance criteria, a non-linear calibration model may be employed.

10.3.8.1.1 It is not EPA's intent to allow non-linear calibration to be used to compensate for detector saturation or to avoid proper instrument maintenance. Thus, non-linear calibrations are not be employed for analytes shown to consistently exhibit linear calibration for the analytes of interest.

10.3.8.2 The intercept of the curve at zero response must be less than + or – the reporting limit for the analyte.

10.3.8.3 r (correlation coefficient) must be ≥ 0.995 OR r^2 (coefficient of difference) must be ≥ 0.990.

10.3.8.4 South Carolina does not allow the use of non-linear regression.

10.4 Initial Calibration Verification (ICV)

10.4.1. An initial calibration verification standard must be a different standard source than the one used for the initial calibration.

10.4.2. An ICV must be performed with every initial calibration.

10.4.3. The ICV performance must be within +/- 30% D criteria.

10.4.3.1 Not meeting this requirement may be indicative of serious system malfunction or inaccuracies in the standards used for the initial calibration curve or ICV standard. Corrective action must be taken (including reanalysis of the ICV, or analysis of a different ICV). Any decision to proceed with analysis of samples when the ICV is out-of-control must be taken with great care and in consultation with the QA department and the laboratory director. Any such action must be documented in an NCM.

10.5 Continuing Calibration Verification (CCV)

10.5.1. A CCV may be the same source or second source as the calibration.

10.5.2. Analyte response factors must be verified at the beginning of each analytical run (by either an ICV or a CCV), after every 10 samples and at the end of the analysis run through the analysis of a mid-level calibration standard.

10.5.3. **SW846 8000C**: The CCV performance must be with +/- 20% D criteria.

10.5.3.1 If a CCV has failed and the analyst can document the reason for failure (e.g. broken vial, carryover from the previous sample etc.) then a second CCV may be analyzed without any adjustments to the instrument. If this CCV meets criteria then sample analysis may continue; however the preceding samples must be reanalyzed. If this second CCV does not meet criteria, the analysis run is terminated. Instrument maintenance is performed and the instrument may require re-calibration (i.e. initial calibration)

10.5.3.2 **SW846 8000B**: The CCV performance must be with +/- 15% D criteria

10.6 Retention Time (RT) Windows

10.6.1. Retention Time (RT) windows must be determined for all analytes.

10.6.1.1 Establishing RT windows:

10.6.1.1.1 Make an injection of all analytes of interest each day over a three day period. Calculate the mean and standard deviation of the three retention times for each analyte.

10.6.1.1.2 The width of the retention time window for each analyte, surrogate, and major constituent in multi-component analytes is defined as ± 3 times the standard deviation of the mean absolute retention time established during the 72-hour period or 0.03 minutes, whichever is greater. Historically, calibrations RT windows have not been greater than 0.03 minutes. Windows larger than 0.03 minutes are indicative of equipment issues.

10.6.1.1.3 The center of the retention time window is the retention time from the CCV performed at the beginning of the analytical run. For samples run during the same shift as the initial calibration, use the retention time of the mid-point standard from the initial calibration. Some clients may have specific requirements regarding the updating of RT windows. Review the Client Requirement Memo for instructions.

10.6.1.1.4 A new retention time window is established annually or each time a new column is installed.

10.6.1.1.4.1 Until these standards have been run on the new column, the retention time windows from the old column may be used, updated with the retention times from the new initial calibration.

10.6.2. Retention Time Criteria

10.6.2.1 The retention times of all compounds in each continuing calibration must be within the retention time windows established.

11.0 PROCEDURE

11.1 Allow standards, samples and sample extracts to reach ambient temperature before analysis.

11.2 All analysis conditions and injection volumes for samples must be the same as for the calibration standards.

11.3 Sample Introduction

11.3.1. Herbicide analytes are introduced by direct injection of the extract. Samples, standards, and QC must be introduced using the same procedure.

11.4 Perform all qualitative and quantitative measurements. When the standards and extracts are not being used, refrigerate them at 4 $\pm$ 2°C, protected from light in screw cap vials equipped with unpierced Teflon lined septa.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 External Standard Calculations

12.2.1 See Target software for calculations.

12.3 Manual Integrations

12.3.1 Identified compounds are reviewed for proper integration. Manual integrations are performed if necessary and are documented by the analyst or automatically by the data system. See TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices. Manual integrations are denoted with a “M” flag on the Target quantitation report.

12.4 Dilutions

12.4.1 If the concentrations of any analytes exceed the working range as defined by the calibration standards, then the sample must be diluted and reanalyzed.

12.4.2 A dilution should target the most concentrated analyte in the upper half (over 50% of the high level standard) of the client specific project requirements.

12.5 Carryover

12.5.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

12.5.1.1 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

12.5.1.2 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, carryover may have occurred.

12.5.1.2.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

12.5.1.3 If the chromatographic profile resembles the previous sample, the results are questionable.

12.5.1.3.1 This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

12.6 Dual column quantitation

12.6.1 As per 8000C, report the lower result of the two columns, unless the Client SOW requires that the higher result be reported. See Client Requirements Sheet for determination.

12.6.1.1 For non-detect (ND) results, report from the A channel, unless there is evidence of chromatographic interference in the A channel's performance.

12.6.1.2 If one result is significantly higher (e.g., >40%), check the chromatograms to see if an obviously overlapping peak is causing an erroneously high result. If no overlapping peaks are noted, examine the baseline parameters established by the instrument data system (or operator) during peak integration. If no anomalies are noted, review the chromatographic conditions. If there is no evidence of chromatographic problems, report the lower result. The data user should be advised of the disparity between the results on the two columns.

12.6.1.3 Use the higher result if there is obvious chromatographic interference on the column with the lower result.

12.6.1.4 If the CCV performance on one of the two channels is outside acceptance criteria due to confirmed matrix interference, report sample data from the column with acceptable performance, irrespective of it being the higher or lower result.

12.6.1.4.1 See Clouseau for data assessment and narration.

12.6.2 The QC should be reported from the column that reflects the column used for the majority of the samples associated with the QC.

12.6.3 The surrogate should be reported from the column that reflects the column used for the majority of the analytes associated with a sample.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: STL-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.1 Method Blank

13.1.1 Acceptance Criteria:

13.1.1.1 No target analytes may be present in the method blank above the reporting limit.

13.1.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target analytes present above ½ RL), will be noted on the client requirements sheet.

13.1.2 Corrective Action for Method Blanks not meeting acceptance criteria:

13.1.2.1 Method Blank Contamination – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.2 Laboratory Control Sample (LCS)

13.2.1 Acceptance Criteria:

13.2.1.1 All control analytes should be within established control limits for accuracy (%Recovery) and precision (RPD).

13.2.1.1.1 For long analyte spike list, marginal exceedances (ME) are allowed as follows:

13.2.1.1.2 < 11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

13.2.1.1.3 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit.

13.2.1.1.4 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit.

13.2.1.1.5 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit.

13.2.1.1.6 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit.

13.2.1.1.7 > 90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit.

13.2.1.1.8 No LCS recoveries may be outside the Marginal Exceedance limit.

13.2.1.1.9 Marginal exceedances must be random. If the same LCS analyte exceeds the control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken.

13.2.2 Marginal Exceedance is not recognized by the state of South Carolina. LCS recovery must meet the criteria of 70 – 130% for all compounds.

13.2.3 The LCS should have acceptable surrogate recoveries.

13.2.4 Corrective Action for LCS not meeting acceptance criteria:

13.2.4.1 LCS Spike Recovery excursion (high) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.2.4.2 LCS Spike Recovery excursion (low) – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.2.4.3 RPD Duplicate excursion – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

13.3.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).

13.3.2 Corrective Action for MS/MSD not meeting acceptance criteria:

13.3.2.1 MS/MSD Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.4 Surrogate

13.4.1 All Surrogates should be within established control limits for accuracy (%Recovery).

13.4.2 Corrective Action for Surrogate not meeting acceptance criteria:

13.4.2.1 Surrogate Spike Rec. excursion may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation reanalysis is required.

13.5 Sample result evaluation

13.5.1 Dilutions

13.5.1.1 If the response for any compound exceeds the working range of the analytical system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range.

13.5.1.2 Dilution: Sample– See Clouseau NCM for corrective action.

13.5.1.3 Dilution: Surrogate(s) diluted out– See Clouseau NCM for corrective action.

13.5.1.4 Dilution: Surrogates(s) and/or Spike(s) diluted out– See Clouseau NCM for corrective action.

13.5.2 Carryover

13.5.2.1 When a sample has a high response for a compound, there is a real possibility that some of the sample may carry over into the sample analyzed immediately afterward.

13.5.2.2 If a sample analyzed after a sample with high concentrations has negative results, carryover did not occur.

13.5.2.3 If a sample analyzed after a sample with high concentrations has positive results for the same analytes, or if the chromatographic profile resembles the previous sample, the results are questionable. This sample must be reanalyzed under conditions in which carryover can be confirmed to not have occurred.

13.6 Insufficient Sample

13.6.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

14.5 An annual MDL study is required for the State of South Carolina. See SOP ST-QA-0016 for determination of MDLs.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA Methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in QAM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica St. Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION PREVENTION

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Solvent waste generated. Solvent waste must be accumulated in the appropriate waste accumulation container, labeled as Drum Type "D".

16.2.1.2 Vials containing sample extract will be accumulated in the appropriate waste accumulation container, labeled as Drum Type "C".

17.0 REFERENCES

17.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 8000B, 8000C.

17.2 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 8151A

17.3 TestAmerica Quality Assurance Manual (QAM), current revision

17.4 TestAmerica Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions.

17.5 TestAmerica Policy CA-Q-S-001, Acceptable Manual Integration Practices

17.6 TestAmerica Policy CA-T-P-0002, Selection of Calibration Points

17.7 Associated SOPs

17.7.1 ST-OP-0001, Labware Preparation for Organic Analysis
17.7.2 ST-OP-0007, Extraction and Cleanup of Herbicides from Water and Soils, Based on SW-846 8151A
17.7.3 ST-PM-0002, Sample Receipt and Chain of Custody
17.7.4 ST-QA-0002, Standard and Reagent Preparation
17.7.5 ST-QA-0005, "Calibration and Verification Procedure for Thermometers, Balances, Weights and Pipettes."
17.7.6 ST-QA-0014, Evaluation of Analytical Accuracy and Precision Through the Use of Control Charts
17.7.7 ST-QA-0016, IDL/MDL Determination
17.7.8 ST-QA-0036, Non-conformance Memorandum (NCM) Process

18.0 MODIFICATIONS, CLARIFICATIONS TO THE REFERENCE METHOD

18.1 Chapter 1 of SW-846 states that the method blank should not contain any analyte of interest at or above the Method Detection Limit. This SOP states that the Method Blank must not contain any analyte of interest at or above the reporting limit. Common lab contaminants are allowed to be up to 5 times the reporting limit in the blank following consultation with the client.

18.2 SW846 requires that new retention time windows be established if a GC column has been shortened during maintenance. Given the matrices of the sample the laboratory receives, and the number of times the GC column may require clipping, TestAmerica St. Louis does not perform a

RT study after clipping a column. RT studies done by the laboratory show that, historically, RT windows have not been greater than the method allowed 0.03 minutes. The lab defaults to a 0.03 minute RT window as allowed by the method.

19.0 CHANGES TO PREVIOUS REVISION

19.1 Columns used added to Section 6.
19.2 Section 7.5 updated to include derivatization of free acids for SW846 compliance
19.3 Updated Section 10.3.8 to include South Carolina requirement that non-linear calibration is not to be used.
19.4 Updated Section 13.2 to disallow marginal exceedance for South Carolina LCS and added South Carolina LCS recovery limits.
19.5 Added South Carolina annual MDL requirement to Section 14.
19.6 Rev 10:
 19.6.1 Annual Review, No Changes.
19.7 Rev 11:
 19.7.1 Added section 7.6, instructions for the derivitization of standards.
 19.7.2 Added statement regarding the use of derivitized acids for initial calibrations to section 10.2.1.
19.8 Rev 12:
 19.8.1 Updated requirements for performing RT window studies.

TAL Reference Data Summary

Structured Analysis Code: A-5C-QS-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	46	140	20	C	Y	100	ug/L	52	150	20
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	42	140	20	C	Y	10	ug/L	45	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	50	140	0	X	Y	160	ug/L	56	147	0

TAL Reference Data Summary

Structured Analysis Code: A-3A-QS-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312) -> LIQ/LIQ, SEP FUNNEL - Acid -> DERIVA
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	46	140	20	C	Y	100	ug/L	52	150	20
1195	Dinoseb	6	ug/L	2.69	ug/L	20100309														
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	42	140	20	C	Y	10	ug/L	45	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	50	140	0	X	Y	160	ug/L	56	147	0

TAL Reference Data Summary

Structured Analysis Code: **A-KB-QS-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP (1311) -> Low Level L/L SEPF -> Acid -> Derivatizatic
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	8.0	ug/L	1.532	ug/L	20030508	C	Y	100	ug/L	46	140	20	C	Y	100	ug/L	52	150	20
2291	2,4,5-TP (Silvex)	2.0	ug/L	0.1476	ug/L	20030508	C	Y	10	ug/L	42	140	20	C	Y	10	ug/L	45	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	50	140	0	X	Y	160	ug/L	56	147	0

TAL Reference Data Summary

Structured Analysis Code: A-3H-QS-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
690	2,4-D	4000	ug/L	1975	ug/L	20100228	C	Y	100	ug/L	46	140	20	C	Y	100	ug/L	52	150	20
2291	2,4,5-TP (Silvex)	1000	ug/L	298	ug/L	20100228	C	Y	10	ug/L	42	140	20	C	Y	10	ug/L	45	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	50	140	0	X	Y	160	ug/L	56	147	0

TAL Reference Data Summary

Structured Analysis Code: A-0V-QS-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION -> DERIVATIZATION
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6048							Spike List 6049						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	80	ug/kg	22.0	ug/kg	20110428	C	Y	200	ug/kg	68	140	20	C	Y	200	ug/kg	29	150	30
753	Dalapon	40	ug/kg	38.5	ug/kg	20110421	C	Y	500	ug/kg	25	121	20	C	Y	500	ug/kg	14	129	30
766	2,4-DB	80	ug/kg	43.8	ug/kg	20110428	C	Y	200	ug/kg	54	140	20	C	Y	200	ug/kg	35	150	30
897	Dicamba	40	ug/kg	3.93	ug/kg	20110428	C	Y	20	ug/kg	62	140	20	C	Y	20	ug/kg	33	150	30
975	Dichlorprop	80	ug/kg	23.4	ug/kg	20110428	C	Y	200	ug/kg	59	140	20	C	Y	200	ug/kg	27	150	30
1195	Dinoseb	25	ug/kg	13.6	ug/kg	20100228	C	Y	100	ug/kg	10	108	20	C	Y	100	ug/kg	10	108	30
1661	MCPA	8000	ug/kg	3071	ug/kg	20110428	C	Y			48	140	20	C	Y			43	150	30
1680	MCPP	8000	ug/kg	4796	ug/kg	20110428	C	Y			45	140	20	C	Y			39	150	30
2001	4-Nitrophenol	200	ug/kg	100	ug/kg	20100108	C	Y			70	130	20	C	Y			40	141	30
2118	Pentachlorophenol	100	ug/kg	8.27	ug/kg	20100108	C	Y			70	130	20	C	Y			50	150	30
2291	2,4,5-TP (Silvex)	20	ug/kg	3.28	ug/kg	20110428	C	Y	20.0	ug/kg	51	140	20	C	Y	20.0	ug/kg	50	150	30
2384	2,4,5-T	20	ug/kg	7.93	ug/kg	20110421	C	Y	20.0	ug/kg	57	140	20	C	Y	20.0	ug/kg	36	150	30
2924	2,4-Dichlorophenylacetic acid						X	Y	320	ug/kg	36	140	0	X	Y	320	ug/kg	50	150	0

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TAL Reference Data Summary

Structured Analysis Code: A-14-QS-01-06
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6048							Spike List 6049						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	4000	ug/kg	1975	ug/kg	20100228	C	Y	200	ug/kg	68	140	20	C	Y	200	ug/kg	29	150	30
753	Dalapon	4000	ug/kg	2916	ug/kg	20100228	C	Y	500	ug/kg	25	121	20	C	Y	500	ug/kg	14	129	30
766	2,4-DB	4000	ug/kg	2112	ug/kg	20100228	C	Y	200	ug/kg	54	140	20	C	Y	200	ug/kg	35	150	30
897	Dicamba	2000	ug/kg	399	ug/kg	20100228	C	Y	20	ug/kg	62	140	20	C	Y	20	ug/kg	33	150	30
975	Dichlorprop	4000	ug/kg	2014	ug/kg	20100228	C	Y	200	ug/kg	59	140	20	C	Y	200	ug/kg	27	150	30
1195	Dinoseb	600	ug/kg	269	ug/kg	20100309	C	Y	100	ug/kg	10	108	20	C	Y	100	ug/kg	10	108	30
1661	MCPA	400000	ug/kg	192000	ug/kg	20100228	C	Y			48	140	20	C	Y			43	150	30
1680	MCPP	400000	ug/kg	138000	ug/kg	20100228	C	Y			45	140	20	C	Y			39	150	30
2291	2,4,5-TP (Silvex)	1000	ug/kg	298	ug/kg	20100228	C	Y	20.0	ug/kg	51	140	20	C	Y	20.0	ug/kg	50	150	30
2384	2,4,5-T	1000	ug/kg	179	ug/kg	20100228	C	Y	20.0	ug/kg	57	140	20	C	Y	20.0	ug/kg	36	150	30
2924	2,4-Dichlorophenylacetic acid						X	Y	320	ug/kg	36	140	0	X	Y	320	ug/kg	50	150	0

TAL Reference Data Summary

Structured Analysis Code: I-0A-QS-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL - Acid -> DERIVATIZATION
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6048							Spike List 6049						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	4.0	ug/L	1.80	ug/L	20110406	C	Y	10.0	ug/L	46	140	20	C	Y	10.0	ug/L	50	150	20
753	Dalapon	4.0	ug/L	0.939	ug/L	20110406	C	Y	25	ug/L	30	121	20	C	Y	25	ug/L	50	129	20
766	2,4-DB	4.0	ug/L	2.42	ug/L	20110411	C	Y	10.0	ug/L	46	140	20	C	Y	10.0	ug/L	50	150	20
897	Dicamba	2.0	ug/L	0.290	ug/L	20110406	C	Y	1	ug/L	55	140	20	C	Y	1	ug/L	50	150	20
975	Dichlorprop	4.0	ug/L	1.18	ug/L	20110406	C	Y	10	ug/L	45	140	20	C	Y	10	ug/L	50	150	20
1195	Dinoseb	1.0	ug/L	0.632	ug/L	20110406	C	Y	5	ug/L	23	140	20	C	Y	5	ug/L	50	150	20
1661	MCPA	400	ug/L	121	ug/L	20110406	C	Y			40	140	20	C	Y			50	150	20
1680	MCPP	400	ug/L	142	ug/L	20110406	C	Y			40	140	20	C	Y			50	150	20
2001	4-Nitrophenol	20	ug/L	10	ug/L	20100118	C	Y			70	130	20	C	Y			50	150	20
2118	Pentachlorophenol	1	ug/L	0.310	ug/L	20100106	C	Y			70	130	20	C	Y			50	150	20
2291	2,4,5-TP (Silvex)	1.0	ug/L	0.148	ug/L	20110411	C	Y	1.0	ug/L	44	140	20	C	Y	1.0	ug/L	50	150	20
2384	2,4,5-T	1.0	ug/L	0.137	ug/L	20110406	C	Y	1.0	ug/L	52	140	20	C	Y	1.0	ug/L	50	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	16.0	ug/L	48	140	0	X	Y	16.0	ug/L	50	150	0

TAL Reference Data Summary

Structured Analysis Code: I-14-QS-01-06
Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6048							Spike List 6049						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	4000	ug/L	1975	ug/L	20100228	C	Y	10.0	ug/L	46	140	20	C	Y	10.0	ug/L	50	150	20
753	Dalapon	10000	ug/L	2916	ug/L	20100228	C	Y	25	ug/L	30	121	20	C	Y	25	ug/L	50	129	20
766	2,4-DB	4000	ug/L	2112	ug/L	20100228	C	Y	10.0	ug/L	46	140	20	C	Y	10.0	ug/L	50	150	20
897	Dicamba	2000	ug/L	399	ug/L	20100228	C	Y	1	ug/L	55	140	20	C	Y	1	ug/L	50	150	20
975	Dichlorprop	4000	ug/L	2014	ug/L	20100228	C	Y	10	ug/L	45	140	20	C	Y	10	ug/L	50	150	20
1195	Dinoseb	1000	ug/L	269	ug/L	20100309	C	Y	5	ug/L	23	140	20	C	Y	5	ug/L	50	150	20
1661	MCPA	400000	ug/L	192000	ug/L	20100228	C	Y			40	140	20	C	Y			50	150	20
1680	MCPP	400000	ug/L	138000	ug/L	20100228	C	Y			40	140	20	C	Y			50	150	20
2291	2,4,5-TP (Silvex)	1000	ug/L	298	ug/L	20100228	C	Y	1.0	ug/L	44	140	20	C	Y	1.0	ug/L	50	150	20
2384	2,4,5-T	1000	ug/L	179	ug/L	20100228	C	Y	1.0	ug/L	52	140	20	C	Y	1.0	ug/L	50	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	16.0	ug/L	48	140	0	X	Y	16.0	ug/L	50	150	0

TAL Reference Data Summary

Structured Analysis Code: **I-64-QS-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> LIQ/LIQ, SEP FUNNEL - Acid -> DERIVATIZ
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	70	120	20	C	Y	100	ug/L	65	122	20
2118	Pentachlorophenol	1	ug/L			0	C	Y			40	140	20	C	Y			50	150	20
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	65	135	20	C	Y	10	ug/L	64	139	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	75	120	0	X	Y	160	ug/L	71	124	0

TAL Reference Data Summary

Structured Analysis Code: **I-3H-QS-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	**Compound**	**RL**	**Units**	**MDL**	**Units**	**Run Date**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**	**T**	**A**	**Amt**	**Units**	**LCL**	**UCL**	**RPD**
690	2,4-D	4000	ug/L	1975	ug/L	20100228	C	Y	100	ug/L	70	120	20	C	Y	100	ug/L	65	122	20
2291	2,4,5-TP (Silvex)	1000	ug/L	298	ug/L	20100228	C	Y	10	ug/L	65	135	20	C	Y	.10	ug/L	64	139	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	75	120	0	X	Y	160	ug/L	71	124	0

TAL Reference Data Summary

Structured Analysis Code: I-5C-QS-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	70	120	20	C	Y	100	ug/L	65	122	20
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	65	135	20	C	Y	10	ug/L	64	139	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	75	120	0	X	Y	160	ug/L	71	124	0

TAL Reference Data Summary

Structured Analysis Code: **I-3A-QS-01-06**
Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312) -> LIQ/LIQ, SEP FUNNEL - Acid -> DERIVA
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6050								Spike List 6051							
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	70	120	20	C	Y	100	ug/L	65	122	20
1195	Dinoseb	10.0	ug/L	2.69	ug/L	20100309														
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	65	135	20	C	Y	10	ug/L	64	139	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	75	120	0	X	Y	160	ug/L	71	124	0

TAL Reference Data Summary

Structured Analysis Code: **A-5C-QS-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	46	140	20	C	Y	100	ug/L	52	150	20
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	42	140	20	C	Y	10	ug/L	45	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	50	140	0	X	Y	160	ug/L	56	147	0

TAL Reference Data Summary

Structured Analysis Code: **A-3A-QS-01-06**
Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312) -> LIQ/LIQ, SEP FUNNEL - Acid -> DERIVA
Method: Herbicides (8151A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6050							Spike List 6051						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
690	2,4-D	40	ug/L	19.8	ug/L	20100228	C	Y	100	ug/L	46	140	20	C	Y	100	ug/L	52	150	20
1195	Dinoseb	6	ug/L	2.69	ug/L	20100309														
2291	2,4,5-TP (Silvex)	10	ug/L	2.98	ug/L	20100228	C	Y	10	ug/L	42	140	20	C	Y	10	ug/L	45	150	20
2924	2,4-Dichlorophenylacetic acid						X	Y	160	ug/L	50	140	0	X	Y	160	ug/L	56	147	0

APPENDIX B

EXAMPLE OF CHAIN-OF-CUSTODY, SAMPLE LABEL, AND CUSTODY SEAL
(on CD only)

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TETRA TECH
1230 Columbia Street, Suite 500
San Diego, CA 92101 (619) 234-8696

NUMBER 21700

CHAIN-OF-CUSTODY RECORD

PROJECT NAME	PURCHASE ORDER NO.	ANALYSES REQUIRED	LABORATORY NAME	Project Information Section Do not submit to Laboratory
PROJECT LOCATION	PROJECT NO.			
SAMPLER NAME	AIRBILL NUMBER		LABORATORY ID (FOR LABORATORY)	
PROJECT CONTACT	PROJECT CONTACT PHONE NUMBER			

SAMPLE ID	DATE COLLECTED	TIME COLLECTED	NO. OF CONTAINER	LEVEL 3	LEVEL 4	TYPE	TAT										COMMENTS	LOCATION	DEPTH START	DEPTH END	QC

RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)
COMPANY	TIME	COMPANY
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)
COMPANY	TIME	COMPANY
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)
COMPANY	TIME	COMPANY

LABORATORY INSTRUCTIONS/COMMENTS

COMPOSITE DESCRIPTION

SAMPLE CONDITION UPON RECEIPT (FOR LABORATORY)

TEMPERATURE: ______ SAMPLE CONDITION: ☐ INTACT ☐ BROKEN

COOLER SEAL: ☐ INTACT ☐ BROKEN

SAMPLING COMMENT:

White - Laboratory; Pink - Laboratory; Canary - Project File; Manila - Data Management

SAMPLE LABEL (EXAMPLE)

SAMPLE NO.:____
PROJECT:____
DATE:_____/_____/_____ **TIME:**_________________**HRS**___________
MEDIUM: WATER______ **SOIL**______ **SEDIMENT**_______________
OTHER_____________________________________**(Specify)**
TYPE: GRAB______ **COMPOSITE**______ **OTHER**________________
PRESERVATION:____
ANALYSIS:____
SAMPLED BY:____
REMARKS:____
____

CUSTODY SEAL (EXAMPLE)

CUSTODY SEAL

Person Collecting Sample:____________________________ Sample No.:______
(Signature)
Date Collected:_______________ Time____________

APPENDIX C

DATA VALIDATION CHECKLISTS
(on CD only)

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DATA QUALIFICATIONS FOR GC/MS ANALYSES

HOLDING TIMES

a. > holding time b. > 2X holding time c. reanalysis or reextracted sample d. Encore samples (VOA) - no preservation , > 2 days < 14 days - preserved with methanol or sodium bisulfate, >14 days < 28days - frozen, > 14 days < 28days	a. J/UJ/P b. J/R/P c. change P to A same as a & b d. J/UJ/P aromatics, > 14 days J/R/P J/UJ/P, > 28 days J/R/P J/UJ/P, > 28 days J/R/P

SAMPLE CONDITION

a. cooler temperature >6°C but <10.9°C b. cooler temperature 11°C to 15°C c. cooler temperature >15°C d. Air bubbles present > 1/4 inch or headspace	a. Note as text in DVR b. J/UJ/A c. J/R/A (VOA), J/UJ/A (SVOA) or professional judgement d. J/UJ/A

GC/MS INSTRUMENT PERFORMANCE CHECK

a. ion abundance criteria exceeded b. > 12 hours after performance check c. mass assignment error (i.e. m/z 96 instead of m/z 95 for VOA)	a. None/P for insignificant ions, others professional judgement b. None/P by professional judgement c. R/P all compounds

INITIAL CALIBRATION

a. > 30.0% RSD - **CLP VOA**:up to 2 *'s out - **SW-846 VOA**:none out CCC's: <30% RSD - **CLP SVOA**:up to 4 *'s out - **SW-846 SVOA**:none out CCC's: <30% RSD b. r^2< 0.990 CCF c. < 0.05 RRF, CLP - **CLP VOA**:up to 2 *'s out - **CLP SVOA**:up to 4 *'s out d. < 0.05 RRF or 0.01, SW-846 - **SW-846 VOA**:none out SPCC's: >0.300 and >0.100 RRFs - **SW-846 SVOA**:none out SPCC's >0.050 RRF e. recalculated value > 10% D - both values in - recalculation out - original out,recalculation in - both values out f. no ICAL g. minimum 5 pts not performed	a. J/UJ/A - **CLP VOA**: >2 *'s out change A to P - **SW-846 VOA**: any CCC's >30% RSD change A to P - **CLP SVOA**: >4 *'s out change A to P - **SW-846 SVOA**: any CCC's >30% RSD change A to P b. J/UJ/A c. J/R/A - **CLP VOA**: >2 *'s out change A to P - **CLP SVOA**: >4 *'s out change A to P d. J/UJ/A - **SW-846 VOA**: any SPCC's <0.300 and <0.100 but >0.050 None/P any SPCC's <0.050 change A to P - **SW-846 SVOA**: SPCC's <0.050 change A to P e. professional judgement - no qualification - None/P,qualify per a-b - None/P - None/P,qualify per a-b f. R/P g. none/P

CONTINUING CALIBRATION

a. > 25.0% D - **CLP VOA**:up to 2 *'s out - **SW-846 VOA**:none out CCC's: <20% D - **CLP SVOA**:up to 4 *'s out: - **SW-846 SVOA**:none out CCC's: <20% D b. < 0.05 RRF, CLP - **CLP VOA**:up to 2 *'s out - **CLP SVOA**:up to 4 *'s out c. < 0.05 RRF, SW-846 - **SW-846 VOA**:none out SPCC's: >0.300 and >0.100 RRFs - **SW-846 SVOA**:none out SPCC's >0.050 RRF d. recalculated value > 10% D - both values in - recalculation out - original out,recalculation in - both values out e. %D < -50% or no CCAL	a. J/UJ/A - **CLP VOA**: >2 *'s out change A to P - **SW-846 VOA**: any CCC's >20% but <25% D None/ P, >25% change A to P - **CLP SVOA**: >4 *'s out change A to P - **SW-846 SVOA**: any CCC's >20% D change A to P b. J/R/A - **CLP VOA**: >2 *'s out change A to P - **CLP SVOA**: >4 *'s out change A to P c. J/UJ/A - **SW-846 VOA**: any SPCC's <0.300 and <0.100 but >0.050 None/P any SPCC's <0.050 change A to P - **SW-846 SVOA**: any SPCC's <0.050 change A to P d. professional judgement - no qualification - None/P,qualify per a-b - None/P - None/P,qualify per a-b e. J/R/P

BLANKS

a. common contaminants ≤ 10X and < CRQL b. common contaminants ≤ 10X and ≥ CRQL c. other contaminants ≤ 5X and < CRQL d. other contaminants ≤ 5X and ≥ CRQL e. common contaminants > 10X and other contaminants > 5X f. no method blank	a. raise to CRQL, U/A compound b. U/A compound c. raise to CRQL, U/A compound d. U/A compound e. no qualification f. R/P all detects

DATA QUALIFICATIONS FOR GC/MS ANALYSES

SURROGATE SPIKES

a. %Rec > upper limit (UL)	a. J/A all detects, SVOA:one out no qualification
b. %Rec > 10% and < lower limit (LL)	b. J/UJ/A all compounds, SVOA:one out no qualification
c. %Rec < 10%	c. J/R/A
d. method blank exceedance	d. change A to P
- %Rec = 0 qualify associated samples	-NJ all detects/A
e. confirmation of exceedance including blank	e. qualify per a-c
f. no confirmation performed when required	f. change A to P
g. exceedance at a ≥ 10X dilution (SVOA; medium level soil VOA)	g. no qualification (if VOA surrogates added during extraction)
h. exceedance at a ≥ 5X to 10X dilution (SVOA; medium level soil VOA)	h. J/UJ or Jdets/A or no qual (professional judgement)
i. MS/MSD and/or LCS out	i. no qualification

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

a. %Rec > UL	a. J/A detects
b. %Rec < LL	b. J/UJ/A
c. %Rec = 0	c. J/R/A
d. RPD > UL	d. J/UJ/A compound
e. no MS/MSD (client specified)	e. no qualification
f. no MS/MSD (method/SOW)	f. None/P
g. > 20 samples associated with MS/MSD(client specified)	g. no qualification
h. > 20 samples associated with MS/MSD(method/SOW)	h. None/P
i. concentration > 4X the spike amount	i. no qualification
j. exceedance at a ≥ 10X dilution	j. J/UJ/A RPD or no qual (professional judgement)
k. exceedance at a ≥ 5X to 10X dilution	k. J/UJ/A RPD, no qualification for %R
l. recalculated value > 10% D	l. note in report
- both values in	- no qualification
- recalculation out	- None/P, qualify per a-d
- original out,recalculation in	- None/P
- both values out	- None/P, qualify per a-d

LABORATORY CONTROL SAMPLES

a. %Rec > UL	a. J/P detects
b. %Rec < LL	b. J/UJ/P
c. %Rec < 10	c. J/R/P
d. RPD > UL	d. J/UJ/P
e. no LCS, MS/MSD out non-CLP	e. None/P LCS, J/UJ/A MS/MSD
f. no LCS, no MS/MSD, with surrogates non-CLP	f. J/UJ/P LCS, None/P or No qual MS/MSD
g. no LCS, no MS/MSD, no surrogates non-CLP	g. J/R/P LCS, None/P or No qual MS/MSD,No qual or J/R/P surrogates
h. LCS/LCSD (averaged)	h. qualify as normal based on average
i. *no LCS for low concentration level SOW*	i. *None/P (for low concentration level SOW)*

INTERNAL STANDARDS

a. < -50% area	a. J/UJ/A associated compounds
b. > +100% area	b. J/A detects associated compounds
c. < -10% area	c. J/R/A associated compounds
d. > + 30 seconds	d. NJ/ R/A associated compounds
e. confirmation of exceedance	e. qualify per a-d
f. no confirmation performed	f. change A to P
g. MS/MSD and/or LCS out	g. no qualification

TARGET COMPOUND IDENTIFICATION

a. > ± 0.06 RRT units	a. NJ/P detects or J/R/P all non-detects by professional judgement
b. missing spectra	b. R/P detects
c. spectra doesn't match	c. R/A detects
d. spectra doesn't match due to interference	d. NJ/A detects

COMPOUND QUANTITATION AND REPORTED CRQLs

a. 1uL injection instead of 2 uL as required for CLP SVOA	a. None/P
b. recalculated value > 10% D	b. J/P all detects
c. non-detect recalculated as detect and vice versa	c. R/P compound
d. compound above calibration range	d. J/A detects
e. no dilution for compound above calibration range	d. J/P detects
f. no adjustment of CRQL for % moisture	f. Note as text in DVR

DATA QUALIFICATIONS FOR GC/MS ANALYSES

TENTATIVELY IDENTIFIED COMPOUNDS (TICs)	
a. spectra doesn't match library b. required amount of TIC's not searched, TICs not reported as required by CLP c. no adjustment of CRQL for % moisture	a. R/P detects b. None/P c. Note as text in DVR
FIELD DUPLICATES	
a. RPD > UL	a. No qualification
SYSTEM PERFORMANCE	
a. professional judgement	
OVERALL ASSESSMENT OF DATA	
a. professional judgement	

DATA QUALIFICATIONS FOR GC ANALYSES

HOLDING TIMES

a. > holding time	a. J/UJ/P
b. > 2X holding time (gasoline, VOA only)	b. J/R/P
c. reanalysis or reextracted sample	c. change P to A same as a & b
d. Encore samples (gasoline, VOA)	d.
- no preservation , > 2 days < 14 days	J/UJ/P, > 14 days J/R/P
- preserved with methanol or sodium bisulfate, >14 days < 28days	J/UJ/P, > 28 days J/R/P
- frozen, > 7 days <14 days	J/UJ/P, > 14 days J/R/P

SAMPLE CONDITION

a. cooler temperature >6°C but <10.9°C	a. Note as text in DVR
b. cooler temperature 11°C to 15°C	b. J/UJ/A
c. cooler temperature >15°C	c. J/R/A (gas,VOA), J/UJ/A (SVOA) or professional judgement
d. Air bubbles present < 1/4 inch (gas,VOA)	d. Note as text in DVR
e. Air bubbles present > 1/4 inch or headspace (gas,VOA)	e. J/UJ/P

INITIAL CALIBRATION

a. > 20.0% RSD	a. J/UJ/A
b. RT outside RT windows	b. NJ/P detects or J/R/P
c. r2 < 0.990	c. J/UJ/A
d. recalculated value > 10% D	d. professional judgement
- both values in	- no qualification
- recalculation out	- None/P,qualify per a-b
- original out,recalculation in	- None/P
- both values out	- None/P,qualify per a-b
e. no ICAL	e. R/P
f. minimum 5 pts not performed	f. none/P

CONTINUING CALIBRATION

a. > 20.0% D	a. J/UJ/A
b. Frequency (one every 10 samples)	b. text
c. RT outside RT windows	c. NJ/P detects or J/R/P
d. recalculated value > 10% D	d. professional judgement
- both values in	- no qualification
- recalculation out	- None/P,qualify per a-b
- original out,recalculation in	- None/P
- both values out	- None/P,qualify per a-b
e. no CCAL	e. J/UJ/P

BLANKS

a. contaminants ≤ 5X and > RL	a. U/A leave as reported
b. contaminants ≤ 5X and < RL	b. U/A raise to RL
c. contaminants > 5X blank	c. no qualification
d. no method blank	d. R/P all detects

SURROGATE SPIKES

a. %Rec > upper limit (UL)	a. J/A all detects
b. %Rec > 10% and < lower limit (LL)	b. J/UJ/A all compounds
c. %Rec < 10%	c. J/R/A
d. method blank exceedance	d. change A to P
- %Rec = 0 qualify associated samples	-NJ all detects/A
e. confirmation of exceedance including blank	e. qualify per a-c
f. no confirmation performed when required	f. change A to P
g. exceedance at ≥ 10X dilution (extractables only)	g. no qualification

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

a. %Rec > UL	a. J/A detects
b. %Rec < LL	b. J/UJ/A
c. %Rec = 0	c. J/R/A
d. RPD > UL	d. J/UJ/A compound
e. no MS/MSD (client specified)	e. no qualification
f. no MS/MSD (method/SOW)	f. None/P
g. > 20 samples associated with MS/MSD(client specified)	g. no qualification
h. > 20 samples associated with MS/MSD(method/SOW)	h. None/P
i. concentration > 4X the spike amount	i. no qualification
j. exceedance at a ≥ 10X dilution	j. no qualification
k. recalculated value > 10% D	k. note in report
- both values in	- no qualification

DATA QUALIFICATIONS FOR GC ANALYSES

- recalculation out - original out,recalculation in - both values out	- None/P, qualify per a-d - None/P - None/P, qualify per a-d

LABORATORY CONTROL SAMPLES

a. %Rec > UL b. %Rec < LL c. %Rec < 10 d. RPD > UL e. no LCS, MS/MSD out non-CLP f. no LCS, no MS/MSD, with surrogates non-CLP g. no LCS, no MS/MSD, no surrogates non-CLP h. LCS/LCSD (averaged) i. *no LCS for low concentration level SOW*	a. J/P detects b. J/UJ/P c. J/R/P d. J/UJ/P e. None/P LCS, J/UJ/A MS/MSD f. J/UJ/P LCS, None/P or No qual MS/MSD g. J/R/P LCS, None/P or No qual MS/MSD,No qual or J/R/P surrogates h. qualify as normal based on average i. *None/P (for low concentration level SOW)*

TARGET COMPOUND IDENTIFICATION

a. out of RT windows b. fingerprint pattern do not match	a. NJ/P detects or J/R/P all non-detects by professional judgement b. NJ/P detects

COMPOUND QUANTITATION AND REPORTED CRQLs

a. recalculated value > 10% D b. non-detect recalculated as detect and vice versa c. compound above calibration range d. no dilution for compound above calibration range e. no adjustment of CRQL for % moisture	a. J/P all detects b. R/P compound c. J/A detects d. J/P detects e. Note as text in DVR

FIELD DUPLICATES

a. RPD > QAPP limits	a. No qualification

SYSTEM PERFORMANCE

a. professional judgement	

OVERALL ASSESSMENT OF DATA

a. professional judgement	

Data Qualifications for Metals by EPA SW-846 6020

HOLDING TIMES

a. > Holding time (>180 days) b. Reanalysis	a. J detect/R non-detect/P all analytes b. J detect/R non-detect/A all analytes

ICP-MS TUNING

a. Tune not performed b. Mass calibration not within 0.1 amu c. %RSD >5%	a. R/P all analytes b. J detect/UJ non-detect/P associated isotope c. J detect/UJ non-detect/P all analytes

INITIAL CALIBRATION

a. No daily calibration b. Incorrect # of standards used c. Correlation coefficient < 0.995 d. ICV %R >160 e. ICV 110 < %R ≤160 f. ICV 75 ≤ %R < 90 g. ICV %R < 75	a. R/P all analytes b. None/P or J detect/UJ non-detect/P by processional judgement c. J detect/UJ non-detected/P d. R/P all detects e. J /P all detects f. J detect/UJ non-detected/P g. J detect/R non-detected/P

CONTINUING CALIBRATION

a. > 10 samples between CCV's b. CCV %R >160 c. CCV 110 < %R ≤160 d. CCV 75 ≤%R < 90 e. CCV %R < 75	a. None/P b. R/P all detects c. J/P all detects d. J detect/UJ non-detect/P e. J detect/R non-detect/P

BLANKS

a. No method blank b. >20 samples per PB c. contaminants ≤ 5X method blank or ICB/CCB d. contaminants > 5X method blank or ICB/CCB	a. R/P all detects b. None/P c. U/A leave as reported d. No qualification

ICP INTERFERENCE CHECK SAMPLE (ICS) ANALYSIS

a. Not performed or not performed as required b. %R of AB solution < 80% or > 120% - %R > 120 - 50 ≤ %R < 80 - %R < 50	a. interferents <90% of spike - None/P interferents ≥90% of spike – J detect/UJ non-detect/P b. For samples with Al,Ca,Fe,Mg,Na,P,K,S,C,Cl,Mo,Ti at conc. ≥90% spike value: - J/P all detects - J detect/UJ non-detect/P - R/P all analytes For samples with Al,Ca,Fe,Mg,Na,P,K,S,C,Cl,Mo,Ti at conc.< 90% spike value: - None/P

LABORATORY CONTROL SAMPLE

a. No LCS b. >20 samples per LCS c. %R > UL d. 50 ≤ %R < LL e. %R < 50 f. RPD > UL	a. None/P b. None/P c. J/P all detects d. J detect/UJ non-detect/P e. J detect/R non-detect/P f. J/UJ non-detect/P

Data Qualifications for Metals by EPA SW-846 6020

MATRIX DUPLICATES	
a. RPD > UL; sample and duplicate results > 5X PQL b. Difference > PQL; sample and duplicate results ≤ 5X PQL	Qualify all samples of the same matrix a. J detect/UJ non-detect/A b. J detect/UJ non-detect/A
MATRIX SPIKE/MATRIX SPIKE DUPLICATE	
a. %R > UL b. 30 ≤ %R < LL c. %R < 30 d. RPD > UL	Qualify all samples of the same matrix, no qualification when sample concentration exceeds the spike concentration by a factor of 4 or greater a. J/A all detects b. J detect/UJ non-detect/A c. J detect/R non-detect/A if no post spike performed or post spike < 75% - J detect/UJ non-detect/A if post spike ≥ 75% d. J/UJ/A
INTERNAL STANDARDS	
a. No internal standards b. %R > 120 or < 30	a. R/P all analytes b. J detect/UJ non-detect/A
ICP SERIAL DILUTION	
a. Sample concentration > 100X MDL and %D > 10	Qualify all samples of the same matrix a. J detect/UJ non-detect/A
FIELD DUPLICATES	
a. RPD > UL	a. No qualification
SAMPLE CALCULATION VERIFICATION	
a. Recalculated value > 10% D b. Non-detect recalculated as detect and vice versa c. Result above calibration range and not diluted d. MDL > QAPP PQL	a. J/P detects b. R/P c. J/P detects d. None/P
OVERALL ASSESSMENT OF DATA	
a. Professional judgement	

A: Indicates the finding is based upon technical validation criteria
P: Indicates the finding is related to a protocol/contractual deviation

Data Qualifications for Mercury by 7470/7471

HOLDING TIMES	
a. > Holding time (>28 days) b. Reanalysis	a. J detect/R non-detect/P all analytes b. J detect/R non-detect/A all analytes
INITIAL CALIBRATION	
a. No daily calibration b. Incorrect # of standards used c. Correlation coefficient < 0.995 d. ICV %R >160 e. ICV 110 < %R ≤160 f. ICV 75 ≤ %R < 90 g. ICV %R < 75	a. R/P all analytes b. None/P or J detect/UJ non-detect/P by processional judgement c. J detect/UJ non-detected/P d. R/P all detects e. J /P all detects f. J detect/UJ non-detected/P g. J detect/R non-detected/P
CONTINUING CALIBRATION	
a. > 10 samples between CCV's b. CCV %R >170 c. CCV 120 < %R ≤170 d. CCV 65 ≤%R < 80 e. CCV %R < 65	a. None/P b. R/P all detects c. J/P all detects d. J detect/UJ non-detect/P e. J detect/R non-detect/P
BLANKS	
a. No method blank b. >20 samples per PB c. contaminants ≤ 5X method blank or ICB/CCB d. contaminants > 5X method blank or ICB/CCB	a. R/P all detects b. None/P c. U/A leave as reported d. No qualification
LABORATORY CONTROL SAMPLE	
a. No LCS b. >20 samples per LCS c. %R > UL d. 50 ≤ %R < LL e. %R < 50 f. RPD > UL	a. None/P b. None/P c. J/P all detects d. J detect/UJ non-detect/P e. J detect/R non-detect/P f. J/UJ/P
MATRIX DUPLICATES	
a. RPD > UL; sample and duplicate results > 5X PQL b. Difference > PQL; sample and duplicate results ≤ 5X PQL	Qualify all samples of the same matrix a. J detect/UJ non-detect/A b. J detect/UJ non-detect/A
MATRIX SPIKE/MATRIX SPIKE DUPLICATE	
a. %R > UL b. 30 ≤ %R < LL c. %R < 30 d. RPD > UL	Qualify all samples of the same matrix, no qualification when sample concentration exceeds the spike concentration by a factor of 4 or greater a. J/A all detects b. J detect/UJ non-detect/A c. J detect/R non-detect/A if no post spike performed or post spike < 75% - J detect/UJ non-detect/A if post spike ≥ 75% d. J/UJ/A

Data Qualifications for Mercury by 7470/7471

FIELD DUPLICATES	
a. RPD > UL	a. No qualification
SAMPLE CALCULATION VERIFICATION	
a. Recalculated value > 10% D b. Non-detect recalculated as detect and vice versa c. Result above calibration range and not diluted d. MDL > QAPP PQL	a. J/P detects b. R/P c. J/P detects d. None/P
OVERALL ASSESSMENT OF DATA	
a. Professional judgement	

A: Indicates the finding is based upon technical validation criteria
P: Indicates the finding is related to a protocol/contractual deviation

Data Qualifications For Radiological Chemistry

HOLDING TIMES	
a. > holding time (6 months or 5 half lives) b. >2X holding time c. reanalysis	a. J detects/UJ non-detects/P b. J detects/R non-detects/P c. change /P to /A. same as a & b
CALIBRATION	
a. instruments/detectors not calibrated as required b. NIST standards not used c. self absorption curve not prepared for each detector (for GFPC) d. check source not identified by activity and radionuclide	a. None/P or J detects/UJ non-detects/P by professional judgment b. J detects/UJ non-detects/P c. J detects/UJ non-detects/P d. None/P or J detects/UJ non-detects/P by professional judgment
SYSTEM PERFORMANCE	
a. check source not performed daily b. check source not within laboratory limits c. routine background measurement not performed	a. J detects/UJ non-detects/P b. J detects/P c. J detects/UJ non-detects/P, professional judgment
BLANK	
a. no method blank b. blank result ≥ MDA but ≤RL and sample result ND or > RL c. blank result ≥ MDA but ≤RL and sample ≥MDA but ≤RL d. blank result > RL and sample result ND e. blank result > RL and sample result > RL but < 10x blank f. > 20 samples per PB	a. J detects/P b. none c. U detects at RL d. none e. J detects f. None/P
TRACER/CARRIER RECOVERY	
a. no tracer/carrier used b. % recovery ≤10 c. % recovery > 10% and < LL d. % recovery > UL	a. None/P or J detects/UJ non-detects/P by professional judgment b. J detects/R non-detects/A c. J detects/UJ non-detects/A d. J detects/A
LABORATORY CONTROL SAMPLE	
a. %R > UL b. %R < LL c. %R < 50% d. RPD > UL e. no LCS f. >20 samples per LCS	a. J detects/P b. J detects/UJ non-detects/P c. J detects/R non-detects/P d. J detects/ UJ non-detects/A e. None/P f. None/P
MATRIX SPIKE/MATRIX SPIKE DUPLICATE	
a. %R > UL b. %R < LL c. %R < 30% d. RPD > UL	a. J detects/A b. J detects/UJ non-detects/A c. J detects/R non-detects/A d. J detects/ UJ non-detects/A
DUPLICATE SAMPLES	
a. DUP RPD > UL and result > 5x RL b. Result # 5x RL and absolute value of difference > RL	a. J detects/UJ non-detects/A b. J detects/UJ non-detects/A
FIELD DUPLICATES	
a. DUP RPD > UL	a. No qualification
COMPOUND QUANTITATION AND REPORTING LIMITS	
a. MDA > QAPP RL	a. None/P
OVERALL ASSESSMENT OF DATA	
a. professional judgment	

A: Indicates the finding is based upon technical validation criteria
P: Indicates the finding is related to a protocol/contractual deviation

ATTACHMENT 5

PROJECT CONTRACTOR QUALITY CONTROL PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 5

FINAL

PROJECT CONTRACTOR QUALITY CONTROL PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

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Gregory D. Joyce, QC Program Manager

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ABBREVIATIONS AND ACRONYMS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
CMT	Construction Management Technician
CQA	construction quality assurance
CQC	Contractor Quality Control
CTO	Contract Task Order
DCN	Design Change Notice
DFW	Definable Feature of Work
DN	Deficiency Notice
DON	Department of the Navy
EHS	Environmental Health and Safety
EM	Engineer Manual
FCR	Field Change Request
IR	Installation Restoration (Program)
LLRW	low-level radioactive waste
NCR	Nonconformance Report
OEW	ordnance and explosives waste
PCQC	Project Contractor Quality Control
PESM	Project Environmental Safety Manager
PjM	Project Manager
PQCE	Project Quality Control Engineer
PQCM	Project Quality Control Manager
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
QCPM	Quality Control Program Manager
RAD EMAC	Radiological Environmental Multiple Award Contract
RAWP	Remedial Action Work Plan
RCT	Radiological Control Technician
ROICC	Resident Officer in Charge of Construction

ABBREVIATIONS AND ACRONYMS
(Continued)

RPM	Remedial Project Manager
RSO	Radiation Safety Officer
RSOR	Radiation Safety Officer Representative
RWP	Radiation Work Permit
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TtEC	Tetra Tech EC, Inc.

1.0 INTRODUCTION

This Project Contractor Quality Control (PCQC) Plan establishes the procedures and methods to be implemented for specific components of the multilayer soil cover (cover) to be placed at Installation Restoration (IR) Site 2, located at the former Naval Air Station Alameda, Alameda Point in Alameda, California. Tetra Tech EC, Inc. (TtEC) has been contracted by Naval Facilities Engineering Command Southwest under Contract Task Order (CTO) 0009, issued under the Radiological Environmental Multiple Award Contract (RAD EMAC) No. N62473-10-D-0809. This PCQC Plan fulfills the TtEC quality control (QC) system requirement. In conjunction with the TtEC Program Construction Quality Control Management Plan (TtEC 2010), this PCQC Plan meets the requirements of *California Code of Regulations* Title 22, Section 66264.19.

1.1 SITE BACKGROUND

Former NAS Alameda was an active military installation from the 1930s to the 1990s, which primarily provided facilities and support for fleet aviation activities. The area of present day IR Site 2 was originally open water until 1956 when a sea wall was constructed along the southern and western shorelines to confine and protect the area. Dredged fill was hydraulically placed within the seawall creating the area encompassed by IR Site 2.

The IR Site 2 landfill, also called the West Beach Landfill, was used as the main disposal area for the Alameda Point from approximately 1952 through 1978. An estimated 1.6 million tons of waste was deposited (E&E 1983). Historical waste disposal methods at the site generally consisted of trench-and-fill operations. Wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB)-containing liquids, batteries, low-level radioactive waste (LLRW) including but not limited to radioluminescent dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E 1983). Ordnance and explosives waste (OEW) may have also been deposited in the 2.5-acre (approximate) Possible OEW Burial Site located in the southern part of the landfill.

In 1978, the Department of the Navy (DON) developed plans to close the landfill in accordance with the requirements of the Water Board's *Minimum Criteria for Proper Closure of Class II Solid Waste Disposal Sites* (Resolution No. 77-7). In 1983, the Water Board issued Order No. 83-35 to implement a final cover, leachate cutoff barrier, methane gas control, earthquake damage control, drainage control, and erosion control, and to generate compliance reports for the former landfill. Between 1983 and 1995, the DON responded by placing a partial clay-soil cover, installing an 820-foot-long, 2-foot-wide and 20- to 30-foot-deep slurry wall to restrict potential contaminant migration to San Francisco Bay. A gas venting system was installed for methane gas control, and repairs were made to the seawall also during this time period. In 1986, 20,000 cubic yards of imported fill soil was spread on the former landfill, which was insufficient in achieving a uniform cover layer of appropriate thickness over the landfill area. Also in 1986, the landfill was graded to prevent ponding, and an earthen perimeter berm was constructed around the landfill.

In August 1999, IR Site 2 was officially added to the U.S. Environmental Protection Agency's National Priority List of Superfund sites and assigned Comprehensive Environmental Response, Compensation, and Liability Information System identification number CA2170023236.

1.2 PURPOSE

The purpose of this PCQC Plan is to establish specific procedures and methods for field inspections, and provide an effective QC system to ensure the quality of all work performed by TtEC and its subcontractor personnel during the construction activities. This plan is applicable to all definable features of work (DFWs) listed in Section 3.0 and will be available at the project field office. All work activities will be conducted in accordance with this PCQC Plan and the Remedial Action Work Plan (RAWP) to which it is attached. Contractor Quality Control Forms are provided in Appendix A.

1.3 DEFINITIONS

1. Construction Quality Assurance (CQA): CQA includes inspections, audits, and evaluations of materials and workmanship to determine and document the quality of the constructed facility. CQA is performed or directed by the DON.

2. Construction Quality Control (CQC) Testing Laboratory: The CQC testing laboratory will perform QC conformance tests required by the specifications and PCQC Plan. The CQC testing laboratory will be contracted by TtEC.

3. Geosynthetics: A generic classification given to synthetic (man-made plastic and fabric) materials used in geotechnical and construction applications. Included are geomembrane or flexible membrane liners (high-density polyethylene), geotextiles, geosynthetic clay liner, geonets, geogrids, geocomposites, and geocells.

4. Geotechnical Construction Quality Control for Earthwork: The protocols to be followed in evaluating the adequacy of the project's work with regard to all elements of earthworks construction with the exception of line and grade (survey) control. Said work will include but need not be limited to all QC activities delineated herein and in the Specifications. Geotechnical QC is to be provided by a party independent of the Project Superintendent.

5. Geotextile: A permeable synthetic fabric providing protection to other systems or serving to separate different materials.

6. Project Documents: Project Documents include all Construction Drawings, Record Drawings, Construction Specifications, CQC Plans, Health and Safety Plans, Project Schedules, and Project Superintendent Submittals.

7. Quality Assurance (QA): An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is the type and quality needed and expected by the customer. QA is performed by the DON on the RAD EMAC.

8. Quality Control: QC is the overall system of checks to measure the attributes and performance of a process, item, or service against defined standards to verify that they meet established requirements. QC is considered an element of the overall QA program. The QC element is usually limited to inspection and test activities used to verify acceptance of an item. QC is performed by TtEC on the RAD EMAC.

9. Work: All tools, equipment, supervision, labor, and materials or supplies necessary to complete the project as specified herein and as shown on the project plans.

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2.0 PROJECT ORGANIZATION, RESPONSIBILITY, AND POINTS OF CONTACT

This section describes the organization and authority of project personnel. The organizational structure, functional responsibilities, levels of authority, and lines of communication within the organization have been established to ensure high-quality work. The project organization chart showing the reporting lines for key personnel is provided on Figure 2-1. The responsibilities of key personnel are described in the following subsections. A listing of the points of contact for the project is provided in Section 2.18.

2.1 REMEDIAL PROJECT MANAGER

The Remedial Project Manager (RPM) has primary responsibility with the DON for day-to-day management of the project activities performed under this RAWP and for its successful completion. The RPM is responsible for the following:

- Perform project management for the DON.
- Ensure the project scope of work requirements are fulfilled.
- Oversee the project cost and schedule.
- Provide formal technical direction to the TtEC project team, as needed.
- Coordinate with other RPMs for other projects being performed to ensure that proper controls are in place.
- Act as lead in interacting with regulatory agencies.

2.2 QUALITY ASSURANCE OFFICER

The Quality Assurance Officer (QAO) is the DON representative with primary responsibility for ensuring that the contract-required QA measures are in place and effective for the work performed. The QAO is responsible for the following:

- Review and approve Sampling and Analysis Plans (SAPs).
- Provide DON oversight of the TtEC QC Program.
- Provide quality-related directives through the Contracting Officer.
- Act as the point of contact for matters pertaining to generating data and maintaining the quality of data.
- Authorize the suspension of project execution if QC requirements are not adequately met.

2.3 RESIDENT OFFICER IN CHARGE OF CONSTRUCTION

The Resident Officer in Charge of Construction (ROICC) is the DON representative with the primary responsibility for providing on-site QC and safety oversight of contractors. The ROICC is responsible for the following:

- Verify that all work has been completed per contract and technical specifications prior to final government acceptance.
- Perform ongoing field inspection to verify that all work is in compliance with both contract and technical specifications.
- Notify the contractor of any work not in compliance.
- Notify the contractor of any work being performed in an unsafe manner.
- Interact with the contractor's Project Quality Control Manager (PQCM) on quality-related issues.
- Review and sign waste manifests as the generator's representative.
- Review daily CQC Reports for completeness and accuracy.
- Attend preparatory phase, initial phase, prefinal, and final acceptance inspections.
- Attend weekly QC meetings.

2.4 PROJECT MANAGER

The Project Manager (PjM) is the TtEC representative responsible for the direction, execution, and successful completion of project tasks to achieve overall project goals. The PjM has responsibility for and the authority to direct all segments of the project including technical, construction, and administrative activities. The PjM is responsible for the following:

- Coordinate work activities of subcontractors and TtEC personnel and ensure that all personnel adhere to the administrative and technical requirements of the project.
- Monitor the status and progress of work and ensure that project deliverables are completed on time and within the project budget.
- Monitor the budget and schedule, and notify the client and the Program Manager of any changes that may require administrative actions.
- Ensure adherence to the quality requirements of the contract, project scope of work, and the QC plans.
- Ensure that all work meets the requirements of the project plans, procedures, and technical specifications and complies with applicable codes and regulations.
- Ensure that all work activities are conducted in a safe manner in accordance with the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), Safety and Health Requirements (Engineer Manual [EM] 385-1-1) (USACE 2008), and all applicable Occupational Safety and Health Administration regulations.

- Ensure that change conditions are properly identified and documented with the appropriate approvals.
- Serve as the primary contact with the DON and TtEC for actions and information related to the work, and make sure to include appropriate TtEC lead and experts in decision-making.
- Coordinate satisfactory resolution and completion of evaluation and acceptance for Nonconformance Reports (NCRs).
- Attend required meetings, including the preconstruction conference, weekly QC meetings, pre- and postconstruction site inspections, and other scheduled and unscheduled meetings.

2.5 PROJECT ENVIRONMENTAL SAFETY MANAGER

The Project Environmental Safety Manager (PESM) is the TtEC representative responsible for implementing and overseeing the Contract Health and Safety Program and for developing, implementing, and approving all APP/SSHP documents. Any changes to the established Contract Health and Safety Program or APP/SSHP must be at the direction and approval of the PESM, with concurrence of the DON Administrative Contracting Officer. The PESM or designee will not necessarily be on-site during all remedial activities but will be readily available for consultation when required.

The PESM or designee is a Certified Industrial Hygienist who is certified by the American Board of Industrial Hygiene. The PESM supervises and directs the activities of the Site Safety and Health Officer (SSHO). The PESM has the authority to stop unsafe operations, remove unqualified personnel from the work area, and approve changes to the APP/SSHP. The PESM is responsible for the following:

- Oversee all aspects of the APP/SSHP from development to implementation.
- Advise the SSHO on all related health and safety matters.
- Review site-specific plans for completeness and compliance.
- Review other site documents as they affect health and safety (e.g., Activity Hazard Analyses [AHAs] and sampling plans).
- Review and evaluate all monitoring results.
- Establish and monitor all related health and safety procedures through site safety inspections and audits.
- Ensure that TtEC employees receive required environmental health and safety (EHS) regulatory training.
- Fulfill specific responsibilities for project EHS personnel that are identified within each EHS procedure.

- Function as a technical resource for all environmental compliance, safety, loss control, and industrial hygiene issues.

2.6 QUALITY CONTROL PROGRAM MANAGER

The Quality Control Program Manager (QCPM) is the TtEC representative responsible for the oversight of program QC, including field activities and data acquisition. The QCPM is responsible for the following:

- Coordinate and resolve quality concerns.
- Provide quality-related direction and ensure the training of the PQCM and others performing quality-related functions.
- Suspend project activities if quality standards are not maintained.
- Interact with the DON, including the QAO, on quality-related issues.
- Review audit and surveillance reports.
- Implement the DON technical directives related to quality.

2.7 PROJECT QUALITY CONTROL ENGINEER

The Project Quality Control Engineer (PQCE) is the TtEC representative responsible for oversight of implementing the cover design and specification. The PQCE is responsible for the following:

- Inspect the cover construction on a weekly basis, or as required.
- Review and approve QC testing and inspections as required by the Design and Test Plan and Log (Appendix C).
- Participate in weekly CQC meetings with the ROICC.
- Suspend construction activities if nonconforming conditions are identified that would compromise the quality of landfill.
- Review and approve any proposed design changes prior to being submitted to the Design Engineer of Record.
- Review and approve the as-built drawings after completion of the cover construction.
- Oversee the PQCM duties outlined in Sections 4.0 and 5.0 of this PCQC Plan.

2.8 PROJECT SUPERINTENDENT

The Project Superintendent is a TtEC representative who reports to the PjM and is responsible for coordinating, directing, implementing, and supervising site construction activities. The Project Superintendent or designated representative will be on-site at all times during field activities. The Project Superintendent is responsible for the following:

- Implement field activities in accordance with the RAWP.
- Direct support personnel and subcontractors.
- Administer site access and communication.
- Maintain the work site, facilities, vehicles, and equipment.
- Coordinate work activities and ensure all personnel adhere to the administrative and technical requirements of the project.
- Prepare status reports and estimate future scheduling needs.
- Prepare daily Contractor Production Reports.
- Monitor the status and progress of field activities and ensure that project deliverables are completed on time and within the project budget.
- Ensure work activities in the field are conducted in a safe manner in accordance with the APP/SSHP.
- Investigate with the SSHO all incidents, accidents, injuries, illnesses, and near misses.

2.9 PROJECT QUALITY CONTROL MANAGER

The PQCM is the TtEC representative responsible for overall management of project QC and reports to the QCPM. The PQCM has the authority to stop work on site-related issues affecting the quality of the work performed and for directing the correction of all nonconforming work. The PQCM or designated representative will be on-site at all times during field activities. A delegation of authority letter is provided as Appendix B. The PQCM is responsible for the following:

- Provide and maintain an effective QC system for all site activities.
- Monitor QC activities to ensure conformance with authorized policies, procedures, contract specifications, required standards, and methods of quality construction.
- Prepare the daily CQC Reports.
- Coordinate and perform the three phases of inspection (preparatory, initial, and follow-up) for all DFWs.
- Responsible for issuance, maintenance, and enforcement of NCRs and other quality actions.
- Ensure that on-site and off-site inspections, testing, and sampling are performed in accordance with the plans, procedures, specifications, and applicable codes.
- Ensure that all required tests and inspections are performed and documented.
- Conduct required QC meetings, including the coordination and mutual understanding meeting, site survey visit, and other scheduled meetings.

- Coordinate and maintain submittal register, photograph log sheet, request for information, and NCR log and other required logs or registers.
- Review and maintain records of approved submittals, Design Change Notices (DCNs), and Field Change Requests (FCRs) for construction activities.
- Inspect material delivery handling and storage in accordance with technical specifications.
- Review and approve submittals and shop drawings and/or forward submittals as information only or for approval.
- Review project plans and procedures for quality issues.
- Confirm the removal or rework of material, equipment, or work activity that is not in compliance with plans and specifications.

2.10 GEOTECHNICAL PROJECT ENGINEER

The Geotechnical Project Engineer is the TtEC representative responsible for the design and specifications for the earthwork and geosynthetic elements of the Design Plans and Specifications. The Geotechnical Project Engineer is a geologic/geotechnical professional registered in the State of California. The Geotechnical Project Engineer or designated representative will be on-site at all times during earthwork and geosynthetic related field activities. The Geotechnical Project Engineer is responsible for the following:

- Observing, testing, and documenting activities related to QC for all geotechnical and geosynthetic aspects of construction except for engineering and survey control
- Performing the three phases of inspection (preparatory, initial, and follow-up) for all earthwork related DFWs
- Monitoring earthwork and geosynthetic activities to ensure conformance with authorized policies, procedures, contract specifications, required standards, and methods of quality construction
- Conducting testing of soils and geosynthetics to ensure conformance with contract specifications and required standards
- Providing approval of all completed geotechnical work

2.11 LANDFILL ENGINEER

The Landfill Engineer is the TtEC representative responsible for the design and preparation of the Design Plans and Specifications including the containment system that fulfills the regulatory and operational requirements of the permitting agencies and the DON, respectively. The Landfill Engineer is responsible for the following:

- Providing Design Plans and Specifications for all construction work

- Modifying or changing the design if unexpected or unanticipated site conditions are encountered during construction
- Providing approval of all completed construction work

2.12 SITE SAFETY AND HEALTH OFFICER

The SSHO is the TtEC representative who reports directly to the PESM and ensures all elements of the APP/SSHP are implemented and enforced on-site. The SSHO has full authority to issue stop work orders or evacuation orders when work operations or noncompliance(s) may threaten the health and safety of site workers or the public. The SSHO is responsible for the following:

- Ensure that all personnel understand the requirements of the TtEC EHS program and procedures through training and communication.
- Investigate with the Project Superintendent all incidents, accidents, injuries, illnesses, and near misses.
- Ensure project personnel are trained in the hazards of substances used on the project, maintain Material Safety Data Sheets and make them accessible to project personnel, and perform inspections and oversight to ensure the Waste Management Plan is being followed.
- Ensure tailgate safety meetings are conducted daily prior to start of work and are documented.
- Ensure project safety equipment is inspected and in good working order as required by the EHS program.
- Coordinate site health and safety requirements with the Project Superintendent and PjM.
- Ensure that all health and safety monitoring equipment and personal protective equipment are maintained and direct site-monitoring activities.
- Coordinate daily field activities with the Project Superintendent.
- Coordinate site safety and emergency response duties and verify site communications system with site personnel.
- Report incidents to the ROICC as required by EM 385-1-1 (USACE 2008).
- Report immediately to the PjM, RPM, and ROICC any fatal injury, persons admitted to a hospital, or damage to government property.
- Ensure all personnel have the required training and medical clearance prior to entering the exclusion zone at the site; inform the Project Superintendent of any site personnel with medical restrictions.
- Determine and post routes to medical facilities and telephone numbers for emergency transportation to medical facilities.
- Serve as the Project Hazard Communication Coordinator.

- Maintain training records and medical certifications for all on-site personnel, including subcontractors.
- Initiate revisions or changes to the APP/SSHP to support changing site conditions.
- Maintain site control procedures.
- Maintain current records of certification for first aid and cardiopulmonary resuscitation training for field personnel.
- Attend meetings, including the preconstruction conference, weekly QC meetings, pre- and post-construction site inspections, and other project meetings.

2.13 RADIATION SAFETY OFFICER

The Radiation Safety Officer (RSO), from TtEC, is responsible for implementing, directing, and supervising all project-related radiological activities. The RSO is responsible for the following:

- Assist in the development of the APP/SSHP.
- Ensure that project radiological analysis needs are identified and provide technical support in subcontractor selection and execution of the Radiological Control program.
- Provide health physics guidance.
- Ensure that Radiological Control Technicians (RCTs) and project personnel properly execute and maintain radiological records.
- Ensure that required radiological safety training is conducted.
- Review and approve project field procedures for the handling of radioactive materials or access to radiological areas.
- Ensure timely review of records prior to approval.
- Approve and ensure radiological records meet the quality standards.
- Conduct radiation incident investigations.
- Conduct radiological project inspections.
- Conduct data assessment.

2.14 RADIATION SAFETY OFFICER REPRESENTATIVE

The Radiation Safety Officer Representative (RSOR), from TtEC, is responsible for oversight of the inspection and certification activities for radiological activities. In accordance with DON requirements, the RSOR or designee will be on-site during radiological work. The RSOR is responsible for the following:

- Provide radiological material-related safety briefings.
- Ensure specified radiological safety procedures are followed and radiological safety tests and inspections are complete and acceptable.

- Conduct daily oversight and field safety inspections and tests as required by the plans, procedures, technical specifications, and regulatory requirements.
- Attend required meetings, including the preconstruction conference, weekly QC meetings, pre- and postconstruction site inspections, and other appropriate project meetings.
- Verify compliance with on-site Radiation Work Permits (RWPs) and Standard Operating Procedure (SOPs), including laboratory SOPs.
- Ensure radiological safety documentation is provided to the PQCM for inclusion in the project files.
- Provide surveillance of radiologically related activities.
- Act as the site contact person for Nuclear Regulatory Commission site inspections.

2.15 RADIOLOGICAL CONTROL TECHNICIAN

The RCT, from TtEC, will support projects in the field and laboratory and is responsible for the following:

- Conduct and document field surveys, sampling, and laboratory support in accordance with the plans and SOPs.
- Interpret and verify field data accumulated from surveys and monitoring activities.
- Support dose assessments and ensure compliance with QC programs, emergency plans, and procedures.
- Perform effluent monitoring and radioactive material inventories.
- Perform survey equipment efficiencies, response checks, and daily checks and calibration of the survey instruments.
- Conduct safety evaluations of health physics field and laboratory equipment.
- Prepare and implement RWPs at active work areas to ensure compliance with the RWPs.

2.16 PROGRAM CHEMIST

The Program Chemist is the TtEC representative who oversees sample collection, handling, analysis, and analytical data reporting. The Program Chemist is responsible for the following:

- Develop the SAP.
- Evaluate and select qualified subcontract laboratories.
- Implement data QC procedures and perform audits of field performance.
- Review off-site laboratory data prior to use.
- Ensure that a proper review of on-site laboratory data is performed.

- Coordinate data validation of off-site laboratory data.
- Review data validation reports.
- Prepare analytical reports and supporting project reports.

2.17 SUBCONTRACTORS AND VENDORS

Qualified subcontractors may be selected to provide various construction services for this project. The subcontractor is required to provide labor, material, and equipment necessary to conduct construction activities as directed by the PjM. Subcontractors and vendors will conform to TtEC's quality requirements including all approved procedures, technical specifications, and contract provisions.

Subcontractors will be required for the following tasks:

- Land surveying
- Geophysical underground utility locations
- Erosion/drainage control
- Radiological Controls
- LLRW removal
- Chemical soil analysis
- Geotechnical testing
- Groundwater monitoring well and gas probe installation

(Note: This list is not all-inclusive and may change as required under the CTO.)

The subcontractor will be responsible for field inspection of their construction and operating activities. TtEC personnel will monitor, oversee, and make on-site observations and inspections of work in progress to determine whether the subcontractor's work is proceeding in accordance with TtEC's quality requirements.

Subcontractor personnel are responsible for maintaining a daily log of the project activities they perform and for providing information needed to complete the daily CQC Report. All inspection records, including inspection reports, deficiency reports, and reinspections of corrective actions, will be documented.

2.18 POINTS OF CONTACT

The following is a list of the key project, DON, and regulatory points of contact:

Organization	Title	Contact
BRAC PMO West 1455 Frazee Road, Ste. 900 San Diego, CA 92108-4310	Lead RPM	Mr. Bill McGinnis (619) 532-0907 william.mcginnis@navy.mil
BRAC PMO West 1455 Frazee Road, Ste. 900 San Diego, CA 92108-4310	RPM	Mr. Jacques P. Lord (619) 532-0902 jacques.lord.ctr@navy.mil
NAVFAC SW 1455 Frazee Road, Ste. 900 San Diego, CA 92108-4310	Contract Specialist	Ms. Joyce Howell-Payne (619) 532-0931 joyce.howell-payne@navy.mil
NAVFAC SW 2450 Saratoga Street, Building 114, Ste. 200 Alameda Point, Alameda, CA 94501-7545	ROICC	Mr. Robert Perricone (510) 521-8600 robert.perricone@navy.mil
NAVFAC SW 2450 Saratoga Street, Building 114, Ste. 200 Alameda Point, Alameda, CA 94501-7545	ROICC	Mr. Gregory Grace (510) 521-8709 gregory.grace@navy.mil
BRAC PMO West CSO – San Francisco Bay Area 410 Palm Ave., Building 1, Ste. 161 San Francisco, CA 94130-1806	ECM/CSO	Mr. Doug DeLong (415) 743-4713 douglas.delong@navy.mil
NAVSEA Detachment RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Radiological EPM	Mr. Matthew Slack (757) 887-4212 matthew.slack@navy.mil
NAVFAC SW 1220 Pacific Coast Highway San Diego, CA 92132-5190	QAO	Mr. Joseph Michalowski (619) 532-3046 joseph.michalowski@navy.mil
EPA, Region IX 75 Hawthorne Street (SFD-8-3) San Francisco, CA 94105	EPA RPM	Ms. Xuan-Mai Tran (415) 972-3002 tran.xuan-mai@epa.gov
Cal/EPA DTSC Office of Military Facilities 700 Heinz Ave., Building F, Ste. 200 Berkeley, CA 94710	Cal/EPA DTSC RPM	Mr. James Fyfe (510) 540-3850 jfyfe@dtsc.ca.gov
CDPH 1616 Capital Avenue; MS 7405 Sacramento, CA 95899-7377	CDPH PjM	Mr. Robert Wilson (916) 449-5688 robert.wilson@cdph.ca.gov
TtEC Alameda NAS 1090 ½ W. Tower Avenue Alameda, CA 94124	Project Manager	Mr. Hedy Abedi (949) 892-7593 hedy.abedi@tetratech.com

Organization	Title	Contact
TtEC 1230 Columbia St., Ste. 750 San Diego, CA 92101-8536	Technical Lead	Mr. Pete Everds (619) 471 3504 pete.everds@tetratech.com
TtEC Alameda NAS 1090 ½ W. Tower Avenue Alameda, CA 94124	Construction Superintendent	Mr. Bob Wells (650) 766-7279 robert.wells@tetratech.com
TtEC Alameda NAS 1090 ½ W. Tower Avenue Alameda, CA 94124	RSOR	Mr. Nathan Smith (614) 332-5838 nathan.smith@tetratech.com
TtEC 1230 Columbia St., Ste. 750 San Diego, CA 92101-8536	QCPM	Mr. Greg Joyce (360) 780-0371 greg.joyce@tetratech.com
TtEC Alameda NAS 1090 ½ W. Tower Avenue Alameda, CA 94124	PQCM	Mr. Vince Richards (949) 283-0589 vincent.richards@tetratech.com
TtBAS 1360 Valley Vista Drive Diamond Bar, CA 91765	PQCE	Peter Skopek (906) 860-7777 peter.skopek@tetratech.com
TtBAS 1360 Valley Vista Drive Diamond Bar, CA 91765	Landfill Engineer	Caleb Moore (906) 860-7777 caleb.moore@tetratech.com
TtEC Twins Oak, Suite 309 5700 Lake Wright Drive Norfolk, VA	RSO	Mr. Erik Abkemeier, CIH, CSP (757)-944-0921 erik.abkemeier@tetratech.com
TtEC 1230 Columbia St., Ste. 750 San Diego, CA 92101-8536	PESM	Mr. Roger Margotto, CIH, CSP (619) 471-3503 roger.margotto@tetratech.com
TtEC Alameda Point Kollman Circle Apt C. Alameda, CA 94501	SSHO	Mr. Keith Rademacher (509) 430-2822 keith.rademacher@tetratech.com
TtEC 17885 Von Karman Avenue, Ste. 500 Irvine, CA 92614-6213	Program Chemist	Ms. Lisa Bienkowski (949) 809-5028 lisa.bienkowski@tetratech.com
TtEC 17885 Von Karman Avenue, Ste. 500 Irvine, CA 92614-6213	Regulatory Compliance Specialist	Ms. Jennifer Dessort (949) 809-5063 jennifer.dessort@tetratech.com

Abbreviations and Acronyms:

Cal/EPA – California Environmental Protection Agency
CHMM – Certified Hazardous Materials Manager
CIH – Certified Industrial Hygienist
CQA – Construction Quality Assurance
CSP – Certified Safety Professional
DTSC – Department of Toxic Substances Control
FEAD – Facilities Engineering and Acquisition Division
NAVFAC SW – Naval Facilities Engineering Command Southwest
NTR – Navy Technical Representative
PQCM – Project Quality Control Manager
PESM – Program Environmental and Safety Manager
PjM – Project Manager
PQCE – Project Quality Control Engineer
QC – quality control
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
SSHO – Site Safety and Health Officer
TtEC – Tetra Tech EC, Inc.
Water Board – Regional Water Quality Control Board

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3.0 DEFINABLE FEATURES OF WORK

A DFW is an activity or task separate and distinct from other activities that requires separate control activities. The DFW establishes the control measures required to verify both the quality of work performed and compliance with specified requirements, which include inspecting materials and workmanship before, during, and after each DFW. Preparatory and initial inspections will be performed on all DFWs, with the exception of the environmental resources survey, mobilization, and site cleanup and final inspection (demobilization). Activities that will be covered by the PQCM during the inspections are listed in Table 3-1. The following DFWs have been identified for the project:

- Mobilization and site setup
- Environmental resource survey
- Installation of temporary fences and gates
- Implementation of temporary erosion and sediment control measures
- Removal/abandonment of existing site facilities including but not limited to groundwater monitoring wells, gas probes, weir structure, and passive gas vent system
- Topographical surveys
- Clearing of vegetation and debris
- Excavations, backfill, and compaction of excavated waste areas (if required)
- Screening of potentially radiologically impacted materials
- Radiological surveys including personnel and equipment
- Subgrade placement
- Characterization survey of subgrade
- Animal intrusion barrier (geonet layer) placement
- Installation of the cover system and access road
- Final erosion control drainage installation
- Installation of groundwater monitoring wells, gas perimeter probes, and gas venting system
- Revegetation of the work area
- Final status survey of final grade
- Transportation and disposal of soil and debris

- Installation of institutional controls
- Site restoration and demobilization

4.0 SUBMITTALS

This section describes the review and approval process for submittals. TtEC will institute a submittal register (Appendix A) that will be maintained on-site by the PQCM to track submittals from issuance to approval. A list of required submittals will be developed at the initiation of project activities and revised as necessary. Submittals will be scheduled, reviewed, certified, and managed in accordance with the procedures defined in this section.

Standard Unified Facilities Guide Specification submittal titles are as follow:

- SD-01 Preconstruction Submittals
- SD-02 Shop Drawings
- SD-03 Product Data
- SD-04 Samples
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificates
- SD-08 Manufacturer's Instructions
- SD-09 Manufacturer's Field Reports
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

Descriptions of the submittals listed above are provided in Specification Section 013300 (NAVFAC 2006). Not all submittals listed above are necessarily applicable to the DON's scope of work for this project.

4.1 REVIEW OF SUBMITTALS

Submittals will be reviewed to ensure completeness, accuracy, and contract compliance. Submittal of a certification will be inspected and approved by the PQCE for conformance to the project specifications or certification criteria. All items will be checked and approved by the PQCE. Any submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review and approval prior to acceptance. Approved submittals will be signed or initialed, and dated. During the preparatory phase of the QC inspections, the PQCE will ensure that all materials and equipment have been tested and approved. No field activities will be performed without the required approval of applicable submittals.

4.2 SUBMITTAL PROCESS

Required submittals will be provided to project personnel as determined by the distribution schedule. Each submittal will be assigned a unique document control number.

A transmittal form will accompany each submittal. Each transmittal will be identified with:

- Contract and CTO number
- Name and address of the submitting organization
- Date of submittal
- Description of item being submitted, including reference to specification section (if applicable)
- Approval of submitting organization indicating conformance to the requirements

The PQCE will update the submittal register regularly.

4.3 REVIEW AND PROCESSING OF SUBMITTALS THAT DO NOT REQUIRE DON APPROVAL

Material submitted for review by the PQCE will indicate whether or not it conforms to established requirements. The PQCE will inform the submitter of the results of the review. The submittal log will be updated to indicate the status.

Conforming submittals will be transmitted to project and DON personnel as determined by the distribution schedule. A transmittal form will accompany all items sent to the DON and will list each item transmitted, the date it was reviewed by the PQCE, and its review status.

Nonconforming submittals will be returned to the submitter for correction, resolution of comments, and resubmittal.

4.4 REVIEW AND PROCESSING OF SUBMITTALS THAT REQUIRE DON APPROVAL

Submittals reviewed by the PQCE will be transmitted to the DON in accordance with the project distribution schedule for further review and approval. All items sent to the DON will use a transmittal form that will indicate each item transmitted, the date reviewed by the PQCE, and its review status. Upon completion of review, the ROICC will either return the transmittal form to the PQCE for further action or accept the submittal as complete.

The PQCE will advise the submitter of the results of the review in writing and include any comments. The submittal log will be updated to indicate status.

Nonconforming submittals may be returned to the submitter for correction, resolution of comments, and resubmittal, if required.

4.5 REVISED SUBMITTALS

Revised submittals will be logged, reviewed, and processed in a manner identical to the initial submittal. Revisions to a submittal will be identified using an alphabetic suffix to the original submittal number, e.g., submittal 18 will be revised to 18(a).

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5.0 TESTING

The PQCM or designated representative will verify the performance of all tests specified or required by the project-specific plans to ensure that control measures are adequate to provide a product conforming to contract specifications. General requirements for testing procedures to be implemented for this project are included in the Work Plan. The type, number, and frequency of required tests are specified in the Test Plan and Log (Appendix C). These tests include both operational and acceptance testing as appropriate.

5.1 DOCUMENTATION

All test results, both passing and failing, will be documented in the daily CQC Report for the day the results are obtained. Paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. The test reports will be available for review by the ROICC and transmitted with the Project Closure Report.

5.2 LABORATORY SERVICES

An independent testing laboratory will provide laboratory services, as needed. Per remedial design construction specifications, the laboratory will require DON approval through the Naval Facilities Engineering Service Center. The scope of the laboratory's accreditation will include the test methods required under the construction specifications. Acceptable accreditation programs include the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program, the American Association of State Highway and Transportation Officials program, and the American Association for Laboratory Accreditation program. A copy of the Certificate of Accreditation and Scope of Accreditation and latest directory of the accrediting organization for selected laboratories will be required prior to qualification in accordance with project requirements.

5.3 TEST PLAN AND LOG

The Test Plan and Log lists tests required by the project specifications and drawings. The Test Plan and Log will be submitted with the last CQC Report of each month. Testing will be conducted to verify that control measures are adequate to provide a product conforming to contract specifications. General requirements for testing procedures to be implemented for this project are included in the project-specific plans.

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6.0 QUALITY CONTROL MEETINGS

6.1 COORDINATION AND MUTUAL UNDERSTANDING MEETING

Prior to the start of site work, a coordination and mutual understanding meeting will be held to discuss the QC Program requirements. DON personnel attending the meeting will include the RPM, ROICC, the ROICC's Construction Management Technician (CMT), and the Alameda Environmental Compliance Manager. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used, administration of on-site and off-site work, coordination of the field activities, production, and the PQCM duties with the ROICC. At a minimum, the TtEC personnel required to attend the meeting will include the PjM, Field Engineer, Project Superintendent, PQCM, and SSHO. Minutes of the meeting will be prepared by the PQCM and signed by the PjM and the DON's RPM and/or ROICC or designated representative. The meeting may be held in conjunction with the preconstruction meeting.

6.2 QC MEETINGS

After the start of field activities, the PQCM will conduct QC meetings at a frequency of once per week or as required by the ROICC. The meetings will be held at the project site and will be attended by the ROICC, ROICC CMT, Project Superintendent, SSHO, and PQCM. The PQCM will notify the ROICC at least 48 hours in advance of each meeting. The following will be covered at each meeting:

- Review the minutes of the previous meeting.
- Review the schedule:
  - Work or testing accomplished since last meeting
  - Rework items identified since last meeting
  - Rework items completed since last meeting
- Review the status of submittals:
  - Submittals reviewed and approved since last meeting
  - Submittals required in the near future
- Review the work to be accomplished in the following 2 weeks, documentation required, and schedule for the three phases of control and testing:
  - Establish completion date for rework items
  - Required preparatory phase inspections
  - Required initial phase inspections

  - Required follow-up phase inspections
  - Required testing
  - Status of off-site work or testing
  - Required documentation

- Identify deficient conditions.
- Resolve QC and production problems.
- Address items that may require revisions to the PCQC Plan.

7.0 INSPECTION

This section discusses the inspection process for the DFWs that will ensure compliance with the contract. The DFWs for this project are identified in Section 3.0 and listed in Table 3-1.

The PCQC Plan includes implementing the following three control phases for all aspects of the work specified:

- Preparatory phase
- Initial phase
- Follow-up phase

7.1 PREPARATORY PHASE INSPECTION

The PQCM will conduct preparatory phase inspections prior to starting the DFWs listed in Table 3-1 with the exception of the environmental resources survey, mobilization, and demobilization. These inspections will include the following:

- Review the project-specific plans (e.g., Work Plan, APP/SSHP, and SAP).
- Ensure that all required procurement forms for supplies and services are approved.
- Ensure that provisions have been made to provide the required QC inspection.
- Ensure that all personnel have the required training and certifications needed to perform the work.
- Examine the work area to ensure that all required preliminary work has been completed and is in compliance with the approved project plans.
- Examine the required materials and equipment to ensure that they are properly delivered to the site, conform to specifications, and are properly stored.
- Review the appropriate AHAs to ensure that safety requirements are met.
- Discuss procedures for performing the work, including potential repetitive deficiencies.
- Document workmanship standards for the particular phase of work.
- Ensure that the PCQC Plan for the work to be performed has been accepted by the DON.

The PQCM will conduct frequent internal inspections of mobilization and demobilization. The PQCM is not required to notify the DON or the PjM prior to these inspections.

The PjM, RPM, and ROICC will be notified at least 2 working days in advance of each preparatory phase activity. This phase will include a meeting conducted by the PQCM and attended by the Project Superintendent and any personnel involved in performing the DFW. When a subcontractor will accomplish a DFW, that subcontractor foreman will attend the preparatory phase meeting.

The issues discussed during the preparatory phase meetings will be documented on the Preparatory Inspection Checklist (Attachment 1). The PQCM will explain the acceptable level of workmanship required to personnel performing work activities.

7.2 INITIAL PHASE INSPECTION

An initial inspection will be performed at the beginning of a DFW and will include the following:

- Check preliminary work to ensure that it is in compliance with contract requirements.
- Review the Inspection Checklist documenting results of the preparatory meeting.
- Verify full contract compliance, including required control inspections.
- Establish the required level of workmanship, testing, and inspection to ensure that work meets minimum acceptable standards.
- Resolve all differences.
- Check safety requirements to include compliance with and upgrading of the APP/SSHP and AHAs.

The PjM, RPM, and ROICC will be notified at least 2 working days in advance of each initial phase activity. The PQCM will document initial inspections for each item using the Initial Phase Inspection Checklist developed from the Construction Specifications (Design Report) and attach it to the daily CQC Report. The location of the initial phase inspection and documentation will be identified for future reference and comparison with follow-up inspections.

The initial phase inspection will be reviewed each time a new crew arrives on-site or when DFWs change.

7.3 FOLLOW-UP PHASE INSPECTION

During the completion of a particular DFW, follow-up inspections will be conducted to ensure compliance with contract requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed. Each follow-up inspection will be documented on the daily CQC Report. A Follow-up Inspection Checklist will be generated for any deficient conditions identified during the initial inspection and attached to the daily CQC Report when all items are resolved. A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase.

7.4 RECEIPT INSPECTION

The PQCM will conduct inspections of materials prior to their use and installation. These inspections will be documented on a receipt inspection form and maintained on-site. Any material(s) that does not meet design specifications will be rejected and returned to the vendor. Nonconforming material will be segregated and marked accordingly, to prevent inadvertent use. The PQCM will record on the daily CQC Report that a material inspection was performed.

7.5 ADDITIONAL INSPECTIONS

The PQCM may conduct additional inspections on the same DFWs under the following circumstances:

- If the quality of ongoing work is unacceptable as determined by the PQCM, PjM, Project Superintendent, RPM, or ROICC
- If the quality of the work is suspected of being below the established criteria of acceptance
- If work on a DFW is resumed after a 2-month period of inactivity
- If other problems develop

7.6 COMPLETION INSPECTION

Completion inspections will be performed as summarized in this section.

7.6.1 Construction Quality Control Completion Inspections

The PQCM will conduct a detailed inspection prior to the prefinal inspection, when all the work or an increment of work is deemed to be substantially complete. The work will be inspected for conformance to plans and specifications, workmanship, and completeness. The PQCM will prepare an itemized list of work that does not conform to plans and specifications, inferior workmanship, or incomplete work. The list will also include outstanding administrative items, such as record (as-built) drawings. The list will be included in the QC documentation and submitted to the PjM following the inspection and will specify an estimated date for correction of each deficiency. The completion inspection will be documented on the Completion Inspection Checklist.

7.6.2 Prefinal Inspection

The PjM or designated representative will conduct the prefinal inspection. The RPM, ROICC, PQCM, Project Superintendent, and other primary management representative(s), as applicable, will attend. The PjM will schedule the prefinal inspection when notified by the PQCM that the work is ready for inspection. The PQCM is required to verify at this time that all specific items previously identified as being unacceptable, along with all remaining project work, will be complete and acceptable by the date scheduled for the prefinal inspection. At this inspection, the ROICC will develop a list of incomplete and/or unacceptable work performed under the contract and will provide this list to TtEC.

7.6.3 Final Acceptance Inspection

The PjM will schedule the final acceptance inspection based on notification from the PQCM of readiness. The RPM, Project Superintendent, ROICC, PQCM, and other primary management representative(s), as applicable, will attend. Notification will be provided prior to the planned final acceptance inspection date and will include verification that all specific items previously identified as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection.

7.7 INSPECTION DOCUMENTATION

The PQCM is responsible for maintaining the inspection records. Inspection records will be legible and clearly provide all information necessary to verify that the items or activities inspected conform to the specified requirements. In the case of nonconforming conditions, the PQCM will provide evidence that the conditions were brought into conformance or otherwise accepted by the ROICC. All inspection records will be made available to the DON.

8.0 DOCUMENTATION

Preparation, review, approval, and issuance of documents affecting quality will be controlled to the extent necessary to ensure compliance to specified requirements. Project documents that will be controlled, if issued, include the following:

- Meeting minutes, conference notes, and confirmation notes
- Submittal Register
- Inspection documentation
- Contractor Production Report
- Daily CQC Report
- Material inspection and shipping logs
- NCRs
- NCR log
- FCRs
- Rework Items list
- Photograph log
- Field logbooks

8.1 DAILY CONTRACTOR QUALITY CONTROL REPORT

The PQCM is responsible for maintenance of current records of QC operation, activities, inspections, and tests performed, including the work of subcontractors and suppliers. The records will include factual evidence that the required QC activities and tests were performed. The daily CQC Report will be completed to document site activities covered by the PCQC Plan and will include:

- Records of inspection and/or testing performed
- Identification and location of each DFW and its current phase (preparatory, initial, follow-up) of completion
- Results of inspections and/or testing
- Location and description of deficiencies
- Deficiencies corrected as of the date of the report
- Rework items
- Deviations from plans, difficulties, and resolution

- Test and/or control activities performed with results and references to specifications and/or plan requirements, including the control phase (preparatory, initial, and follow-up) and deficiencies (along with corrective action)
- Material received, with statement as to its acceptability and storage
- Submittals reviewed with contract reference, reviewer, and action taken
- Off-site surveillance activities, including actions taken

The records will describe both conforming and nonconforming features and include a statement that equipment and materials incorporated in the work, and the workmanship, comply with the contract. The daily CQC Report attached to the Contractor Production Report will be furnished to the ROICC by 10:00 a.m. on the first work day following the date covered by the report, or as agreed to by the ROICC. The report need not be submitted for days in which no work is performed. At a minimum, one report will be prepared and submitted for every 7 days of no work and on the last day of a no-work period. All calendar days will be accounted for throughout the life of the contract. The first report following a day of no work will summarize work for that day only. Copies of the reports will be maintained on-site and will be available for review during business hours.

The daily CQC Report will be signed and dated by the PQCM and contain the following statement: "On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and to the best of my knowledge, except as noted in this report." Other appropriate personnel, including subcontractors responsible for completion of activities, will sign and date the report as required. The report will include copies of test reports.

8.2 CONTRACTOR PRODUCTION REPORT

The Contractor Production Report will be prepared for each day work is performed and will be attached to the daily CQC Report prepared for the same day. The Contractor Production Report will be prepared, signed, and dated by the Project Superintendent or designated representative, and will contain the following information:

- Contractor and subcontractor(s) and their area of responsibility
- Trades working on the project that day and number of personnel
- Operating equipment, with hours worked, idle, or down for repair
- Work performed that day, including location, description, weather conditions, and who did the work
- Any delays encountered
- Site visitors and the purpose of the visit

- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given and/or received and conflicts in plans and/or specifications
- Contractor's verification statement

8.3 LOGBOOKS

The PQCM will maintain a logbook to document QC activities. The information in the logbook is intended to serve as a phone log and memory aide in the preparation of the daily CQC Report and in addressing follow-up questions that may arise.

8.4 PHOTOGRAPHS AND PHOTOGRAPH LOGS

The PQCM will maintain photographs and a photograph log to document site activities. Each photograph will have a date and time stamp on it or the photograph will show a sign board documenting the date and time clearly and legibly. The photograph log will identify each photograph by date, time, location, and activity.

8.5 CONFERENCE NOTES AND CONFIRMATION NOTES

In addition to other required documentation, the PQCM is responsible for taking notes and preparing the reports of all conferences. Conference notes will be typed and the original report furnished to the DON within 5 days of the date of the conference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include the following:

- Date and place the conference was held
- List of attendees, including name, organization, and telephone number
- Comments made during the conference and decisions affecting criteria changes
- Conference notes that augment the written comments

The PjM is also responsible for providing a record of all discussions, verbal directions, telephone conversations, and so forth in which TtEC personnel or their representatives participate on matters relating to this contract and work. These records, titled Confirmation Notices, will be numbered sequentially and will fully identify participating personnel, subject discussed, and any conclusions reached. The PjM or designated representative will forward a reproducible copy of the confirmation notices to the DON RPM and ROICC within 5 working days.

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9.0 CHANGE MANAGEMENT

This section describes the DCN and FCR, the two main vehicles to document project changes.

9.1 DESIGN CHANGE NOTICES

The following sections detail the identification, preparation, and review and approval process for DCNs.

9.1.1 Identification

Any member of the Project Team may identify the need for a change to the design specifications or drawings. The Project Team member will notify the Field Engineer, who will evaluate the request and initiate a DCN, if determined necessary.

9.1.2 Preparation

The Field Engineer will generate a DCN form (Appendix A) and submit it to the Design Engineer for review and disposition. The DCN will identify the specification requirements, the proposed change, and the reason for the change.

9.1.3 Review and Approval

The PjM, Project Superintendent, and PQCM will review and approve the DCN. It is the responsibility of the PjM to gain the approval of the DON for the DCN prior to making any changes identified on the DCN.

9.1.4 Implementation of Approved DCNs

The Project Superintendent is responsible for the implementation of approved DCNs.

9.1.5 Records

Each approved DCN will be sequentially numbered as follows:

DCN-CTO X-YY

Where:

X is the task order number and YY is the DCN number, beginning with 01.

A DCN log will be maintained by the PQCM and will provide the DCN number, date of DCN, and brief description of contents.

Each DCN will be copied to all the management signatories, the Project Superintendent, PQCM, SSHO, and other personnel as deemed appropriate by the PjM.

Copies of the approved DCN will be posted or otherwise included in daily site briefings as appropriate to ensure that all site personnel are aware of the changes to the task order program. Copies of the DCN will be issued to all holders of controlled copies. DCNs are required to be maintained with the controlled copy of the changed document.

9.2 FIELD CHANGE REQUEST

Site personnel will document changes to the approved plans (except the design specifications and drawings) in the field through the FCR form (Appendix A). At a minimum, the following information will be documented in the FCR form:

- Project name
- CTO number
- FCR number
- Documents to which a change is requested (including revision number if applicable)
- Description of the item or condition for which the change is requested
- Reason for the change
- Recommended disposition
- Cost and schedule implication of the change, if any
- Approval of disciplines
- Approval of the PjM, Project Superintendent, PQCM, PESM, and QCPM and concurrence from the RPM or ROICC

10.0 NONCONFORMANCE

All deficiencies or nonconforming conditions discovered during inspections or other QC functions will be noted on either a Deficiency Notice (DN) or an NCR, as appropriate.

A DN is used to document the failure to develop, document, or implement effectively any applicable element of approved plans or to follow established procedures. A deficiency could lead to a nonconformance.

An NCR is used to document a nonconforming condition that renders the quality of an item, process, or product that has been defined in the specifications or drawings as unacceptable or indeterminate.

Copies of these forms are provided in Appendix A along with the logs used for tracking these documents. All deficiencies and nonconforming conditions will be resolved prior to completion of the project and in the timeliest manner possible. The DN will be used for all conditions that do not affect the final work product. An NCR will be used when a condition may affect the final work product.

The PQCM will be notified of all deficiencies and nonconforming conditions identified during the course of the field activities to ensure that each of these occurrences is documented, reported, and tracked, and that corrective actions are taken and follow-up verification is conducted.

The PQCM will also document deficiencies and nonconforming conditions in the daily CQC Report, noting the items found to be deficient or nonconforming; the date, time, and location; the person who identified the deficiency or nonconformance; and the status of the item to which the deficiency or nonconformance applies.

The PQCM will update the status of the deficiency when it changes. Before the work activities of the day begin, the PQCM will note the deficiencies or nonconforming conditions that require follow-up verification that day. New or changed status will be entered into the file at the end of each day. The daily CQC Report will document completion of the corrective action for each deficiency or nonconformance for that day. Nonconforming conditions or deficiencies that require rework for resolution will be noted on the Rework Items List included in Appendix A.

10.1 ROOT CAUSE ANALYSIS

The DN and the NCR forms both include space to enter information regarding the cause of the problem and the proposed resolution. The determination of the root cause of a deficiency or nonconformance is an integral part of the QC process. Root cause analysis will be made by the

PQCM in conjunction with other appropriate site personnel such as the Project Superintendent and the SSHO. Criteria considered in the analysis will include:

- Staff qualifications and training
- Adequacy of procedures and methods
- Adequacy of equipment
- Adequacy of QC measures

Input will be obtained, as necessary, from field staff and technical advisors in order to identify the factors that led to the problem.

10.2 CORRECTIVE ACTION

Following the root cause analysis, the PQCM will evaluate potential solutions (corrective actions) to determine which remedy is most effective in correcting the problem. This process will include all appropriate staff. Potential remedies considered will include:

- Supplemental staff training
- Changes of equipment or modification of equipment currently in use
- Acquisition of supplemental equipment
- Implementation of new procedures or modification of existing procedures
- Changes in QC procedures

Final approval of all remedies will be the responsibility of the PjM.

Successful implementation of corrective action will be documented by the PQCM in the appropriate areas of the DN or NCR. This documentation will be supported by changes to the inspection procedures or schedule as warranted (i.e., the PQCM will not certify that corrective action has been taken until inspection of the actions and the resulting changes in the program are complete).

10.3 CONDITION REQUIRING STOP WORK

If corrective actions are insufficient, resolution cannot be reached, or results of prior work are indeterminate, work may be stopped. The PQCM will notify the QCPM and direct the PjM to suspend work associated with the nonconformance until corrective action is complete. If there is a disagreement between the PQCM and the PjM, the difference will be brought to the attention of the QCPM until resolution is achieved.

The conditions of the suspension of work will be described in detail on the daily CQC Report and on the Rework Items List, if corrective action is not completed by the end of the working day. Work will not continue until directed by the individual who authorized it.

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11.0 QUALITY MANAGEMENT

In addition to the required QC field inspections, the TtEC Quality Program requires a quality management overview of the site QA/QC Program implementation. The PQCM will perform regular internal QC checks on the site implementation of the QA/QC Program. Reports of any deficiencies will be provided to the PjM for corrective action.

Inspections will be performed and checked for the following:

- Conformance with the Execution Plan and associated plans
- Thoroughness of performance
- Identification and completeness of documentation generated during performance

The PQCM will maintain a list of work items that do not comply with the contract and identify each item that needs rework, the date the item was discovered, the date the item will be corrected, and the date the item was corrected.

The PQCM will ensure that as-built drawings are kept current on a daily basis. The PQCM (or designee) will initial each revision. At the end of the project, updated as-built drawings will be submitted.

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12.0 REFERENCES

E&E (Ecology and Environment, Inc.). 1983. Initial Assessment Study, Naval Air Station, Alameda, California. Prepared for the Department of the Navy, Navy Assessment and Control of Installation Pollutants Department, Naval Energy and Environmental Support Activity, Port Hueneme, CA.

NAVFAC (Naval Facilities Engineering Command). 2006. Unified Facilities Guide Specification (UFGS) 01330, Submittal Procedures. January.

TtEC (Tetra Tech EC, Inc.). 2010. Program Construction Quality Control Management Plan. March.

USACE (United States Army Corps of Engineers). 2008. Safety and Health Requirements Manual. EM 385-1-1. September 15.

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TABLES

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TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	THE FOLLOWING ACTIVITIES WILL BE VERIFIED BY THE PQCM
Mobilization and Site Setup #40	Preparatory, initial, and follow-up phase inspections are not applicable to mobilization. However, the following list of controls must be met: • Verify schedule notification with the RPM, ROICC and CSO. • Verify that all pertinent permitting and notifications have been initiated. • Verify that all pertinent meetings have been held. • Verify that all material and contractor procurements are in place. • Verify that all pertinent documents are approved. • Review the RAWP. • Verify that all site personnel, including contractors, have submitted health and safety and qualification documentation, and are prequalified by Program Health and Safety Manager. • Review all applicable regulations and base requirements for traffic control and equipment operation. • Verify that required equipment and materials are on hand to conduct work in accordance with RAWP and procurement documents. • Review the AHAs for this activity. • Verify that an Operation Readiness Review has been conducted. • Verify base traffic patterns and requirements. Traffic control will be carried out in accordance with the approved Traffic Control Plan. • Check compliance with APP/SSHP and task AHAs. • Verify radiological training, health and safety training and site orientation of all field personnel. • Verify the establishment of staging area and general support area. • Verify compliance with RAWP requirements. • Verify any electrical work to connect trailers or other systems are done by a certified electrician. • Verify that the proper materials are on hand and comply with specifications. • Verify that stockpiles are managed per the RAWP. • Inspect stockpiles daily per the EPP.

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	THE FOLLOWING ACTIVITIES WILL BE VERIFIED BY THE PQCM
Environmental Resources Survey #41	Preparatory, initial, and follow-up phase inspections are not applicable to the environmental resources surveying. However, the following list of controls must be met: • Review survey areas as identified in the Environmental Protection Plan. • Verify that RPM has been notified about the environmental survey. • Verify that ROICC has been notified. • Review AHAs. • Verify that a project kickoff meeting was held. • Verify that project kickoff meeting minutes were prepared, reviewed, and distributed. • Verify the qualifications of TtEC's wildlife biologist. • Verify that the biological resource requirements have been met. • Inspect record for biological resources awareness training for all workers. • Inspect environmental survey documentation. • Verify that qualified SSHO is present at active work areas. • Verify that site activities are being photographed. • Verify that environmental resource survey is conducted in all areas where field activities will take place and adjacent areas. • Ensure that sensitive locations at the site are delineated and work crews are aware of any restricted areas. • Verify that photographs are logged and stored.

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Installation of Temporary Fencing and Gates #40	• Review site drawings and fence specification. • Verify that site security and radiological posting requirements have been reviewed.		• Verify that fence is installed as shown in the site plan drawing and in accordance with specifications. • Verify that site security and radiological posting requirements have been followed.		• Inspect fence installation.	
Implementation of Temporary Erosion and Sediment Control Measures #41	• Ensure that a site plan identifying sensitive areas is prepared. • Ensure that the SWPPP has been reviewed with ROICC. • Review AHA(s) for this activity. • Ensure equipment and products are appropriate for work and are stored on-site. • Verify that material and equipment for erosion control measures meet requirements of RAWP and SWPPP.		• Identify inspection requirements. • Identify sensitive areas in field.		• Inspect field control BMPs. • Ensure and verify implementation of erosion control measures. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Removal and Abandonment Existing Site Facilities including but not limited to Gas Probes, Weir Structure and Passive Gas Venting System #42	• Verify that the ROICC and CSO have been notified. • Verify that a site plan identifying sensitive areas has been prepared. • Verify that the SWMP has been reviewed with the ROICC. • Verify that training requirements are met for all personnel. • Verify that proper equipment is on site to perform work. • Review the RAWP and Design Plan. • Review the AHAs. • Verify that PPE is available and meets the requirements of the HASP. • Verify that radiation awareness training has been completed and that training is documented. • Verify that designated personnel have assigned dosimeters.		• Verify that the RCT and SSHO are present in an active work area. • Verify that air monitoring and initial baseline sampling are being performed per HASP. • Verify that required dosimetry is being worn. • Verify that all personnel have signed the RWP(s). • Verify that the removal protocols, as described in the RAWP and Design Plan, are being followed. • Verify that site activities are being photographed.		• Verify that an RCT and SSHO are present in an active work area. • Verify that airborne concentrations do not exceed the established levels. • Verify that air and water samples are collected as required. • Verify that required dosimetry is being worn. • Verify that daily safety briefings discuss status of RWP(s). • Verify that RWP is available at the work location. • Verify that RWP is modified in the event of changes to the conditions. • Verify that tools, material, and equipment are cleaned, wiped down, and surveyed prior to removal.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Topographical Surveys #41	• Verify that RPM have been notified. • Verify the land surveyors are licensed in the State of California • Verify that survey instrument certification is current and in good condition. • Verify that sensitive locations at the site are delineated and work crews are aware of restricted areas. • Review control points. • Review AHAs. • Review the RAWP and Design Plan and drawings for this activity. • Review boundaries and extent of survey. • Verify that radiation awareness training has been completed and that training is documented.		• Verify that SSHO is present at active work areas. • Verify that surveyor understands the work scope and coordinates system to be used. • Verify the measurement of grid system. • Verify that site activities are being photographed. • Verify that settlement monuments are placed on the final landfill service in accordance to the design		• Verify that SSHO is present at active work areas. • Verify that pre-excavation drawings/maps are complete and correct. • Verify that survey includes limits of excavation and identifiable features. • Verify that boundaries of survey have been met. • Verify that nodes of each grid system are marked. • Verify that photographs are logged and stored. • Verify that site activities are being photographed.	
Clearing of Vegetation and Debris #42	• Verify that PPE is available and meets requirements of the SSHP. • Verify boundaries and features for vegetation and debris clearance are established in the field based on design drawing and pre-construction surveys. • Verify that the area has been walked/visually inspected for items that could interfere with clearing (utilities, rebar, etc.). • Verify that biological awareness training has been completed and that training is documented. • Review AHAs.		• Verify that SSHO is present at active work areas. • Verify that vegetation and/or debris is removed throughout the designated excavation area. • Verify that the activity is photographed. • Verify that waste vegetation and/or debris is being managed as required.		• Verify that vegetation is disposed of in accordance with the RAWP requirements, and that the stockpile locations are cleaned up. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Excavations, Backfill Placement, and Compaction of Excavated Waste Areas (if required) #43	• Review work with ROICC and verify work area. • Verify that an OSHA excavation permit is on site. • Verify that equipment and material are surveyed for radiation and survey results are documented. • Review RAWP and project schedule. • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment. • Ensure dust control measures are in place per the RAWP. • Review AHA(s) for this activity. Verify that PPE is available and meets the requirements of the APP/SSHP and RWP. • Verify that radiation awareness training has been completed and documented. • Verify that all personnel have assigned dosimeters • Verify that the RWP is in place and that all workers have read the requirements. • Verify that compaction equipment is available. • Review the RAWP and construction specifications to verify that adequate material is available for fill and site has been surveyed.		• Ensure that materials and equipment delivered to the site are as identified in the RAWP. • Verify equipment operation maintenance and safety conditions. • Verify that excavation boundary is properly delineated. • Verify that excavation is conducted per RSOR instructions. • Verify that contractor has required health and safety documentation. • Verify that backfill placement and compaction are completed in accordance with the plans and specifications.		• Protect work area from water runoff. • Verify correct excavation depth and limits • Survey excavation depth and limits • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Conduct ongoing inspection of backfilling and compaction operation. • Verify that backfill placement and compaction are completed in accordance with the plans and specifications. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Screening of Potentially Radiologically Impacted Materials #44	• Verify that the DON and the RASO have been notified and verify the work area. • Verify that stormwater BMP requirements have been reviewed. • Verify that proper equipment is on-site to perform work. • Review the RAWP. • Review AHAs. • Verify that radiation awareness training has been completed and that training is documented. • Verify that dust control and erosion control measures are in place per the RAWP. • Verify that designated personnel have assigned dosimeters. • Verify that material and equipment for erosion control meet requirements for stormwater at the site. • Verify that equipment and products are appropriate for work and are stored on site. • Verify that materials and equipment delivered to the site are as identified in the RAWP. • Verify that safety checks on all heavy equipment have been completed. • Verify that all equipment operators are certified to operate the equipment and completed radiological training. • Review AHAs for this activity.		• Verify that stormwater BMPs are implemented. • Verify equipment maintenance and safety conditions. • Verify that sediment free of radioactive debris is segregated and placed in the proper stockpile area. • Verify that the background reference area measurements for each instrument being used to survey have been obtained using the procedure described in the RAWP. • Verify that daily checks are performed on all portable survey instruments. • Verify that required dosimetry is being worn. • Verify that the RWP is available at the work site. • Verify that field logbooks and proper forms are in use. • Verify that measurements are being collected in accordance with the RAWP and relevant SOPs.		• Inspect field control BMPs. • Verify implementation of the stormwater BMPs. • Verify that work area is protected from water runoff. • Verify that all radiological safety procedures are being followed. • Verify equipment maintenance and safety. • Verify that any suspected material location is marked, flagged, and documented. • Verify that daily instrument checks and background measurements are obtained and documented. • Verify that survey results are documented as required by the RAWP and SOPs. • Verify that RWP is available at the work site. • Verify that personnel have read and signed the revised RWP, if revision is required. • Verify that survey data and sample analysis results are reviewed and approved as required per the RAWP and SOPs.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Potentially Radiologically Impacted Materials (continued) #44	• Verify that the relevant SOPs and/or manufacturers' instructions are available and have been reviewed for equipment to be used for radiological surveys. • Verify that dust control and erosion control measures are in place per the RAWP. • Verify that background reference area(s) for instrument background determinations have been identified. • Verify current calibration of survey instrument. • Verify that a daily operation check instrument logbook or data sheet is available.		• See above		• See above	
Radiological Surveys including Personnel and Equipment #44	• Verify that the RPM, RASO, and CSO are notified. • Verify that an approved RWP is available and has been read and signed by assigned personnel. • Verify that the RAWP and AHAs have been reviewed. • Verify that assigned personnel are trained and qualified. • Verify that training record documentation is being maintained. • Verify that personnel have been given an emergency notification procedure. • Verify that workers assigned dosimetry have completed NRC Form 4.		• Verify that radiological instruments are as specified in the RAWP. • Verify that a qualified RCT and SSHO are present at active work areas. • Verify that site activities are being photographed. • Verify that the background reference area measurements for each instrument being used to survey have been obtained using the procedure described in the RAWP		• Verify that the site is properly posted and secured, if necessary. • Conduct ongoing inspection of material and equipment. • Verify that a qualified RCT and SSHO are present at active work areas. • Verify that required dosimetry is being worn. • Verify that any suspected material location is marked, flagged, and documented. • Verify that daily instrument checks and background measurements are obtained and documented.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Radiological Surveys including Personnel and Equipment (continued) #44	• Verify that the relevant SOPs and/or manufacturers' instructions are available and have been reviewed for equipment to be used for radiological surveys. • Verify that the limits and boundaries of surveys have been established and are understood. • Verify background reference area(s) for instrument background determinations has been identified. • Verify that calibration of survey instrument is current. • Verify that equipment is on site. • Verify that instrument a daily operation check logbook or data sheet is available		• Verify that daily checks are performed on all portable survey instruments. • Verify that required dosimetry is being worn. • Verify that the RWP is available at the work site. • Verify that field logbooks and proper forms are in use. • Verify that measurements are being collected in accordance with the RAWP, SAP, and relevant SOPs. • Verify that the limits and boundaries of the survey are being met.		• Verify that survey results are documented as required by the RAWP and SOPs. • Verify that the RWP is available at the work site. • Verify that personnel have read and signed the revised RWP, if revision is required. • Verify that survey data and sample analysis results are reviewed as required by the RAWP, SAP, and SOPs. • Verify that survey activities conform to the RAWP and SOPs. • Verify that the boundaries of the survey have been met. • Verify that survey instrument is recalibrated after repairs or modifications. • Verify that personnel surveys are performed for all personnel leaving a radiologically controlled area. • Verify that equipment surveys are performed for all equipment leaving a radiologically controlled area. • Verify that the RASO is notified of discovered radioactive material. • Verify that areas known or suspected to contain radioactive material are isolated.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Subgrade Placement #43	• Ensure that subgrade material complies with specifications. • Review work with ROICC and verify work area. • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity • Verify that radiation awareness training has been completed and documented. • Verify that all personnel have assigned dosimeters • Verify that the RWP is in place and that all workers have read the requirements. • Verify grading plan is finalized and land surveyors have correct data.		• Ensure that materials and equipment delivered to the site are as identified in the RAWP. • Ensure on-site geotechnical quality assurance contractor is on-site and results are being logged in the field. • Verify that appropriate soil tests are being conducted in accordance with specifications.		• Inspect operation and ensure that materials meet gradation specifications. • Protect work area from water runoff. • Complete Test Log entries. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	
Characterization Survey of Subgrade #44	• Verify that the ROICC and CSO have been notified. • Review AHAs. • Review the RAWP and SSHP. • Verify that radiation awareness training has been completed and training is documented. • Verify that designated personnel have assigned dosimeters and completed the NRC Form 4. • Verify that PPE is available. • Verify background areas approved. • Verify VTA equipment is in working order.		• Verify that the RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Verify VTA data collection rates in accordance with specifications • Verify GPS systems control coordinates		• Verify that the RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Conduct ongoing inspection of decontamination and survey activities. • Verify that site activities are being photographed. • Verify that survey forms are properly completed and stored. • Verify the grid layouts in in accordance with the RAWP.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Biotic Barrier (Geonet Layer) Placement #46	• Verify that geonet data meet project requirements and specifications. • Review work with ROICC and verify work area. • Review submittals from material suppliers and document in submittal register. • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment. • Verify that radiation awareness training has been completed and documented. • Verify that all personnel have assigned dosimeters • Verify that the RWP is in place and that all workers have read the requirements • Review AHA(s) for this activity.		• Ensure that placement of geonet is conducted per specifications. • Ensure that materials and equipment delivered to the site are as identified in the RAWP. • Verify that contractor has required health and safety documentation. • Ensure geotechnical testing contractor is on-site and results are being logged in the field.		• Protect work area from water runoff. • Complete Test Log entries. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	
Installation of the Multilayer Soil Cover System and Access Road #47	• Ensure that soil material complies with specifications. • Review work with ROICC and verify work area. • Review the design plans • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity • Verify that radiation awareness training has been completed and documented.		• Ensure that materials and equipment delivered to the site are as identified in the RAWP. • Ensure on-site geotechnical quality assurance contractor is on-site and results are being logged in the field. • Verify that appropriate soil tests are being conducted in accordance with specifications.		• Inspect operation and ensure that materials meet gradation specifications. • Review compaction data. • Protect work area from water runoff. • Complete Test Log entries. • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Protect work area from water runoff.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Installation of the Multilayer Soil Cover System and Access Road (continued) #47	• Verify that all personnel have assigned dosimeters • Verify that the RWP is in place and that all workers have read the requirements. • Verify grading plan is finalized and land surveyors have correct data. • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment.		• Verify grades and location of access road. • Verify depth of access road			
Final Erosion Control Drainage Installation #51	• Ensure that concrete complies with specifications. • Review work with ROICC and verify work area. • Review submittals from contractors. • Review design plans • Verify geotechnical laboratory meet project requirements. • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity.		• Ensure that materials and equipment delivered to the site are as identified in the RAWP and Design documents • Verify reinforcement requirements and inspect areas prior to any concrete pour.		• Protect work area from water runoff. • Verify that boundaries of survey have been met. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Installation of Gas Probes and Passive Gas Venting System #51	• Verify that the ROICC and CSO have been notified. • Verify that a site plan identifying sensitive areas has been prepared. • Verify that the WMP has been reviewed with the ROICC.		• Verify that the RCT and SSHO are present in an active work area. • Verify that air monitoring and initial baseline sampling are being performed per HASP. • Verify that required dosimetry is being worn. • Verify that all personnel have signed the RWP(s). • Verify that the removal protocols, as described in the RAWP and Design Plan, are being followed. • Verify that site activities are being photographed. • Verify that well, probe and venting system materials are being installed in accordance with specifications. • Verify proper decontamination procedures are being followed.		• Verify that an RCT and SSHO are present in an active work area. • Verify that airborne concentrations do not exceed the established levels. • Verify that soil and water samples are collected as required. • Verify that required dosimetry is being worn. • Verify that daily safety briefings discuss status of RWP(s). • Verify that RWP is available at the work location. • Verify that RWP is modified in the event of changes to the conditions. • Verify that tools, material, and equipment are cleaned, wiped down, and surveyed prior to removal. • Verify installations are surveyed for as-built information • Verify well installation information is provided to the appropriate agencies.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Revegetation of the Work Area #54	• Review work with ROICC and verify work area. • Review submittals from contractors. • Review design plans • Review seed type • Review erosion mat specifications • Complete safety checks on all heavy equipment. • Ensure that all equipment operators are certified to operate the equipment. • Verify that radiation awareness training has been completed and documented. • Verify that all personnel have assigned dosimeters		• Verify proper seeds are being used. • Verify application rate. • Verify erosion control measures are in place. • Verify proper moisture is being maintained. • Verify erosion mat placed in accordance with specifications.		• Protect work area from water runoff. • Conduct ongoing inspection for moisture and verify that moisture content is maintained • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	
Final Status Survey of Final Grade #49	• Verify that the ROICC and CSO have been notified. • Review AHAs. • Review the RAWP and SSHP. • Verify that radiation awareness training has been completed and training is documented. • Verify that designated personnel have assigned dosimeters and completed the NRC Form 4. • Verify that PPE is available. • Verify that PPE is available. • Verify background areas approved.		• Verify that the RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Verify that up to 18 systematically located post-excavation samples are collected for each survey unit of the trench. • Verify that survey units are not greater than 1,000 m2		• Verify that the RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Conduct ongoing inspection of decontamination and survey activities. • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Verify that survey forms are properly completed and stored.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Final Status Survey of Final Grade (continued) #49	• Verify VTA equipment is in working order. • Verify GPS system is operable.		• Verify VTA data collection rates in accordance with specifications. • Verify GPS systems control coordinates.		• Verify the grid layout and sampling of the Final Status Survey units in accordance with the RAWP.	
Transportation and Disposal of Soil and Debris #55	• Verify that all transporters are authorized to haul the particular type of waste being transported. • Verify that the ROICC and CSO have been notified. • Review the RAWP and RWP for the portal monitor operations. • Verify that waste profiles have been approved by disposal sites. • Verify that the waste manifest has been approved and signed by DON representative. • Verify that locations of disposal with the ROICC have been confirmed. • Review submittal load tickets process from contractors. • Review the traffic pattern. • Review the road closure and traffic plan with ROICC and CSO. • Review signage requirements with ROICC and CSO. • Review truck decontamination requirements. • Review the AHA for this activity.		• Verify that all transporters are authorized to haul the particular type of waste being transported. • Verify trucks are passing portal monitor during ingress to the site and egress from the site. • Verify drivers sign manifest. • Verify that the contractor performs work as specified in the RAWP and Waste Management Plan. • Review load ticket record procedures. • Verify that truck decontamination is being conducted in accordance with the RAWP. • Verify sample collection and labeling of samples.		• Verify that data have been collected in compliance with the EPP. • Verify DOT labeling based on sample results and waste characterization. • Verify RSOR has monitored use of portal monitor • Verify manifest are signed and originals given to CSO • Verify that the contractor has provided delivery logs. • Verify that disposal loads are in accordance with the standard requirements of the RAWP. • Verify that all load tickets are accounted for.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

SCHEDULED ACTIVITY # and DESCRIPTION	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Installation of Permanent Site Features and Institutional Controls including but not limited to Settlement Monuments and Signage. #52 and #53	• Verify that the ROICC and CSO have been notified. • Verify that training requirements are met for all personnel. • Verify that proper equipment is on site to perform work. • Verify proper supplies are on site. • Review the RAWP and Design Plan. • Review the AHAs. • Verify that PPE is available and meets the requirements of the HASP. • Verify that radiation awareness training has been completed and that training is documented. • Verify that designated personnel have assigned dosimeters • Verify California licensed surveyors have been procured for the work.		• Verify that the RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Verify that all personnel have signed the RWP(s). • Verify that the installation protocols, as described in the RAWP and Design Plan, are being followed. • Verify that site activities are being photographed. • Verify installations are in accordance with specifications. • Verify settlement monuments labeled properly. • Verified proper materials are in use.		• Verify that the RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Conduct ongoing inspection of work activities. • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Verify that the survey data is prepared in a format to be included in final reports and signed by licensed surveyor.	
Site Restoration and Demobilization #55	Preparatory, initial, and follow-up phase inspections are not applicable to site restoration, cleanup and final inspections. However, the following list of controls must be met: • Review applicable sections of RAWP and RWP. • Review the AHAs for this activity. • Verify that required equipment and materials are on hand to conduct work in accordance with the RAWP. • Verify that all equipment and materials have been decontaminated and removed from the site in accordance with the RWP. • Verify that all disposable equipment and materials have been collected and disposed of. • Inspect and verify that work was performed in accordance with the RAWP.					

TABLE 3-1

DEFINABLE FEATURES OF WORK

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
BMP – best management practice
CSO – Caretaker Site Office
DON – Department of the Navy
DOT – Department of Transportation
DPW – Department of Public Works
EPP – Environmental Protection Plan
GPS – global position system
NRC – Nuclear Regulatory Commission
OSHA – Occupation Safety and Health Administration
PPE – personal protective equipment
PQCM – Project Quality Control Manager
RASO – Radiological Affairs Support Office
RAWP – Remedial Action Work Plan
RCT – Radiological Control Technician
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
RSOR – Radiation Safety Officer Representative
RWP – Radiation Work Permit
SAP – Sampling and Analysis Plan
SSHO – Site Safety and Health Officer
SSHP – Site Safety and Health Plan
SWPPP – Stormwater Pollution Prevention Plan
TtEC – Tetra Tech EC, Inc.
VTA – vehicle towed array
WMP – Waste Management Plan

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FIGURES

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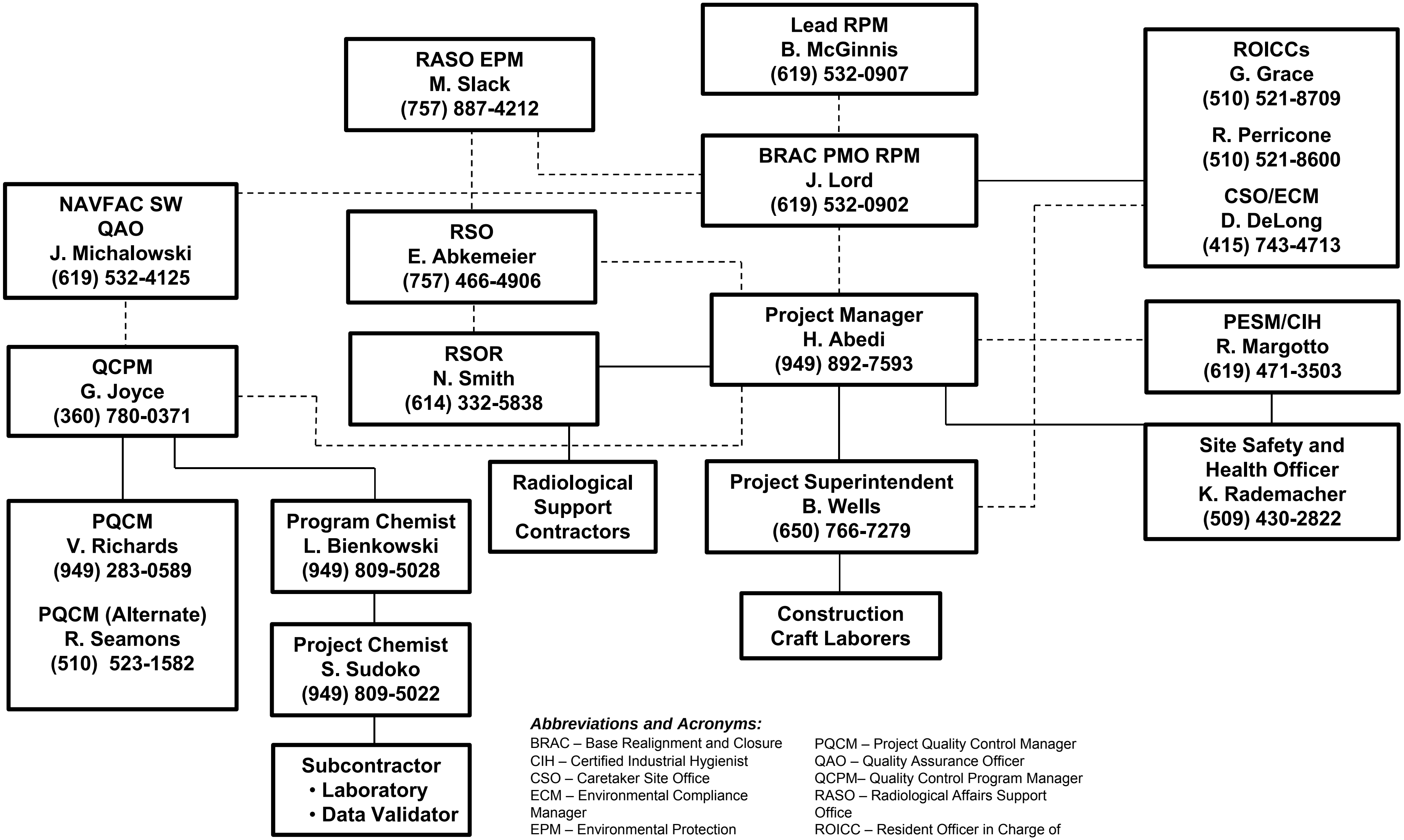
Figure 2-1
Project Organization Chart



Abbreviations and Acronyms:

BRAC – Base Realignment and Closure
CIH – Certified Industrial Hygienist
CSO – Caretaker Site Office
ECM – Environmental Compliance Manager
EPM – Environmental Protection Manager
NAVFAC SW – Naval Facilities Engineering Command Southwest
PESM – Project Environmental Safety Manager
PMO – Program Management Office
PQCM – Project Quality Control Manager
QAO – Quality Assurance Officer
QCPM– Quality Control Program Manager
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
RSO – Radiological Safety Officer
RSOR – Radiological Safety Officer Representative

Legend

- - - - - - = In regular contact and coordination
———— = Directly reports to above

APPENDIX A

CONTRACTOR QUALITY CONTROL FORMS
(on CD only)

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TETRA TECH EC, INC.		Date:
CONTRACTOR PRODUCTION REPORT	Page 1 of 1	

Contract No. N62473-10-D-0809	Title & Location:	Report No.

Contractor:	Superintendent:
AM Weather:	PM Weather:

Work Performed Today

Work Location & Description	Employer	Number	Trade	Hours

Was a job safety meeting held this date?	Yes:		Total work hours on site this date:	0.0
(If yes, attach a copy of meeting minutes.)	No:			
Were there any lost time accidents this date?	Yes:			
(If yes, attach a copy of completed OSHA report.)	No:		Cumulative work hours from previous report:	
Was trenching/scaffolding/HV electrical/high work done this date?	Yes:			
(If yes, attach statement or checklist showing inspection performed.)	No:			
Was hazardous material/waste released to the environment?	Yes:		Cumulative work hours since start of work:	
(If yes, attach description of incident and proposed action.)	No:			

List safety actions taken today/safety inspections conducted:

Remarks:

Contractor Superintendent

Date

CONTRACTOR PRODUCTION REPORT

Date: 1/0/1900

Contract No.	Title & Location:	Report No.
N62473-10-D-0809		0

Rental Equipment	Vendor	PO/MOA#	Charge #	Start Date	Rate	Daily Hrs	P.O.P. Expires

Materials	Vendor	PO #	Charge #	QTY REC'D	ACCUM QTY	P O QTY	P.O.P. Expires

Contractor Superintendent

01/00/00

Date

TETRA TECH EC, INC	REPORT NO:	
NAVFAC SW RADIOLOGICAL EMAC CONTRACT NO. N62473-10-D-0809 SAN DIEGO, CA	PROJECT:	
	PROJECT NO:	
	SUBCONTRACTOR:	
	LOWER TIER SUB:	
CONTRACTOR QUALITY CONTROL REPORT	DATE:	
	TASK:	
	LOCATION	

SEE CONTRACTOR DAILY PRODUCTION SUMMARY REPORT FOR INFORMATION ON SAFETY, WEATHER, SUBCONTRACTOR HOURS AND AREAS OF RESPONSIBILITY:

SUMMARY OF CONSTRUCTION PROGRESS AND QUALITY CONTROL ACTIVITIES PERFORMED:

Tests Performed and Results:

Materials Received:

Deficiencies Noted with Proposed or Implemented Corrective Action:

JOB SAFETY: (LIST OBSERVATIONS)

COMMENTS: ADDRESS ANY CHANGES (FCR/DCN), MEETING RESULTS OR OTHER INFORMATION

Contractor's Verification: On behalf of the Contractor, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications to the best of my knowledge, except as may be noted above.

NAME:	TITLE/COMPANY: PQCM
SIGNATURE:	DATE:

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

DEFICIENCY NOTICE

TASK ORDER # ____________________ DN # ____________________ DATE __________

LOCATION: ____________________ ROICC / RPM ____________________

1. Plan, Procedure, Specification, or Drawing (Clearly state the requirement)

2. Description of Deficiency

QC verification of corrective action required: **Yes** ________ **No** __________

Prepared by: ____________________ **Approved by:** ____________________

3. Corrective Action

Organization ____________________ Signature ____________________ Date __________

4.
Corrective action verified by: ____________________ Date ________

Comments:

Program Quality Control Manager ____________________ Date __________

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

DESIGN CHANGE NOTICE (DCN)

TASK ORDER # ____________ DCN # ____________ DATE ____________

LOCATION ____________ NTR / RPM ____________

1. **Document to be changed. Identify revision, date, section, drawing, etc.**

2. **Description of Change (Items involved, submit sketch, if applicable):** **(Use continuation sheet if necessary)**

Engineering "HOLD" placed on all activities in area defined herein pending receipt of formally revised document(s) and / or DCN.
Released for construction basis of modifications prescribed by this DCN.

3. **Reason for Change (Attach additional information if needed)**

4. Originator (Print name and sign)		Title	Date
Reviewed by: (Print name and sign)		Title	Date
Task Order Manager (Print name and sign)	Date	Program Quality Manager (Print name and sign)	Date
NTR Acknowledgement (Print name and sign)	Date	RPM Approval (Print name and sign)	Date

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

DESIGN CLARIFICATION REQUEST

TASK ORDER # ____________________ **DC#** _______________ **DATE** __________

Submitted to: ____

1. Document reference. Identify revision, date, section, drawing, etc.

2. Clearly state requirement or describe drawing as shown. (Attach additional info if needed)

3. Information requested or proposed change. (Attach additional information if needed)

4. Response

Does response require an FCR or DCN **YES** ☐ **NO** ☐

FCR ☐ **DCN** ☐

Task Order Manager (Print name and sign)	**Date**

TETRA TECH EC, INC.

NAVY RADIOLOGICAL ENVIRONMENTAL MULITPLE AWARD ACTION CONTRACT (Rad EMAC)

CONTRACT NO. N62473-10-D-0809

FIELD CHANGE REQUEST (FCR)

TASK ORDER # ____________ FCR # ____________ DATE ____________

LOCATION: ____________ NTR / RPM ____________

1. Document to be changed. Identify revision, date, section, drawing, etc.

2. Description of existing requirement and proposed change (Attach sheet if necessary)

3. Reason for Change (Attach sheet if necessary)

4. Originator: (print name and sign)		**Title**	**Date**
Reviewed by: (print name and sign)		**Title**	**Date**
Site Superintendent (Print name and sign)	**Date**	**Task Order Manager (Print name and sign)**	**Date**
TtEC Program QC Manager (Print Name and Sign)	**Date**	**NTR Acknowledgement (Print name and sign)**	**Date**

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

Initial Phase Inspection Checklist

Task Order No.: ____________________ Date: ______________
Definable Feature: ____________________ Spec Section: ______________

I. Personnel Present:

	Name	Position	Company / Government
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

(List additional personnel on reverse side)

II Identify full compliance with procedures identified at preparatory inspection. Coordinate plans, specifications, and submittals.
Comments:

III Preliminary Work. Ensure preliminary work is complete and correct. If not, what action is taken?
Actions:

IV Establish Levels of Workmanship

1. Where is the work located? ______________________________
2. Is a sample panel required? Yes ________ No ________
3. Will the initial wok be considered as a sample? Yes ________ No ________
   (If yes, maintain in present condition as long as possible.)

V Resolve any differences.
Comments:

VI Check Safety
1. Review job conditions using Site Health and Safety Plan and job hazard analysis.
2. Review job conditions using using EM-385-1-B151.

Comments:

____
Site CQC Representative

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

Initial Phase Inspection Checklist

Task Order No.: ____________________ Date: ________________
Definable Feature: ____________________ Spec Section: ________________
EFA Northwest Notified ____________________ Hours in Advance Yes ____ No ____

I. Personnel Present:

Name	Position	Company / Government
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

(List additional personnel on reverse side)

II Identify full compliance with procedures identified at preparatory inspection. Coordinate plans, specifications, and submittals.

Comments ____

III Preliminary Work. Ensure preliminary work is complete and correct. If not, what action is taken?

____

IV Establish Levels of Workmanship

1. Where is the work located? ______________________
2. Is a sample panel required? Yes ________ No ______
3. Will the initial wok be considered as a sample? Yes ________ No ______
   (If yes, maintain in present condition as long as possible.)

V Resolve any differences.

Comments ____

VI Check Safety

Review job conditions using Site Health and Safety Plan and job hazard analysis.

Initial Phase Inspection Checklist

Comments: ____________________

____

____

____
Site CQC Representative

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

MONTHLY REWORK ITEMS LIST

Task Order Number: ______________ Project: ______________ Date: ______

Number	Identification of item requiring rework	Date Identified	Date Corrected	Remarks

____
Site CQC Representative Date

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

NONCONFORMANCE REPORT

TASK ORDER # ______________________ **NCR#** ______________________ **DATE** __________

LOCATION: ______________________ **ROICC/RPM**

1. Plan, Procedure, Specification, or Drawing (Clearly state the requirement)

2. Description of Nonconforming Item or Condition

Did nonconforming condition require suspension of work activities Yes ☐ No ☐

If yes, explain requirement to restart work activities: ______________________

Prepared by:	Title	Date

3. Corrective Action

☐ use-as-is
☐ repair
☐ rework to specificaion
☐ other - specify: ______________________

Comments:

Organization	Signature	Date

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

NONCONFORMANCE REPORT

4. Evaluation of Proposed Disposition

Evaluator ______________________ Title ______________________

Accept	
Accept with comments	
Reject	
Reject with comments	

Comments:

Signature ______________________ Date ______

Evaluator ______________________ Title ______________________

Accept	
Accept with comments	
Reject	
Reject with comments	

Comments:

Signature ______________________ Date ______

5. Verification

Verification required Yes ☐ No ☐

Verified by: ______________________ ______________________ ______
Signature Title Date

Approved by: ______________________ ______
Program QC Manager Date

PREPARATORY PHASE CHECKLIST

(CONTINUED ON SECOND PAGE)

SPEC SECTION	DATE

CONTRACT NO	DEFINABLE FEATURE OF WORK	SCHEDULE ACT NO.	INDEX #

PERSONNEL PRESENT

GOVERNMENT REP NOTIFIED _____ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/GOVERNMENT

SUBMITTALS

REVIEW SUBMITTALS AND/OR SUBMITTAL REGISTER. HAVE ALL SUBMITTALS BEEN APPROVED? YES ☐ NO ☐

IF NO, WHAT ITEMS HAVE NOT BEEN SUBMITTED? ______________________

ARE ALL MATERIALS ON HAND? YES ☐ NO ☐

IF NO, WHAT ITEMS ARE MISSING? ______________________

CHECK APPROVED SUBMITTALS AGAINST DELIVERED MATERIAL. (THIS SHOULD BE DONE AS MATERIAL ARRIVES.)

COMMENTS: ______________________

MATERIAL STORAGE

ARE MATERIALS STORED PROPERLY? YES ☐ NO ☐

IF NO, WHAT ACTION IS TAKEN? ______________________

SPECIFICATIONS

REVIEW EACH PARAGRAPH OF SPECIFICATIONS. ______________________

DISCUSS PROCEDURE FOR ACCOMPLISHING THE WORK. ______________________

CLARIFY ANY DIFFERENCES. ______________________

PRELIMINARY WORK & PERMITS

ENSURE PRELIMINARY WORK IS CORRECT AND PERMITS ARE ON FILE.

IF NOT, WHAT ACTION IS TAKEN? ______________________

TESTING	IDENTIFY TEST TO BE PERFORMED, FREQUENCY, AND BY WHOM.
	WHEN REQUIRED?
	WHERE REQUIRED?
	REVIEW TESTING PLAN.
	HAS TEST FACILITIES BEEN APPROVED?
SAFETY	ACTIVITY HAZARD ANALYSIS APPROVED? YES ☐ NO ☐
	REVIEW APPLICABLE PORTION OF EM 385-1-1.
MEETING COMMENTS	NAVY/ROICC COMMENTS DURING MEETING.
OTHER ITEMS OR REMARKS	OTHER ITEMS OR REMARKS:

QC MANAGER DATE

COMPLETION INSPECTION CHECKLIST

Date	
Report No.	

Contract No.: N62473-10-D-0809, CTO No. 0009	Contract Title: CTO 0009 – IR Site 2, Alameda Point, Alameda California

Contract Specifications:

Major Definable Features of Work:

A. Open Punch list Items From Follow-Up Phase Checklist:

	Item	Date of Completion
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

B. New Punchlist Items Noted:

	Item	Date of Completion
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

C. ROICC NOTIFIED? ☐ Yes ☐ No

On behalf of Tetra Tech EC, Inc., I certify this activity is completely in accordance with the Contract Documents, based upon the information available to me.

Project Quality Control Manager

TtEC'S SUBMITTAL REGISTER

TITLE AND LOCATION: IR Site 2 Remedial Action			Alameda Point, Alameda, CA		CONTRACTOR TtEC							CONTRACT NO. N62473-10-D-0809, CTO 0009				
					CONTRACTOR SCHEDULE DATES				CONTRACTOR ACTION			APPROVING AUTHORITY				
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	CLASSIFICATION GOVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)
			SD-01, PRE-CONSTRUCTION SUBMITTAL													
			a. List of Contact Personnel		G											
			b. Project Schedule		G											
			c. Submittal Register (RAWP copy only)													
			d. Site Health and Safety Plan and AHAs		G											
			e. Accident Prevention Plan		G											
			f. Radiation Control Plan		G											
			SD-02, SHOP DRAWINGS													
			a.													
			SD-03, PRODUCT DATA													
			a.													
			SD-04, SAMPLES													
			a. Import Material		G											
			SD-05, Design Data													
			a.													
			SD-06, TEST REPORTS													
			a. Test Plan Logs													
			SD-07, CERTIFICATES													
			a. Waste Profiles		G											
			b. Waste Manifest		G											
			SD-08, MANUFACTURER'S INSTRUCTIONS													
			a.													
			SD-09, MANUFACTURER'S FIELD REPORTS													
			a.													
			SD-10, OPERATION AND MAINTENANCE DATA													
			a.													
			SD-11, CLOSEOUT SUBMITTALS													
			a. Submittal Register & Test Plan Log (Monthly Submittal)		G											
			b. As-built drawings		G											
			c. Project Closeout Report		G											

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APPENDIX B

DELEGATION OF AUTHORITY LETTERS
(on CD only)

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TETRA TECH EC, INC.

April 2, 2013

Mr. Vince Richards
Tetra Tech EC, Inc.
1090 ½ W. Tower Avenue
Alameda, CA 94501

Subject: Project Quality Control Manager

Reference: Contract No. N62473-10-D-0809,
Radiological Environmental Multiple Award Contract, Contract Task Order (CTO) No. 0009,
Alameda Point, Alameda, California

Dear Mr. Richards:

In accordance with the terms of the Tetra Tech EC, Inc. (TtEC) Contract No. N62473-10-D-0809, this letter notifies you of your appointment as the Project Quality Control Manager for CTO No. 0009, Remedial Action at Installation Restoration Site 2, Alameda Point, Alameda, California.

As the designated Project Quality Control Manager, you will be responsible for managing the site-specific quality control requirements in accordance with the approved plan. You will be responsible for conducting quality control meetings, performing the three phases of control, and performing submittal review. You will be required to be present during all field activities to ensure that any testing is conducted in accordance with approved plans. In addition, you will be required to prepare the necessary quality control certification and documentation.

You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all nonconforming work.

This letter is effective immediately until modified by the Quality Control Program Manager with concurrence of the TtEC Project Manager, the NAVFAC SW Remedial Project Manager, and the Resident Officer in Charge of Construction.

Sincerely,

Gregory D. Joyce

Gregory D. Joyce, ASQ CQM
Quality Control Program Manager
Tetra Tech EC, Inc.

cc: Hedy Abedi, Project Manager

1230 Columbia Street, Suite 750, San Diego, CA 92101
Tel 619.234.8690 Fax 619.234.8591
www.tteci.com

TETRA TECH EC, INC.

April 2, 2013

Mr. Ray Seamons
Tetra Tech EC, Inc.
1090 ½ W. Tower Avenue
Alameda, CA 94501

Subject: Project Quality Control Manager

Reference: Contract No. N62473-10-D-0809,
Radiological Environmental Multiple Award Contract, Contract Task Order (CTO) No. 0009,
Alameda Point, Alameda, California

Dear Mr. Seamons:

In accordance with the terms of the Tetra Tech EC, Inc. (TtEC) Contract No. N62473-10-D-0809, this letter notifies you of your appointment as the Alternate Project Quality Control Manager (PQCM) for CTO No. 0009, Remedial Action at Installation Restoration Site 2, Alameda Point, Alameda, California.

As the designated Alternate Project Quality Control Manager, you will be responsible for managing the site-specific quality control requirements in accordance with the approved plan when the Vincent Richards the PQCM is not available. You will be responsible for conducting quality control meetings, performing the three phases of control, and performing submittal review. You will be required to be present during all field activities to ensure that any testing is conducted in accordance with approved plans. In addition, you will be required to prepare the necessary quality control certification and documentation.

You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all nonconforming work.

This letter is effective immediately until modified by the Quality Control Program Manager with concurrence of the TtEC Project Manager, the NAVFAC SW Remedial Project Manager, and the Resident Officer in Charge of Construction.

Sincerely,

Gregory D. Joyce

Gregory D. Joyce, ASQ CQM
Quality Control Program Manager
Tetra Tech EC, Inc.

cc: Hedy Abedi, Project Manager

1230 Columbia Street, Suite 750, San Diego, CA 92101
Tel 619.234.8690 Fax 619.234.8591
www.tteci.com

APPENDIX C

TESTING PLAN AND LOG
(on CD only)

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TtEC TESTING PLAN AND LOG

CONTRACT NUMBER N62473-10-D-0809, CTO No. 0009			PROJECT TITLE AND LOCATION Remedial Action at IR Site 2, Alameda Point, Alameda, CA							CONTRACTOR TtEC	
SPECIFICATION SECTION AND PARAGRAPH NUMBER	SCHEDULE ACTIVITY ID	TEST REQUIRED (FREQUENCY)	ACCREDITED/ APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		DATE COMPLETED	DATE FORWARDED TO CONTR. OFF.	REMARKS
			YES	NO			ON-SITE	OFF-SITE			
31 00 00 3 3.11.1	43, 47, 48	Laboratory test ASTM D 1557 Moisture/Density Compacted cover material 24-inches above biotic layer and compacted subgrade fill above random fill. One per week									
31 00 00 3 3.11.1	43, 47, 48	Field test ASTM D 6938 In-Place Moisture/Density (Nuclear Gauge) Compacted cover material 24-inches above biotic layer. 4/1000 cy or 4 per day									
31 00 00 3 3.11.1	43, 47, 48	Field test ASTM D 6938 In-Place Moisture/Density (Nuclear Gauge) Compacted subgrade-fill above random fill. Three/day or 2/40,000 sq ft (greater of the two)									

TtEC TESTING PLAN AND LOG

CONTRACT NUMBER N62473-10-D-0809, CTO No. 0009			PROJECT TITLE AND LOCATION Remedial Action at IR Site 2, Alameda Point, Alameda, CA							CONTRACTOR TtEC	
SPECIFICATION SECTION AND PARAGRAPH NUMBER	SCHEDULE ACTIVITY ID	TEST REQUIRED (FREQUENCY)	ACCREDITED/ APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		DATE COMPLETED	DATE FORWARDED TO CONTR. OFF.	REMARKS
			YES	NO			ON-SITE	OFF-SITE			
31 00 00 3 3.11.1	43, 47, 48	Field test ASTM 1140, 4318 and 2487. Grain size, Atterberg, USCS respectively. Compacted fill material. One every 8000 cy delivered for 5 consecutive passing test and then weekly at the borrow site.									
31 00 00 3 3.11.1	43, 47, 48	Laboratory test ASTM 6913, 4972 and 2974. Grain size, pH and organic content respectively. Vegetated topsoil material. One every 8000 cy placed for 5 consecutive passing test and then weekly at the borrow site.									
33 40 00 3 3.1.1	50	Concrete Test: Laboratory test. 7 and 28 day breaks ASTM C39 (One per concrete design mix)									

ATTACHMENT 6

ENVIRONMENTAL PROTECTION PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 6

FINAL

ENVIRONMENTAL PROTECTION PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

TETRA TECH EC, INC.

1230 Columbia Street, Suite 750
San Diego, California 92101-8530

Hedy Abedi, PhD, PE
Project Manager

TABLE OF CONTENTS

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(Continued)

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TABLES

ABBREVIATIONS AND ACRONYMS

§	section
ARAR	applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
BCDC	(San Francisco) Bay Area Conservation and Development Commission
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
C.F.R.	*Code of Federal Regulations*
CSO	Caretaker Site Office
CWA	Clean Water Act
DCAMP	Dust Control and Air Monitoring Plan
DoD	Department of Defense
DON	Department of the Navy
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EO	Executive Order
EPP	Environmental Protection Plan
ESA	Endangered Species Act
FESA	Federal Endangered Species Act
IC	institutional control
IR	Installation Restoration (Program)
KCH	CH2M HILL Kleinfelder, A Joint Venture
MBTA	Migratory Bird Treaty Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NWP	nationwide permit
PESM	Project Environmental and Safety Manager
PjM	Project Manager
RAP	Remedial Action Plan
RASO	Radiological Affairs Support Office
RAWP	Remedial Action Work Plan

ABBREVIATIONS AND ACRONYMS
(Continued)

RI	remedial investigation
ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SSHO	Site Safety and Health Officer
SWPPP	Stormwater Pollution Prevention Plan
TtEC	Tetra Tech EC, Inc.
USACE	U.S. Army Corps of Engineers
U.S.C.	*United States Code*
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
Water Board	Regional Water Quality Control Board

1.0 INTRODUCTION

The purpose of this Environmental Protection Plan (EPP) is to present the applicable or relevant and appropriate environmental regulatory requirements for the implementation of the remedial action for soil and groundwater at Installation Restoration Program (IR) Site 2 as documented in the Record of Decision (ROD) (DON 2010). This EPP will help ensure that activities associated with the environmental management program at the facility are conducted in a systematic and well-documented manner. The EPP also details environmental compliance procedures and waste management, regulatory, procedural, and training requirements associated with conducting field activities. The Project Manager's (PjM's) responsibility is to verify that all project personnel are aware of the compliance requirements of this plan.

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2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 AGENCY/CLIENT/CONTRACTOR INTERFACE AND CONTRACTUAL RESPONSIBILITIES

The Federal Facility Agreement (FFA) signatories who provide regulatory oversight for the IR Site 2 RA are the U.S. Environmental Protection Agency (EPA), the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board).

2.2 AGENCY APPROVAL PROCESS/DOCUMENTATION

The regulatory agencies have provided review and comment on the remedial design work plan documents. A Final Remedial Design Work Plan was approved by the EPA, DTSC and the Water Board prior to commencement of the remedial action activities.

2.3 PROJECT PERSONNEL

A list of the key project team members and their responsibilities for the project is provided in Section 1.3 of the Remedial Action Work Plan (RAWP).

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3.0 SITE HISTORY

The location, description, general site history, and a summary of previous investigations can be found in Section 2.0 of the RAWP. The site location is included as Figure 1-1 of the RAWP. A figure showing site features is included as Figure 2-2 in the RAWP.

3.1 EXISTING NATURAL RESOURCES

The site generally consists of four distinct habitat types: uplands; tidal wetland (i.e., wetlands); seasonal wetland; and open water/mudflats. A description of the habitat types and a Figure showing the distribution are included in the Wetland Mitigation Plan (Attachment 7 to the RAWP).

Areas defined as uplands, seasonal and tidal wetlands, and open water/mudflats demonstrate variability in their extent depending on changes in water levels resulting from seasonal rainfall and tidal variability.

The habitat types present at IR Site 2 and their associated biota are described in more detail in the following Section 6.0.

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4.0 SCOPE OF WORK

The Department of the Navy (DON) has conducted a Feasibility Study (Battelle and BBL 2008) to evaluate the potential remedial alternatives for IR Site 2 and prepared a ROD (DON 2010) to document the selected remedy for the site. The selected remedy identified in the ROD consists of the following components:

- Scan the site surface and excavate surficial radiological hot spots.
- Install a multilayer soil cover over the former landfill.
- Implement engineering controls and institutional controls (ICs).
- Provide for any necessary wetland mitigation.
- Monitor wetland mitigation.
- Conduct methane gas monitoring (as necessary).
- Conduct monitored natural attenuation for site groundwater.

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5.0 REGULATORY FRAMEWORK

5.1 LEAD PROGRAM SUMMARY

Remedial activities at IR Site 2, former Naval Air Station Alameda, Alameda Point, Alameda, California are being conducted as part of the IR Program. Under this program, the Department of Defense (DoD) has been identifying, evaluating, and controlling environmental contamination at various sites identified at DoD facilities nationwide. The DON is implementing the remedy identified in the ROD/remedial action plan (RAP) (DON 2010) at IR Site 2 pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 42 *United States Code* (U.S.C.) Section (§) 9604, 10 U.S.C. § 2701, and Federal Executive Order (EO) 12580. Pursuant to CERCLA; the Defense Environmental Restoration Program at 10 U.S.C. §§ 2701–2706, 2810, and 2811; and EO No. 12580, Congress and the President have delegated CERCLA response action authority and environmental restoration authority to the DoD for facilities under its jurisdiction.

Accordingly, DoD serves as the lead agency. In turn, DoD has re-delegated this authority to the individual military departments, including the DON, who serves as the lead agency for implementation of remedial action at IR Site 2.

This project is being conducted under the authority of the CERCLA and coordinated through a Federal Facilities Agreement with the U.S. Environmental Protection Agency. The coordination effort also includes the DTSC and the Water Board. The project area is located within the jurisdiction of the Bay Area Air Quality Management District (BAAQMD).

5.2 LEAD AGENCY SUMMARY

The EPA, California DTSC, and Water Board provide support to the DON in evaluating and selecting response actions. The DON, with concurrence from the EPA, California DTSC, and Water Board, selected the remedial action that includes construction of an alternative engineered cover described in the Final Remedial Design Work Plan for IR Site 2.

5.3 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

The following agency review requirements will be implemented prior to construction activities associated with commencing project activities for the selected remedy. The applicable or relevant and appropriate requirements (ARARs) as provided in the ROD (DON 2010) are presented in Table 5-1.

5.3.1 California Fish and Game Code and California Endangered Species Act

The California Endangered Species Act and California Fish and Game Code Sections 1908, 2080, 3511, 4700, and 5050 were identified as state applicable or relevant and appropriate requirements (ARARs). Section 1908 prohibits importing, taking, possessing, or selling a native plant designated as endangered or rare. Section 2080 prohibits importing, exporting, taking, possessing, or selling of any state candidate, threatened, or endangered species. Sections 3511, 4700, and 5050 prohibit taking or possessing fully protected birds, mammals, and reptiles and amphibians, respectively. The DON will implement reasonable measures to ensure adequate protection of ecological receptors during excavation and cover placement. The DON will coordinate with the state prior to implementing such reasonable measures, but the DON retains the authority to select which measures it will implement.

5.3.2 United States Army Corps of Engineers

The project involves several factors that alleviate the applicability of Section 404(b)(1) of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act requirements as overseen by the United States Army Corps of Engineers (USACE). Agency-directed CERCLA-related activities are exempt from the need to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act. As a courtesy, at the DON's request, the San Francisco District of USACE will be informally consulted on the status of this project.

Work conducted pursuant to the construction of the remedial design will be completed in accordance with the substantive aspects of Nationwide Permit (NWP) 38, which pertains to activities required to affect containment, stabilization, or removal of hazardous and toxic wastes. The general conditions of NWP 38, which include provisions for delineating sensitive areas of vegetation and aquatic sites, minimizing impacts from usage of heavy equipment, controlling soil erosion and sediment, preventing harm to aquatic life movements, and protecting endangered species, will be requisite. Project staff will be required to receive training to become familiar with the requirements of the permit and will be educated about how each of the NWP requirements is being met.

5.3.3 San Francisco Bay Conservation and Development Commission

The Bay Conservation and Development Commission (BCDC) is authorized under state law and under the federal Coastal Zone Management Act to review federal projects to determine "federal consistency." BCDC requires a permit for development in San Francisco Bay, certain waterways that flow into the bay, salt ponds or managed wetlands around the bay, and within BCDC's shoreline band jurisdiction, which extends 100 feet inland from the bay. The permits are required for any activity proposing to fill, extract materials, or change the use of water, land, or structures in BCDC's jurisdiction.

During implementation of the remedial design, the substantive BCDC requirements will be met without a formal BCDC permit application and review, pursuant to the permit exemption in Section 121(e) of CERCLA. The BCDC's published permit application requirements and conditions of project certification do not apply to federal projects, projects that require federal approval, or project activities that are supported by federal funds. Therefore, the DON is not required to submit an application or obtain a permit from BCDC to implement the remedial design.. However, in an effort to comply with the substantive provisions of the San Francisco Bay Plan, for IR Site 2 the DON has conducted a BCDC Consistency Evaluation, which is attached as Table 5-2.

5.3.4 Federal Endangered Species Act

The substantive provisions of the Federal Endangered Species Act (ESA) are ARARs for IR Site 2 because federally protected species may be present at the site. Based on site surveys and literature reviews, the only federally threatened species with some potential to be present at the project site is the western snowy plover (*Charadrius alexandrinus nivosus*). Federally endangered species with some potential to be present at the site are the California least tern (*Sterna antillarum brownie)*, the California clapper rail (*Rallus longirostris obsoletus*), and the salt marsh harvest mouse (*Reithrodontomys raviventris*). Evaluation of the potential presence of these species is discussed in Section 6.2.

Because federally listed species have either been observed near IR Site 2 or some potential for supporting habitat features may exist on site, the DON has coordinated with the USFWS during the remedy selection process. The DON will continue to coordinate with the USFWS during remedial design construction activities to ensure compliance with the ARARs provisions.

5.3.5 Executive Orders

Two EOs in 1977 established policies for all federal agencies associated with wetland and floodplain impacts. EO 11990, Protection of Wetlands, requires all federal agencies to "take" action to minimize the destruction, loss, or degradation of wetlands, and enhance the natural and beneficial values of wetlands" while carrying out their responsibilities. EO 11998, Floodplain Management, requires similar protection for floodplains, including avoiding activity in the floodplain when possible.

To meet the substantive requirements of these EOs, project implementation will need to avoid wetland or floodplain impacts, when practicable. Site-specific measures will need to be implemented to mitigate impacts from project activities (e.g., limit construction schedule to avoid adverse impacts to special-status species, provide biological monitoring during excavation and mobilization/demobilization activities, avoid or limit duration of operations during sensitive times of the year, delineate sensitive habitat areas, including but not limited to wetlands and floodplains, to limit disturbance).

5.3.6 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703–712) prohibits at any time, using any means or manner, the pursuit, hunting, capturing, and killing or attempting to take, capture, or kill any protected migratory bird. The MBTA also prohibits the possession, sale, export, and import of any migratory bird or any part of a migratory bird, as well as nests and eggs. A list of migratory birds for which this requirement applies is found at 50 *Code of Federal Regulations* (C.F.R.) § 10.13. Species listed under Section 10.13 of the MBTA have been observed within the project area. Protected avian species may require special management such as biological surveys, construction-timing restrictions, and/or monitoring. As avoidance of the entire nesting season is not likely to be practical given the current project schedule, on-site personnel will be trained to be sensitive to the MBTA and natural resource clearance surveys would be implemented immediately prior to field activities. Monitoring of construction activities may also be implemented, if appropriate, to ensure resources protected under the MBTA are not harmed.

5.4 Applicable or Relevant and Appropriate Requirements

ARARs for the IR Site 2 remedy, cited in the ROD (DON 2010) and included as Table 5-1, are location-, action-, and chemical-specific with portions of the FESA (16 U.S.C. §§ 1531–1543), the federal MBTA (16 U.S.C. §§ 703–712), and the California Endangered Species Act (CESA) (*California Fish and Game Code* §§ 2080–2081). As cited in the remedial design, the DON has concluded that the cover remedy does not extend to treatment and control of leachate (no generation of leachate is anticipated). The DON and state have concurred that the statutory requirements of 27 *California Code of Regulations* § 20080(g) do not apply with respect to groundwater monitoring.

6.0 ENVIRONMENTAL RESOURCE PROTECTION AND MITIGATION

The purpose of the environmental resource protection section and mitigation is to identify the protection measures that will be implemented to avoid, minimize, and mitigate potential impacts from the remedial action to special-status wildlife species. The following subsections summarize the existing natural environmental conditions at the site. More detailed information can be obtained from the ROD (DON 2010).

6.1 NATURAL RESOURCES AND VEGETATION

IR Site 2 borders San Francisco Bay and is situated along the Pacific Flyway. Most of the land at Alameda Point was originally created by filling existing tidelands, marshlands, and sloughs with dredged material from the bay and Oakland Inner Harbor. The site is generally considered "disturbed" due to historical filling and landfilling activities. The site is ecologically isolated as it is bordered by San Francisco Bay to the south and west, and by roads, runways, and other hardened or impermeable (e.g., concrete) surfaces to the north and east; in addition, the site is fenced along its entire (onshore) boundary. The identified habitat types and their associated biota are described in more detail in the following sections.

6.1.1 Upland

The landfill portion of IR Site 2 covers approximately 77 acres and, along with the interior margin, constitutes the upland area of the site. The area has been partially covered using fill materials dredged from the wetlands and imported from other sites across Alameda Point (E&E 1983). The terrestrial environment of the landfill has been characterized in the remedial investigation (RI) as coastal prairie and northern coastal scrub. The majority of the upland area is highly disturbed from historical landfill activities and is composed almost entirely of noxious invasive species including iceplant (*Carpobrorus edulis*), Pampas grass (*Cortaderia jubata*), and sweet fennel (*Foeniculus vulgarum*). Other less noxious ruderal species observed include black mustard (*Brassica negra*), Italian thistle (*Carduus pycnocephalus*), and wild radish (*Raphanus raphanistrum*). Approximately 1 acre of good quality coyote brush (*Baccharis pilularis*) and grassland habitat has been documented near the south pond during TtEC site surveys conducted in November 2011.

A coastal margin composed of the perimeter berm and riprap seawall is present between the landfill and/or wetland, and the bay, and is characterized as a thin strip of land, 100 feet at its narrowest, that acts as a buffer for the landfill and the wetland. Materials identified in the coastal margin differ from those in the landfill and wetlands.

6.1.2 Wetlands and Ponds

The wetland boundary consists of two ponds and adjacent areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The wetland is both seasonally wet and wet during high tides.

A recent wetland delineation was conducted at IR Site 2 for the DON by CH2M HILL Kleinfelder, A Joint Venture (KCH), in conjunction with the Pre-Design Remedial Investigation Report, and in accordance with survey methodology followed USACE's 1987 *Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008). Field surveys were conducted by KCH on July 27, 2010, and March 31, 2011. The results of the wetland delineation identified the presence of 9.40 acres of open waters, including 4.41 acres of tidal waters, and 11.91 acres of wetlands, including 3.22 acres of tidal wetlands, within the boundaries of the 110-acre IR Site 2 (KCH 2011). This compilation of acreage is defined as approximately 33 acres of wetland habitat. Wetland boundaries were determined in the field based on changes in plant species composition and cover, the presence or absence of hydric soil, hydrologic indicators, and local micro-topography. All of these waters and wetlands were considered to be adjacent to San Francisco Bay and were therefore considered potential jurisdictional waters of the United States subject to regulation under the federal CWA.

Previous wetland delineations at IR Site 2 were conducted by the Habitat Restoration Group in October 1993 and February 1994, in association with PCR Environmental, Kinnetics Laboratories, Inc., and Tocsin, Inc.

Due to the existing limits of delineated refuse in the wetland area within the southwest corner of the site and to the north in the interior margin, approximately 2.27 acres of seasonal wetland and 0.89 acre of tidal wetland will require placement of fill to extend the limits of the landfill cover during construction. As defined in 33 U.S.C § 1344, this meets the definition of fill placed in waters of the United States where the material has the effect of replacing any portion of a water of the United States with dry land. This is defined as conversion of a CWA Section 404 wetland to a non-wetland, which is considered a change in use of an area of waters of the United States. Section 404 of the CWA applies to all jurisdictional waters of the United States, including wetlands that have significant nexus to interstate commerce. Given that the remedial activities will not cross navigable waters, Section 404 of the CWA would be the prevailing federal regulation for this project.

The federal and state goals of "no net loss" of wetlands are established in 40 C.F.R. parts 230–233 (404 (b)(1) guidelines) and in the State of California Executive Department, EO W-59–93, respectively, and will be complied with by providing compensatory mitigation through an aquatic resource restoration, establishment, enhancement, and/or preservation activity. Substantive requirements in accordance with mitigation required will include habitat replacement with an equivalent area of similar wetlands outside the cover, but within the IR Site 2 boundary in accordance with 33 C.F.R. Part 330. Additional mitigation details are provided in Section 6.3.3 and a complete wetlands mitigation plan is presented as Attachment 7.

The DON will also ensure applicable substantive requirements are followed to protect the beneficial uses of San Francisco Bay in compliance with the Coastal Zone Management Act and the San Francisco Bay Plan (an approved state management program).

6.1.3 Vegetation

Terrestrial vegetation associated with IR Site 2 is characterized by a variety of weedy native and naturalized grasses and forbs. Common species observed during the pre-design wetland delineation conducted by KCH (2011) on the levee, landfill, and other upland areas include rip-gut brome, wild oak, rat-tail fescue, Italian thistle, field mustard, wild radish, tarweed, fennel, and yellow star-thistle. Tall fescue is present in the northern part of the site, and dense patches of ice plant are common to the southwest and northeast of the landfill area. Coyote bush shrubs and Pampas grass are scattered throughout the site. A grouping of small trees was identified in the northeastern corner of the site, including black wood acacia and arroyo willow.

6.2 FISH AND WILDLIFE/THREATENED, ENDANGERED, AND SENSITIVE SPECIES

A variety of birds and mammals have been observed at the site during historical surveys (PRC 1995; TtEMI 1998). A list of mammalian and avian species observed at the site is presented in Tables 6-1 and 6-2. More than 130 species of birds have been observed at Alameda Point and may use IR Site 2 to some degree. Passerine birds that glean insects off of and feed on terrestrial vegetation are the most significant avian components of the upland terrestrial habitat. However, the most significant bird use is primarily associated with the wetlands and wetland ponds, which provide resting and foraging areas for migrating waterfowl and habitat for other resident bird species. No avian foraging from the wetland ponds was observed during the DON's RI sampling activities of 2004/2005 (Battelle and BBL 2006).

Commonly observed avian species include the barn swallow (*Hirundo rustica)*, European starling (*Sturnus vulgaris*), western meadowlark (*Sturnella neglecta*), and house finch (*Carpodacus mexicanus*). Please see Table 6-2 for a complete listing of avian species. Mammals that potentially live, forage, and/or reproduce in the upland terrestrial habitat include the domestic rabbit (*Oryctolagus cuniculus*), black-tailed hare (*Lepus californicus*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), and striped skunk (*Mephitis mephitis*). The habitat also is suitable for the red fox (*Vulpes vulpes*), but this species has not been specifically observed at the site.

Existing ecological management at IR Site 2 consists of a Navy program administered by the USFWS and U.S. Department of Agriculture (USDA) for the protection of California least tern colonies residing at Alameda Point. Potential predators of terns and tern eggs that are managed through this program include red fox, coyote, and carnivorous birds. Potential predators of the tern colonies are harassed, temporarily relocated, or in extreme circumstances culled periodically by field staff from the USFWS/USDA to protect the terns.

Special-status avian species that could occur within remedial action areas at IR Site 2 include the California least tern, California clapper rail, and the western snowy plover.

Marginal habitat for the salt marsh harvest mouse occurs in the pickleweed marsh in the southwest part of IR Site 2. However, it was deemed unlikely that they would occur at this wetland, despite the presence of pickleweed, based on the following:

- The site is isolated from other expanses of tidal marsh, and is separated from the nearest extant population of salt marsh harvest mice by a distance of approximately 5 miles. It is also surrounded by developed areas. Salt marsh harvest mice would only be able to access the site by floating in, which is possible but improbable.
- There is an extremely narrow mid-high marsh zone at this site, so high tide refugia is very minimal. This greatly increases the chances that salt marsh harvest mice attempting to escape tidal inundation would be subject to predation.
- The pickleweed patch size is well below the estimated 150 acres that is generally assumed needed to support a viable salt marsh harvest mouse population.

Furthermore, protocol-level surveys for this species were completed in 2009, and concluded that no salt marsh harvest mice were present at Alameda Point, which includes IR Site 2 (H.T. Harvey Inc. 2009). Therefore, additional surveys or construction monitoring for the salt marsh harvest mouse will not be performed.

Scheduled remedial activities planned for the site are not anticipated to have an adverse effect on the listed species. Compliance with the following regulatory legislation for the protection of wetlands and wildlife will occur: MBTA of 1918; the Endangered Species Act (ESA) of 1973, as amended; CESA; the Fish and Wildlife Act of 1956, as amended by the Fish and Wildlife Improvement Act of 1978; and Sections 404 and 401 of the CWA.

6.3 MITIGATION MEASURES

The DON will fully implement and adhere to the following protection measures to avoid, minimize, and mitigate for potential impacts from remedial activities. Measures are divided into the following sections with detailed instructions for the designated special-status species.

6.3.1 Training

The DON will conduct an education program for all persons who will work at the site during project implementation and construction. The program will include a discussion of the biology/ecology of the site, threats, protection under the ESA and MBTA, and the protection measures provided herein. The program will consist of a presentation from a qualified biologist familiar with the ecology, behavior, and identifying signs of the sensitive natural resources potentially present on or near the site.

Training will occur during initial site orientation for all site personnel, and will include the following elements and guidelines:

- Instruction and appropriate compliance with substantive requirements of local, state, and federal regulatory agencies, environmental laws, and regulations (e.g., USACE, Water Board, USFWS, California Department of Fish and Game [CDFG], MBTA, FESA, and CESA).
- Instruction that no personnel working on the project will "take" or destroy wildlife including birds, eggs, or active nests (i.e., with viable eggs/chicks) that are protected under CESA, FESA, MBTA, and CFG code sections.
- Specify the biologist who will conduct surveys to assess the nesting status of any active nests in the action area, as well as provide intermittent monitoring, if necessary, during remedial construction activities. The USFWS and DTSC/CDFG will be contacted prior to conducting the surveys.
- Document active avian nests (i.e., with viable eggs/chicks) and establish an appropriate no-work buffer around each that will be maintained during active construction. Buffers will remain in-place until nests have reached their natural end (i.e., no viable eggs/chicks are present), as verified by a qualified biologist; at that point, the buffer would be removed.
- If an active nest is identified within 100 feet of remedial activities and appears to be insulated from construction, or the nesting birds appear habituated to the ongoing disturbance, the DON will be notified to consider whether a no-work buffer is required to ensure the MBTA is appropriately followed.
- Any personnel who inadvertently kills or injures wildlife will be required to immediately report the incident to the staff biologist and/or supervisor. The biologist or other appropriate representative shall contact the DON, who will be responsible to notify the USFWS and/or DTSC/CDFG as applicable.
- DON will be notified verbally and in writing within 24 hours of the accidental death or injury to any state- or federal-listed species during project-related activities, with summary information of the incident, the type of dead or injured animal, and other pertinent information. The notification will be forwarded to the USFWS and/or DTSC/CDFG as applicable.

- Limits of grading and other remedial construction activity impacts will be communicated to field personnel so that no land, water, or vegetation outside the delineated limits of the remedial construction area will be disturbed.
- Project-directed activities will remain within designated work areas and access roads. Approved work areas, access roads, and lay-down areas will be clearly marked and denoted. No field personnel may access or disturb lands outside of the designated remedial construction limits.
- Littering is prohibited and appropriate disposal of trash in designated containers will be instructed. All litter and construction debris will require removal daily from remedial construction areas.
- All personnel will practice fire prevention and safety through equipment maintenance and observance of designated hot work areas.
- Any and all feeding of wildlife by site personnel will be prohibited.
- Ensure site personnel understanding of all applicable environmental requirements before initiation of each remedial construction activity. It is the responsibility of each person working on the project to understand and comply with the environmental requirements associated with the project. Any and all questions are to be directed to a supervisor or biologist prior to starting work.
- All supervisors or other field managers will receive environmental awareness briefings prior to initiating ground-disturbing activities within the project area. Training will be documented and records maintained within the on-site project files.

A fact sheet or wallet-sized card containing this information will also be prepared and distributed. Upon completion of the education program, employees will sign a form stating that they attended the program and understand all protection measures.

6.3.2 Ecological Surveys

A qualified biologist will conduct ecological surveys of the plants and animals at IR Site 2 to collect current information on species present in or near the intended project areas and to complete an ecological checklist before work begins. These surveys will be conducted in accordance with appropriate survey guidelines and protocols and will be conducted at appropriate times of the year for identifying the presence of special status plant and animal species. The survey will include all planned staging and storage areas, site transportation routes, work areas, and stockpile areas. Preconstruction surveys will be performed by a qualified biologist at an appropriate interval prior to ground disturbance activities. Preconstruction surveys will consist of four separate site visits on different days in order to update the presence of plant and animal species located on or near the work sites. The USFWS and DTSC/CDFG will be contacted prior to conducting the surveys.

Work is expected to be performed during portions of the nesting season (February 1 to September 30). Before construction activities begin during the nesting season, a qualified biologist will conduct a focused survey for nesting birds within 14 days of construction activities. If work is already occurring when the nesting season begins, no additional surveys will be required; however, additional construction monitoring would be performed as per Section 6.3.6. If work is stopped more than 15 days during the nesting season, work areas and all natural habitat within 500 feet of work areas will be resurveyed. If an active nest (i.e., with viable eggs or chicks) is documented, a no-work buffer zone will be established around the nest by the site biologist, and will remain in place until the natural end of the nest is reached (i.e., no viable eggs or chicks are present).

Surveys for breeding amphibians in the seasonal, freshwater wetlands were performed in January of 2013. A single egg mass was found, and appears to have been deposited by a Pacific chorus frog *(Pseudacris regilla).* No evidence of special-status amphibians or their egg masses or larvae were identified in these wetlands, therefore additional surveys are not recommended.

Additional construction monitoring plans are discussed in Section 6.3.6.

The qualified biologist will provide a report to the DON on the results of the ecological survey and pre-construction surveys for IR Site 2 shortly after the surveys are complete. Reporting is further discussed in Section 6.3.4.

6.3.3 Compensatory Wetlands Mitigation

Tidal wetlands lost as a result of the required remedial design activities total approximately 0.89 acre and will be replaced with defined in-kind, on-site habitat. Low-quality seasonal wetlands lost as a result of the project total 2.27 acres and will be replaced on-site with higher quality freshwater open marsh and mudflat. A project-specific Wetland Mitigation Plan (Attachment 7) has been prepared to specify mitigation design and an implementation plan is to replace lost wetlands with habitat of the same or better quality. Compensatory wetlands will be created concurrently as the original wetlands are filled during remedial construction activities, at a projected 1:1 replacement ratio. The plan will specify mitigation goals, success criteria, implementation activities, and long-term monitoring and maintenance requirements.

6.3.4 Documentation and Reporting

A Preconstruction Survey Report including survey results from the Ecological Survey (i.e., findings from the four preconstruction site visits) will be prepared to include a written evaluation of lands proposed for grading/excavation, temporary structure installation, landfill cover placement, and revegetation before the onset of construction activities. Intermediate reports may also be prepared and submitted if appropriate. The Preconstruction Survey Report will include a full description of any sensitive biological resources that were documented and a clear directive for what was established to ensure their protection from construction activities. If no sensitive biological resources were documented, the report will include a clear statement to that effect.

An Initial Monitoring Report will be prepared, if monitoring construction monitoring is applicable, that details the results of routine biological inspections after the commencement of remedial construction. The report will document as-needed examination of the work activities and project areas including beginning and ending dates, impacts to resources, and when necessary, verify that selected protection measures are being implemented.

Incident Reports are required in the event of unauthorized "take" of special-status wildlife species. These reports are intended to convey specifics associated with any type of take-related incident which occurs within the Project Area, document that required notifications have been provided, and demonstrate that corrective actions have been proposed and taken.

A Final Mitigation and Monitoring Report will be prepared upon completion of project activities, and will summarize information detailed within all applicable previously prepared reports. The report will be prepared by the qualified biologist and will include, at a minimum:

- A description of when each of the mitigation measures was implemented
- All available information about project-related incidental "take" of special-status species, if appropriate
- Information about other project impacts on special-status species, if appropriate
- Construction dates
- An assessment of the effectiveness of the DON's conditions of approval in minimizing and compensating for project impacts
- Recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects
- Other pertinent information

If a special-status species is injured as a result of project related activities, the site biologist will coordinate with the appropriate agencies to have it immediately taken to an appropriate and approved facility. The site biologist will immediately notify appropriate agencies unless the incident occurs outside of normal business hours, in which case, notification will be made on the next business day via the DON and normal project communications channels. If a special-status species is killed by project-related activities during construction, or if such species is otherwise found dead on the project site, a written report will be sent to the appropriate agencies via the DON within 2 calendar days. The report will include the date, time of the finding or incident, location of the carcass, and the circumstances.

6.3.5 Construction Delineation

The area of disturbance will be confined to the smallest practical area, and use previously disturbed areas as much as practical. Project related personnel will access the project site during construction and development activities using existing routes and will not cross special-status species' habitat outside of the project site. To the extent possible, previously disturbed areas within the project site will be used for temporary storage areas, laydown sites, and any other surface-disturbing activities. The DON will post signs; place posting stakes, flags, and/or rope or cord; and place fencing as necessary to minimize the disturbance of special-status species' habitat. Vehicle speeds will not exceed 20 miles per hour in order to avoid these species on or traversing the roads during project-related construction and development activities. If construction of off-site routes of travel will be required, these will be coordinated in advance via the DON.

6.3.6 Construction Monitoring

If appropriate, a qualified biologist knowledgeable and experienced in the biology and natural history of protected biological resources will monitor construction activities in areas of suitable habitat to avoid the "take" of individual animals and to minimize habitat disturbance. Construction monitoring would be needed in the case that surveys described in Section 6.2 indicated the presence of special status species or active avian nests in or near the construction area.

A qualified biologist would need to have experience monitoring and identifying the special status species mentioned in the report, experience monitoring in tidal wetlands, and be able to set up a monitoring program. General construction monitoring will include the following activities:

- Clearance survey 1 to 7 days prior to the onset of each phase of construction activities
- Routine biological inspections after commencement of ground-disturbing activities
- As-needed examination of the project area to document activity beginning and ending dates, identify impacts to resources, and verify that protection measures are being employed appropriately.

Compliance inspections will be conducted by the qualified biologist at appropriate intervals during clear and grub activities, and periodically during grading and cover construction. The qualified biologist will thoroughly inspect work areas to determine presence of sensitive biological resources, will check for compliance with all mitigation/avoidance measures, and will check any established exclusion zones (if present) to ensure that signs, stakes, and fencing are intact and that human activities are restricted in these protective zones.

Any and all observations of sensitive biological resources will be documented and conveyed to the DON's designated representative or qualified biologist. Observations of all special status species will be fully documented.

If project activities are conducted during the nesting season (February 1 to September 30), additional surveys would be performed as discussed in Section 6.3.2 and a qualified biologist would monitor construction activities when appropriate to ensure no harm is incurred to nesting birds. If nesting birds are discovered (either during surveys or during monitoring), project activity will be restricted within no-work buffer zones established around each nest by the site biologist, and will be maintained until the natural end of the nest (i.e., when no viable eggs or chicks are present). Authorization to proceed will likely be obtained if it is determined that project activity would not likely adversely affect the nest. The qualified biologist will remain on-site to monitor the activity of the nesting birds during work activities. If the nesting birds change behavior due to work activities, buffer zone distances will be reevaluated.

The qualified biologist will have authority to immediately stop any activity that is not in compliance with these measures and to order any reasonable measure to avoid the "take" of any protected biological resource. If a special status species is observed in a project work area, increasing the potential for it to be harmed, an appropriate buffer will be established by the site biologist and coordination with the appropriate agencies via the DON will be initiated.

6.3.7 Hazardous Materials and Refuse

Any fuel or hazardous waste leaks or spills on the project site during construction and development activities will be stopped/repaired immediately and cleaned up at the time of occurrence. The storage and handling of hazardous materials will be excluded from the construction zone and any unused or leftover hazardous products will be properly disposed of off-site.

A trash abatement program will be initiated during preconstruction phases of the project and will continue throughout the duration of the project. Trash and food items will be secured in closed containers and removed regularly to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs. Upon project completion, all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes shall be removed from the site and disposed of properly.

6.3.8 Site Security and Access

The DON will provide regulatory agency representatives with reasonable access to the project site and mitigation lands under the control of the DON, and will otherwise fully cooperate with efforts to verify compliance with or effectiveness of the mitigation measures set forth herein.

6.3.9 Air Quality

The BAAQMD regulations specify standards for fugitive dust emissions and particulate matter emissions. Due to the nature of the remedial action, which involves significant earthmoving activities, it is probable that dust will be produced. The BAAQMD exempts certain operations, under Regulation 2, from obtaining air permits. In addition, dust control measures will be implemented within the landfill area throughout the field activities for alleviation or prevention of dust nuisance. A Dust Control and Air Monitoring Plan (DCAMP) is included as Attachment 9 to the RAWP.

6.3.10 Air Resources

Measures will be taken during removal activities to minimize the release of airborne particulates within and outside the boundaries of the work sites. Dust and particulates will be controlled to minimize contaminant spread and to protect human health and the environment. A DCAMP is included as Attachment 9 to the RAWP.

6.3.10.1 Dust and Particulate Control

Work procedures will be designed to control and minimize particulate emissions. Control of fugitive particulates will involve cleaning loose dirt from haul vehicles, enforcing speed limits on facility roads, watering down dry or barren work areas and roadways, and covering soil stockpiles at the end of every shift.

A decontamination pad will be constructed. All equipment will be inspected before leaving the project sites to ensure it is in an acceptable condition (e.g., free of dirt on the undercarriage, frame, tail gate, wheels, and axles) for site exit and decontaminated. Vehicles and/or equipment that cannot be easily cleaned by dry methods may be washed and air-dried before leaving the site(s). All wastewater will be captured for future disposal. Specific requirements and measures to be taken are detailed in the Stormwater Pollution Prevention Plan (SWPPP) (Attachment 8 to the RAWP).

6.3.11 Stormwater, Sediment, and Erosion Control

Because earthmoving activities will be conducted primarily during the dry season and on relatively flat terrain and because soil materials are well-drained, the potential for erosion is low. However, to prevent surface water runoff from impacting adjacent surface water features, various Best Management Practices will be implemented during the remedial action activities to minimize the potential for release of contaminants during construction. A site-specific SWPPP (Attachment 8 to the RAWP) has been prepared in order to address applicable and substantive requirements under the identified ARARs.

6.3.12 Soil and Construction Material Stockpiles

Soil stockpiles will be created through the periodic removal of existing soil cover materials. Soil and animal intrusion barrier construction material stockpiles will also be created from the import of materials from off-site. Stockpiles consisting of existing site materials will be staged on-site in inactive areas, and soil materials from off-site will be stored in staging areas located adjacent to the site.

7.0 REPORTING SPILLS AND RELEASES

The steps below outline the chain of communications that will be followed if a significant spill of any hazardous substance occurs. A significant spill will be considered any spill over the reportable quantity, as determinable by federal and/or state regulations, as well as any spill below the reportable quantity that is not properly contained and released into the environment.

1. Site personnel involved in the spill will immediately contact the TtEC Spill/Release On-site Coordinator, Site Superintendent, or Site Safety and Health Officer (SSHO), who will notify the PjM and the Project Environmental Safety Manager (PESM). At least one of the following individuals will be on-site during all remedial activities:

SSHO:	Mr. Keith Rademacher
Site Superintendent:	Mr. Larry Spencer

The TtEC SSHO or Site Superintendent will contact the Remedial Project Manager (RPM), Resident Officer in Charge of Construction (ROICC), Caretaker Site Office (CSO), and Radiological Affairs Support Office (RASO) individuals identified below:

RPM:	Mr. Jacques P. Lord
ROICC:	Mr. Gregory Grace
CSO:	Mr. Doug DeLong
RASO:	Mr. Matthew Slack

2. If a release of a waste or hazardous substance above the reportable quantity or a release of petroleum that causes a sheen to water occurs, the PjM will verify that the National Response Center (800-424-8802) and the local Emergency Response Coordinator (Fire Department) have been notified by the DON. Releases will be reported and written follow-up emergency notices will be submitted under the Superfund Amendments and Reauthorization Act, Title II requirements.
3. In concert with the above actions, the following persons will be contacted by the PjM or Site Superintendent:

TtEC Certified Industrial Hygienist/PESM:	Mr. Roger Margotto

In the event of a spill of radioactive material, TtEC will make appropriate notifications in accordance with its Nuclear Regulatory Commission license requirements. Notifications will also include the DON RPM, the RASO, and the subcontractor.

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8.0 TRAINING/CERTIFICATION REQUIREMENTS FOR PROJECT PERSONNEL

8.1 FEDERAL REQUIREMENTS

Occupational Safety and Health Administration and California Occupational Safety and Health Administration Health and Safety/Emergency Response/Hazardous Communication training requirements are specified in the Site Safety and Health Plan. All site personnel must have this training.

Specified site personnel must also be trained in Department of Transportation (DOT) standards. Only site personnel who have received this training are allowed to conduct DOT functions.

Specified site personnel that are handling Resource Conservation and Recovery Act or dangerous waste must be trained in waste management procedures under 40 C.F.R. Parts 262.11–265.16.

8.2 STATE REQUIREMENTS

A professional engineers' certification will be required to certify the adequacy of the landfill cap design and other specifications and drawings.

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9.0 INSPECTION AND AUDIT PROCEDURES

9.1 INSPECTION BY REGULATORY AGENCIES

Regulatory inspections will be coordinated by the DON. If contacted by a regulatory agency for a site inspection, site personnel or the PjM must notify the client (as described below).

9.1.1 Client Notification

The PjM or his alternative will notify the client if contacted by a regulatory agency for a site inspection.

Client Contact: Mr. Gregory Grace (ROICC)

9.1.2 Designated Representative for Inspections by Regulatory Agencies

The PjM will designate an on-site representative for inspections by regulatory agencies. The selected representative will have received training on this procedure by the Environmental Regulatory Compliance Manager and will be familiar with implementation of the procedure.

9.2 INSPECTIONS BY THIRD PARTIES

Any third party requesting access to inspect the site must be referred to the client for access. Contractors must not grant site access or answer questions for unauthorized personnel. Individuals requesting access must be told to contact the DON. Notify the PjM, or the designated Task Manager, and the client of any attempts to gain access to the site.

Client Contact: Mr. Gregory Grace (ROICC).

If members of the media ask questions or attempt to access the site, notify the RPM for the DON, Mr. Jacques P. Lord, at (619) 532-0902.

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10.0 DOCUMENTATION AND RECORDS RETENTION

Documentation of regulatory compliance issues and records retention will be conducted in accordance with the TtEC Compliance Procedure and the DON/Marine Corps Installation Restoration Manual (DON 2000).

10.1 RECORDS RETENTION

Under contract conditions, documents must be kept in the project files for a minimum of 10 years. In addition, compliance records will be maintained in accordance with the Compliance Procedure for Documentation and Records Retention.

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11.0 REFERENCES

Battelle and BBL (Blasland, Bouck, and Lee, Inc.). 2006. Final Remedial Investigation Report IR Site 2, West Beach Landfill and Wetlands Alameda Point, California. Prepared for Base Realignment and Closure, Program Management Office West, San Diego, CA. June 23.

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TABLES

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TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
		SOIL		
Federal Applicable or Relevant and Appropriate Requirements (ARARs) for Chemical Contamination				
Resource Conservation and Recovery Act (RCRA) (Title 42 United States Code [USC], ch. 82, §§ 6901 through 6991[i]) [c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the Toxicity Characteristic Leaching Procedure (TCLP), if the waste exceeds the TCLP maximum concentrations.	Waste	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether waste is hazardous.
Groundwater protection standards: requirements to ensure that hazardous constituents entering the groundwater from a regulated unit do not exceed the concentration limits for contaminants of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	A regulated unit that receives or has received hazardous waste before July 26, 1982, or regulated units that ceased receiving hazardous waste prior to July 26, 1982, where constituents in or derived from the waste may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.94(a)(1) and (3), (c), (d), and (e)	Relevant and appropriate	While these standards are not applicable because Installation Restoration (IR) Site 2 does not contain an RCRA waste management unit, the Navy has determined that the substantive provisions are potentially relevant and appropriate ARARs for this response action because the wastes at the site are similar to RCRA hazardous waste constituents.
Uranium Mill Tailings Radiation Control Act [c]				
In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 working level. In any case, the radon decay product concentration (including background) shall not exceed 0.03 working level. Provisions applicable to radon-222 shall also apply to radon-220.	Uranium Mill Tailings Radiation Control Act (UMTRCA) Sites	40 *Code of Federal Regulations* (CFR) § 192.12(b)(1) and 192.41(b)	Relevant and appropriate	These requirements are not applicable because IR Site 2 is not a UMTRCA site. The Navy has determined that these requirements are relevant and appropriate because radiological contamination may remain on IR Site 2. Currently, there are no buildings on IR Site 2 property and no buildings are planned in the future. However, because the ICs do not prohibit the construction of all new buildings (ICs prohibit construction of the buildings associated with the prohibited land uses listed in Table 2-12 of the ROD [Navy, 2010]), these requirements are necessary. If

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
				buildings are constructed on IR Site 2 in the future, the transferee will address these requirements in documents provided to the Federal Facilities Agreement (FFA) signatories and California Department of Public Health (CDPH) for approval of land disturbing activities.
Concentration limits for cleanup of gamma radiation in buildings at inactive uranium processing sites designated for remedial action. In any occupied or habitable building, the level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.	UMTRCA sites	40 CFR § 192.12(b)(2)	Relevant and appropriate	These requirements are not applicable because IR Site 2 is not an UMTRCA site. The Navy has determined that these requirements are relevant and appropriate because radiological contamination may remain on IR Site 2. Currently there are no buildings on IR Site 2 property and no buildings are planned in the future. However, because the ICs do not prohibit the construction of all new buildings (ICs prohibit construction of the buildings associated with the prohibited land uses listed in Table 2-12 of the Record of Decision [ROD]), these requirements are necessary. If buildings are constructed on IR Site 2 in the future, the transferee will address these requirements in documents provided to the FFA signatories and CDPH for approval of land disturbing activities.
Standards for cleanup of land and buildings contaminated with radium-226 (Ra-226], radium-228, and thorium from inactive uranium processing sites. As a result of residual radiological materials from any designated processing site, the concentration of Ra-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than (1) 5 picocuries per gram (pCi/g), averaged over the first 15 centimeters (cm) of soil below the surface, and (2) 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface.	UMTRCA Title 1 Sites	40 CFR § 192.12(a), 192.32(b)(2), and 192.41(a)	Not ARARs	These requirements are not ARARs for IR Site 2. They are not applicable because IR Site 2 is not an UMTRCA Title 1 site. They are not relevant and appropriate for sites like IR Site 2 that are remediated based upon restricted reuse. The Navy will place ICs to prohibit residential use of IR Site 2 because the level of contamination that will remain at IR Site 2 will be above unrestricted use levels.

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Nuclear Regulatory Commission (NRC) Radiological Criteria				
Performance objectives for the land disposal of low-level radioactive waste. Concentrations of radioactive material that may be released to the general environment must not result in an annual dose exceeding 25 millirems to the body or any organ of a member of the general public.	Existing NRC-licensed low-level radioactive waste disposal site	10 CFR § 61.41	Relevant and appropriate	These requirements are not applicable because IR Site 2 is not an NRC-regulated site. The Navy has determined that these requirements are relevant and appropriate because radiological contamination may remain on IR Site 2. Implementation of the remedy selected in this ROD will result in concentrations of released radiological material less than an annual dose of 25 millirems to the body or any organ of a member of the general public. See Table 2-4 of the IR Site 2 ROD for remediation goals for Ra-226.
Requires that the total effective dose equivalent to individual members of the public not exceed 0.1 rem from licensed operation: construction, operation, and decommissioning of commercial reactors and fuel cycle facilities; possession, use, processing, exporting, and certain aspects of transporting nuclear materials and waste; and siting, design, construction, operations, and closure of waste disposal sites.	Existing NRC-licensed site	10 CFR § 20.1301	Relevant and appropriate	These requirements are not applicable because IR Site 2 is not an NRC-regulated site. The Navy has determined that these requirements are relevant and appropriate because radiological contamination may remain on IR Site 2.
A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in total effective does equivalent to an average member of the critical group that does not exceed 25 millirem per year, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to as low as reasonably achievable.	Existing NRC-licensed radiologically contaminated site.	10 CFR § 20.1402	Not an ARAR	These requirements are not applicable because IR Site 2 is not an NRC-regulated site. The Navy and USEPA have determined that this requirement is not relevant and appropriate because: (1) the regulation addresses circumstances that are not sufficiently similar to the remedial action selected, which includes a multilayer soil cover and ICs, and (2) the Alameda IR Site 2 remediation goals (RGs) are more protective.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation**[b]	**ARAR Determination**	**Comments**
As a condition for license termination with restricted site use, the licensee must demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of 10 CFR § 20.1402 would result in net public or environmental harm or were not being made because the residual levels associated with restricted conditions are as low as reasonably achievable.	Existing NRC-licensed radiologically contaminated site	10 CFR § 20.1403(a)	Not an ARAR	These requirements are not applicable because IR Site 2 is not an NRC-regulated site. These requirements are not relevant and appropriate because the RGs for IR Site 2 are protective of human health and the environment and are more stringent and protective than the criteria in 10 CFR § 20.1403.
As a condition for license termination with restricted site use, the licensee must make provisions for legally enforceable ICs that provide reasonable assurance that the total effective dose equivalent from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 millirems per year.	Existing NRC-licensed radiologically contaminated site	10 CFR § 20.1403(b)	Not an ARAR	These requirements are not applicable because IR Site 2 is not an NRC-regulated site. These requirements are not relevant and appropriate because the RGs for IR Site 2 are protective of human health and the environment and are more stringent and protective than the criteria in 10 CFR § 20.1403.
State ARARs for Chemical Contamination				
California Environmental Protection Agency Department of Toxic Substances Control (DTSC)				
Definitions of designated waste, nonhazardous waste, and inert waste.	Waste	Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	Applicable	Applicable for classifying waste and determining ARAR status of other requirements.
Definition of non-RCRA hazardous waste.	Waste	Cal. Code Regs. tit. 22, § 66261.3(a)(2) (C) or 66261.3(a)(2)(F), 66261.22(a)(3) and (4), 66261.24(a)(2)–(a)(8), 66261.101(a)(1) and (a)(2)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
State ARARs for Radiological Contamination				
California Department of Public Health				
This regulation requires each person granted a specific license to do the following: • Keep records of information important to the decommissioning of a facility • Notify CDPH prior to vacating an installation that may have been contaminated with radioactive material • Complete certain activities if the person does not submit a specific license renewal application • Submit a decommissioning plan for approval by CDPH and, if approved, complete decommissioning The regulation also provides that if the information submitted does not adequately demonstrate that the premises are suitable for release for unrestricted use, CDPH shall inform the licensee of appropriate further actions and that specific licenses shall be terminated by written notice to the licensee when CDPH determines that: (1) radioactive material has been properly disposed; (2) reasonable effort has been made to eliminate residual radioactive contamination, if present; and (3) a radiation survey has been performed which demonstrates that the premises are suitable for release for unrestricted use; or other information submitted by the licensee is sufficient to demonstrate that the premises are suitable for release for unrestricted use.	A person with a specific license granted pursuant to Group 2 of Title 17, Division 1, Chapter 5, Subchapter 4	Cal. Code Regs. tit. 17, § 30256	Not an ARAR	<u>The State Regulation is not Applicable.</u> A Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action must comply with promulgated state requirements, which are either “applicable” or “relevant and appropriate.” The Navy and USEPA assert that the provisions of Cal. Code Regs. tit. 17 §30256 are not “applicable” requirements because these regulations by their express terms apply to facilities licensed by the State of California that are undergoing a license termination process. The remediation of IR Site 2 under CERCLA is not part of a decommissioning or license termination procedure nor has any state license ever been issued for IR Site 2 because California laws and regulations regarding possession of radioactive materials do not apply to land possessed by the federal government. <u>The State Regulation is not Relevant and Appropriate.</u> The Navy and USEPA also assert that the provisions of this regulation are not “relevant and appropriate” because standards for decommissioning a licensed facility are not “appropriate” for this site because they do not address a set of circumstances similar to the remediation of IR Site 2. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) specifies a series of factors to be used to compare the proposed CERCLA action with potential ARARs to determine if a requirement is both relevant and appropriate (40 CFR § 300.400[g][2]). CDPH regulation can be distinguished from the selected remedial action for IR Site 2 on a number of bases, including the

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
				medium addressed, type of action/activity regulated, and type of place regulated. More specifically, the license termination process described in the regulation appears to be intended to reach the conclusion that the facility is suitable for release for unrestricted use. This requirement is one among a detailed set of requirements for the “cradle-to-grave” management of licensed radiological material that were never applied to Alameda Point. The radionuclides addressed in IR Site 2 were not subject to such regulatory controls when they were used by the Navy or when they were released into the environment, and, hence, present very different issues; for example, very high volume of potentially impacted soil, low concentrations of radionuclides in soil, high cost of removal, etc. The remedial action selected in this ROD provides for a surface scan of the landfill to identify and address radiological contamination, which is accessible and acontainment remedy for residual radionuclides consisting of a multilayer soil cover and enforceable ICs that will ensure adequate protection of human health and the environment by preventing unauthorized disturbance of the cover and limiting use of the property. Containment remedies for sites potentially containing radionuclides consisting of remedial caps or covers supported by enforceable ICs have been accepted by USEPA and the California Environmental Protection Agency DTSC as compliant with CERCLA and the NCP (e.g., Marine Corps Air Station El Toro Operable Unit 2C [Site 3 and 5] ROD and Hunters Point Shipyard Amended Parcel B ROD). The state regulation is not more stringent than federal ARARs or risk-based cleanup levels. To qualify as a state ARAR under CERCLA and the NCP, a state regulation must be more stringent than federal laws

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
				and regulations. See 40 CFR §§ 300.400(g)(4) and 300.515(h)(2). The state is responsible for identifying potential state ARARs that it believes are more stringent than federal ARARs or risk-based cleanup levels and for demonstrating why they are more stringent. The remedy for IR Site 2 is based on a risk-based approach and the State has not demonstrated that the standards under § 30256(k) would be more stringent. The State has asserted that the phrase "eliminate residual radioactive contamination" in subsection 30256(k)(2) established a more-stringent standard because CERCLA does not require the elimination of residual radioactive contamination. The suggestion ignores the actual language of the regulation, which requires only "reasonable effort to eliminate residual radioactive contamination." This standard is by its terms flexible and cannot be assumed to require a more-stringent cleanup than the selected CERCLA remedial action. Subsection (k) neither contains a numerical standard nor describes a narrative standard, which would inform the question of whether (or what quantity of) radiological material can remain in the landfill. If there were a means to derive an objective standard from (k), that standard has not been identified by the State. Without an identified objective standard, there can be no basis for asserting that the requirement is more stringent than the CERCLA risk-based standards for the landfill. Although general goals can be considered state ARARs if they are directive in intent and enforceable (see the NCP preamble at 55 Fed. Reg. 8746, March 8, 1990), CDPH has stated that California laws concerning possession of radioactive materials do not apply to property that remains in the possession of the federal government. Therefore, these laws are not enforceable as required

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
				by CERCLA and the NCP. The State Regulation is not Substantive. A state regulation must be substantive rather than procedural to qualify as a state ARAR (see definitions of "applicable" and "relevant and appropriate" in the NCP at 40 CFR § 300.5). CDPH asserts that, in particular, subdivision (k) is a potential ARAR because it contains substantive requirements. Since these three criteria apply to decisions to terminate a specific license, the Navy and USEPA interpret them to be procedural and not substantive requirements. In summary, the Navy and USEPA have determined that the provisions of Cal. Code Regs. tit. 17 § 30256 do not constitute an ARAR because: (1) they are neither applicable" nor "relevant and appropriate", (2) they have not been demonstrated by the State to be more stringent than federal ARARs or risk-based cleanup levels, and (3) they are not substantive requirements.
GROUNDWATER				
Federal ARARs				
Resource Conservation and Recovery Act (Title 42 USC, ch. 82, §§ 6901 through 6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic based on the TCLP if the waste exceeds the TCLP maximum concentrations.	Waste	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Substantive provisions are applicable for determining whether waste is hazardous.
Owners/operators of RCRA treatment, storage, and disposal (TSD) facilities must comply with conditions designated to ensure that hazardous constituents entering groundwater from a regulated unit do not exceed concentration limits for chemicals	Waste	Cal. Code Regs., tit. 22, § 66264.94(a)(1), (a)(3), (b), (c), and (e)	Relevant and Appropriate	These requirements are not applicable because IR Site 2 was used for waste disposal before the RCRA waste management unit regulations were in place. However, substantive provisions of these requirements are relevant and appropriate for groundwater at IR Site 2 because the wastes at the

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
of concern set forth under Cal. Code Regs. tit. 22, § 66264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance.				site are similar to RCRA wastes, making this a chemical-specific ARAR for development of site RGs.
State ARARs				
California Environmental Protection Agency DTSC				
Definition of non-RCRA hazardous waste.	Waste	Cal. Code Regs. tit. 22, § 66261.3(a)(2) (C) or 66261.3(a)(2)(F), 66261.22(a)(3) and (4), 66261.24(a)(2)–(a)(8), 66261.101(a)(1) and (a)(2)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.
State and Regional Water Quality Control Boards[c]				
Authorizes the State Water Resources Control Board (SWRCB) and San Francisco Bay Regional Water Quality Control Board (Water Board) to establish in water quality control (QC) plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including National Pollution Discharge Elimination System (NPDES) permits, and to take enforcement action to protect water quality.	Waters of the State	Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Act)	Applicable	The Navy accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan for the San Francisco Bay Region.

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
Describes the water basins in the San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes water quality objectives, including narrative and numerical standards, and incorporates statewide water QC plans and policies.	Waters of the State	Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) Chapter 2 and Chapter 3 (Cal. Water Code § 13240)	Applicable	Substantive provisions in Chapters 2 and 3 of the Water QC Plan for the San Francisco Bay are ARARs, except for the municipal beneficial use designation of the Basin Plan (see Section B2.2.1.2). The beneficial uses for the East Bay subbasin are agricultural supply, industrial service supply, and industrial process supply. These uses also apply to the shallow groundwater system at Alameda Point. The narrative standard requiring that all waters be maintained free of toxic substances in concentrations that are lethal to or that produce other harmful responses in aquatic organisms, and that there shall be no acute toxicity or chronic toxicity in ambient waters is an ARAR for groundwater.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids exceed 3,000 milligrams per liter, and it is not reasonably expected by the Water Board to supply a public water system.	Waters of the State	SWRCB Resolution 88-63 (Sources of Drinking Water Policy)	Applicable	This resolution is an ARAR for the selected remedial alternative for groundwater.
Establishes the policy that high-quality waters of the State “shall be maintained to the maximum extent possible” consistent with the “maximum benefit to the people of the State.” It provides that whenever the existing quality of water is better than that required by applicable water quality policies, such existing high-quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not	Waters of the State	Statement of Policy With Respect to Maintaining High Quality of Waters in California, SWRCB Resolution 68-16	Not an ARAR	This policy is not a chemical-specific ARAR for determining RGs or for addressing any further migration of existing contamination at IR Site 2. The State does not agree. Whereas the Navy and State of California have not agreed on whether this resolution is an ARAR for this response action, the ROD documents each of the parties’ positions on the resolution but does not attempt to resolve the issue.

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Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
result in water quality less than that prescribed in the policies. It also states that any activity that produces or may produce a waste or increased volume or concentration of waste and that discharges or proposes to discharge to existing high-quality waters will be required to meet waste-discharge requirements that will result in the best practicable treatment or control of the discharge.				
Describes requirements for Water Board oversight of investigation and cleanup and abatement activities resulting from discharges of hazardous substances. The Water Board may decide on cleanup and abatement goals and objectives for the protection of water quality and beneficial uses of water within each region. Establishes criteria for "containment zones" where cleanup to established water-quality goals is not economically or technically practicable.	Discharge of hazardous substances to waters of the State	Policies and procedures for investigation and cleanup and abatement of discharges under Cal. Water Code § 13304, SWRCB Resolution 92-49	Not an ARAR	This policy is not applicable because it is not more stringent than the federal ARAR at Cal. Code Regs. tit. 22, § 66264.94(a)(1), (a)(3), (b), (c), and (e). The State does not agree. Whereas the Navy and State of California have not agreed on whether this resolution is an ARAR for this response action, this ROD documents each of the parties' positions on the resolution but does not attempt to resolve the issue.

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
		SURFACE WATER		
Federal ARARs				
Clean Water Act of 1977, as Amended (33 USC, ch. 26, §§ 1251–1387)[c]				
Water quality standards in the California Toxics Rule	Discharge to waters of the United States	40 CFR § 131.38	Applicable	The substantive numeric standards in the California Toxics Rule are ARARs for surface water and will be met in the surface water offshore of IR Site 2, at the interface of the groundwater and the Bay.
Water quality standards in the National Toxics Rule	Discharge to waters of the United States	40 CFR § 131.36(b)	Applicable	The substantive numeric standards in the National Toxics Rule are ARARs for surface water and will be met in the surface water offshore of IR Site 2, at the interface of the groundwater and the Bay.
Effluent limitations that meet technology-based requirements, including best conventional pollution-control technology and best available technology to the extent economically achievable.	Point source discharges to waters of the United States	33 USC, ch. 26, § 1311(b)(2) (CWA § 301[b])	Applicable	Substantive provisions are applicable for point source discharges of groundwater to surface water in San Francisco Bay associated with any dewatering activities associated with the implementation of the selected remedial alternative for soil.
State ARARs				
State and Regional Water Quality Control Boards[c]				
Authorizes the SWRCB and Water Board to establish in water QC plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Waters of the State	Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Act)	Applicable	The Navy accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, promulgated policies of the Basin Plan for the San Francisco Bay Region.

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APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements				
Requirement	**Prerequisite**	**Citation[b]**	**ARAR Determination**	**Comments**
Describes the water basins in the San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes water quality objectives, including narrative and numerical standards, and incorporates statewide water QC plans and policies.	Waters of the State	Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) Chapter 2 and Chapter 3 (Cal. Water Code §13240)	Applicable	Substantive provisions in Chapters 2 and 3 of the Water QC Plan for the San Francisco Bay are ARARs, except for the municipal beneficial use designation of the Basin Plan (see Section B2.2.1.2). The beneficial uses for the East Bay subbasin are agricultural supply, industrial service supply, and industrial process supply. These uses also apply to the shallow groundwater system at Alameda Point. The narrative standard requiring that all waters be maintained free of toxic substances in concentrations that are lethal to or that produce other harmful responses in aquatic organisms, and that there shall be no acute toxicity or chronic toxicity in ambient waters is an ARAR for surface water.
Requires analysis for each priority pollutant to determine if water-quality based effluent limitation is required. Provides effluent limitation development methodology.	Discharges of toxic priority pollutants into in land surface waters, bays, or estuaries	Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Inland Surface Waters Plan) (SWRCB 2000a), § 1.3 and 1.4	Applicable	The substantive provisions of this Plan are accepted as ARARs for implementing the California Toxics Rule and the National Toxics Rule, identified previously as federal ARARs, and for the point source discharge of groundwater to surface water that may be necessary in the implementation of the selected remedial alternative for soil.

Source: Final Record of Decision (DON 2010)

Notes:

[a] Chemical-specific concentrations used for FS evaluation may not be ARARs indicated in this table but may be based on other factors, including human health risk-based concentrations (40 CFR) § 300.430[e][2][i][A][1] and [2]), ecological risk-based concentrations (40 CFR § 300.430 [e][2][i][G]), or practical quantification limits of contaminants (40 CFR § 300.430[e][2][i][A][3]). Many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables. concentrations (40 CFR) § 300.430[e][2][i][A][1] and [2]), ecological risk-based concentrations (40 CFR § 300.430 [e][2][i][G]), or practical quantification limits of contaminants (40 CFR § 300.430[e][2][i][A][3]). Many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[b] Only the substantive provisions of the requirement(s) cited in this table are ARARs.

[c] Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only pertinent substantive requirements of specific citations are considered ARARs.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Abbreviations and Acronyms:

§ – section
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
Cal. Water Code – *California Water Code*
CDPH – California Department of Public Health
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – *Code of Federal Regulations*
ch. – chapter
cm – centimeter
CWA – California Water Act
DTSC – (California) Department of Toxic Substances Control
Fed. Reg. – Federal Regulation
FFA – Federal Facility Agreement
FS – feasibility study
IC – institutional control
IR – Installation Restoration (Program)
NCP – National Oil and Hazardous Substances Pollution Contingency Plan
NPDES – National Pollutant Discharge Elimination System
NRC – Nuclear Regulatory Commission
pCi/g – picocuries per gram
QC – quality control
Ra-226 – radium-226
RCRA – Resource Conservation and Recovery Act
RG – remediation goal
ROD – Record of Decision
SWRCB – (California) State Water Resources Control Board
TCLP – toxicity characteristic leaching procedure
tit. – title
TSD – treatment, storage, and disposal
UMTRCA – Uranium Mill Tailings Radiation Control Act
USC – *United States Code*
USEPA – U.S. Environmental Protection Agency

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Federal ARARs					
Executive Order No. 11990, Protection of Wetlands[b]					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland meeting definition of Section 7	40 CFR § 6.302(a)	Applicable	Substantive provisions are ARARs because wetlands are located within IR Site 2.
Clean Water Act of 1977, as Amended, Section 404 (33 USC § 1344)[b]					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Exec. Order No. 11990 Section 7	33 U.S.C § 1344	Applicable	Substantive provisions are ARARs because filling of some portions of the wetlands at IR Site 2 may be required to effectively implement the remedial alternative selected for the soil.
Migratory Bird Treaty Act of 1918 (16 USC § 703-712)[b]					
Migratory bird area	Protects almost all species of native birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds	16 U.S.C. § 703	Relevant and appropriate	Substantive provisions are ARARs because the wetlands at IR Site 2 could be used for nesting and foraging by many migratory bird species.
Habitat upon which endangered species or threatened species depend	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	Determination of effect upon endangered or threatened species or its habitat. Critical habitat upon which endangered species or threatened species depend.	16 U.S.C. § 1536(a) and (h)(1)(B); 16 U.S.C. § 1538(a)(1)(B) and (G);	Applicable	The substantive provisions of these requirements are ARARs for IR Site 2 because the wetlands at IR Site 2 could be used by bird species that are listed as endangered or threatened. The selected remedy will prevent exposure of ecological receptors to contamination at IR Site 2 and will be implemented in a manner by which taking or adverse effects to threatened or endangered species does not occur.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Coastal Zone Management Act (16 USC §§ 1451 – 1464)[b]					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs.	Activities affecting the coastal zone, including land under and adjacent to shore land	16 USC § 1456(c) 15 CFR § 930	Relevant and Appropriate	The CZMA specifically excludes federal lands from its jurisdiction; however, because IR Site 2 is adjacent to San Francisco Bay, the Navy has identified the CZMA as relevant and appropriate. The selected remedial alternatives for soil and groundwater at IR Site 2 will not result in filling in San Francisco Bay proper, but may entail some minor filling of the North Pond that is present in the wetlands portion of the site. To the extent that during the remedial design phase it is determined that some minor filling of the North Pond is required to place the multilayer soil cover, the Navy will ensure applicable substantive requirements are followed to protect the beneficial uses of San Francisco Bay in compliance with the CZMA by and the San Francisco Bay Plan (an approved state management program).
State ARARs					
California Endangered Species Act, California Fish & Game Code[b]					
State threatened or endangered species	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Threatened or endangered species determination on or before January 1, 1985	Cal. Fish and Game Code § 2080	Relevant and Appropriate	Cal. Fish & Game Code § 2080 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. The Savannah Sparrow is protected under Cal. Fish & Game Code § 2080. The substantive provisions of Cal. Fish & Game Code § 2080 appear to meet the criteria under 40 C.F.R. § 300.400(g)(2)(viii) and are potentially relevant and appropriate for this species. The DON is subject to the jurisdiction of the FESA. The substantive requirements of Cal. Fish & Game Code § 2080 that are more stringent than FESA are accepted by the DON as being relevant and appropriate. Thus, species that are listed under CESA, but not protected under FESA, will be addressed by the application of the substantive provisions of Cal. Fish & Game Code § 2080.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
California Endangered Species Act, California Fish & Game Code[b]					
State threatened or endangered species (continued)	A take under Cal. Fish & Game Code § 2080 may be allowed if it is incidental to a response action and is fully mitigated.	Threatened or endangered species determination	Cal. Fish & Game Code § 2081(b)	Relevant and appropriate	The selected remedial alternatives do not include the intentional taking of species listed under the CESA. Cal. Fish & Game Code § 2081(b) allows for take incidental to otherwise lawful activities. The substantive provisions of Cal. Fish & Game Code § 2081(b) are integrally related to § 2080 and are also accepted as "relevant and appropriate" requirements consistent with 40 C.F.R. § 300.400(g)(2)(v). DON environmental restoration projects are exempt from procedural permitting processes under CERCLA Section 121(d)(2)(B)(i) (42 U.S.C. § 9621[d][2][B][i]).
Birds or mammals	It is unlawful to take birds or mammals with any net, pound, cage, trap, set line or wire, or poisonous substance, or to possess birds or mammals so taken, whether taken within or without this state.		Cal. Fish & Game Code § 3005(a) (Statute 1957, c. 456, p. 1353, Section 3005)	Not an ARAR	See June 16, 2009 letter from Department of Navy counsels Rex Callaway and Michael Waters to California Department of Fish and Game counsel Wendy Johnson for a more detailed explanation of the position set forth below. This section is not an environmental or facility siting law and is, therefore, not an ARAR (see CERCLA § 121(d) and 40 CFR § 300.5 of the NCP). The Navy further reviews below whether this requirement would otherwise qualify as a State ARAR if it were deemed to be an environmental requirement. Cal. Fish and Game Code § 3005(a) is not applicable because the United States of America has not waived sovereign immunity in the FESA for this State of California requirement. Pursuant to 40 CFR § 300.400(g)(2) of the NCP, the Navy has determined that this requirement is not "relevant and appropriate", because it does not address problems or situations sufficiently similar to the circumstances of the release or CERCLA response action and is not well-suited to the site based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP.2

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Birds or mammals (continued)					CERCLA response actions are intended to respond to releases of hazardous substances in order to protect human health and the environment including environmental receptors such as the species addressed in the statutory provisions and regulations cited by CDFG. In contrast, the purpose of this State requirement is to regulate and set forth conditions for the "taking" of the species addressed by those requirements. Moreover, that purpose is achieved through the regulation of intentional conduct directed at the species as opposed to incidental “take” (or possession, etc.) of species in the course of lawful activity such as CERCLA remedial action. The focus on intentional conduct is not well- suited to the circumstances at CERCLA sites. In summary, the purposes of this State requirement and the actions that it regulates do not include responding to releases of hazardous substances. Therefore, it is not “relevant and appropriate” based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP. The Navy’s ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/cleanup goals will ensure that they are adequately protected from exposure to CERCLA hazardous substances that present unacceptable risk. In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARs related to those designations. Although this requirement is not an ARAR, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Bird nest or eggs	It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.	Bird nests or eggs on-site	Cal. Fish & Game Code § 3503 (Added by Statutes 1985, c. 1334, Section 6)	Not an ARAR	See June 16, 2009 letter from Department of Navy counsels Rex Callaway and Michael Waters to California Department of Fish and Game counsel Wendy Johnson for a more detailed explanation of the position set forth below. This section is not an environmental or facility siting law and is, therefore, not an ARAR (see Section 121(d) of CERCLA and 40 CFR Section 300.5 of the NCP). The Navy further reviews below whether this requirement would otherwise qualify as a State ARAR if it were deemed to be an environmental requirement. Cal. Fish and Game Code § 3503 is not applicable because the United States of America has not waived sovereign immunity in the FESA for this State of California requirement. Pursuant to 40 CFR § 300.400(g)(2) of the NCP, the Navy has determined that this requirement is not "relevant and appropriate", because it does not address problems or situations sufficiently similar to the circumstances of the release or CERCLA response action and is not well-suited to the site based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP.[3] CERCLA response actions are intended to respond to releases of hazardous substances in order to protect human health and the environment including environmental receptors such as the species addressed in the statutory provisions and regulations cited by CDFG. In contrast, the purpose of this State requirement is to regulate and set forth conditions for the "taking" of the species addressed by those requirements. Moreover, that purpose is achieved through the regulation of intentional conduct directed at the species as opposed to incidental “take” (or possession, etc.)

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Bird nest or eggs (continued)					of species in the course of lawful activity such as CERCLA remedial action. The focus on intentional conduct is not well- suited to the circumstances at CERCLA sites. In summary, the purposes of this State requirement and the actions that it regulates do not include responding to releases of hazardous substances. Therefore, it is not "relevant and appropriate" based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP. The Navy's ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/cleanup goals will ensure that they are adequately protected from exposure to CERCLA hazardous substances that present unacceptable risk. Although this requirement is not an ARAR, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process.
Falconiformes or *Strigiformes*	It is unlawful to take, possess, or destroy any birds in the orders *Falconiformes* or *Strigiformes* (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird.	*Falconiformes* or *Strigiformes* birds on-site	Cal. Fish & Game Code § 3503.5 (Added by Statutes 1985, c. 1334, Section 6)	Not an ARAR	The California Department of Fish and Game has withdrawn its identification of this requirement as a potential State ARAR (see December 3, 2009, letter from Department counsel Wendy Johnson to Navy counsels Rex Callaway and Mike Waters).

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Fully protected bird species/ habitat	Provides that it is unlawful to take or possess listed fully protected birds.	Taking of protected birds	Cal. Fish and Game Code § 3511	Relevant and Appropriate	Cal. Fish & Game Code § 3511 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. The Savannah Sparrow is protected under Cal. Fish & Game Code § 3511. The substantive provisions of Cal. Fish & Game Code § 3511 appear to meet the criteria under 40 C.F.R. § 300.400(g)(2)(viii) and are potentially relevant and appropriate for these species. The DON is subject to the jurisdiction of the FESA. The substantive requirements of Cal. Fish & Game Code § 3511 that are more stringent than FESA are accepted by the DON as being relevant and appropriate.
Nongame birds	It is unlawful to take any nongame bird.	All birds occurring naturally in California that are not resident game birds, migratory game birds, or fully protected birds are nongame birds	Cal. Fish & Game Code § 3800(a) (Added by Statutes 1971, c. 1470, p. 2906, Section 13)	Not an ARAR	The California Department of Fish and Game has withdrawn its identification of this requirement as a potential State ARAR (see December 3, 2009, letter from Department counsel Wendy Johnson to Navy counsels Rex Callaway and Mike Waters).
Nongame mammals	All mammals occurring naturally in California that are not game mammals, fully protected mammals, or fur-bearing mammals, are nongame mammals. Nongame mammals or parts thereof may not be taken or possessed.	Response action may potentially take a nongame mammal	Cal. Fish & Game Code § 4150	Not an ARAR	The California Department of Fish and Game has withdrawn its identification of this requirement as a potential State ARAR (see December 3, 2009, letter from Department counsel Wendy Johnson to Navy counsels Rex Callaway and Mike Waters).

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Aquatic habitat	Action must be taken if toxic materials are placed where they can enter the waters of the state	Materials entering the waters of the state	Cal. Fish and Game Code § 5650(a), (b) and (f)	Relevant and Appropriate	California Fish and Game Code § 5650 is not applicable because the United States of America has not waived sovereign immunity in the FESA for this State of California requirement. While no direct deposition of material is expected to enter into or impact waters of the state, the substantive provisions of this standard will be complied with as an ARAR. Any removal action taking place in an area that may impact waters of the state will be conducted in such a way as to ensure that materials dug up will not be released into the water column.
Mollusks, crustaceans, or invertebrates	No mollusks, crustaceans, or other invertebrates may be taken, possessed aboard a boat, or landed for commercial purposes by any person in any tide pool or tidal area, including tide flats or other areas between the high tidemark and 1,000 feet beyond the low tidemark.	The taking and possession of fish for any commercial purpose	Cal. Fish & Game Code § 8500	Not an ARAR	The California Department of Fish and Game has withdrawn its identification of this requirement as a potential State ARAR (see December 3, 2009, letter from Department counsel Wendy Johnson to Navy counsels Rex Callaway and Mike Waters).
Reptiles and amphibians	It is unlawful to capture, collect, intentionally kill or injure, possess, purchase, propagate, sell, transport, import, or export any native reptile or amphibian, or part thereof.	Potentially affect native reptiles or amphibians	Cal. Code Regs. tit. 14 § 40	Not an ARAR	The California Department of Fish and Game has withdrawn its identification of this requirement as a potential State ARAR (see December 3, 2009, letter from Department counsel Wendy Johnson to Navy counsels Rex Callaway and Mike Waters).

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Nongame birds and mammals	Nongame birds and mammals may not be taken except as provided. (a) The following nongame birds and mammals may be taken at any time of the year and in any number except as prohibited: English sparrow, starling, coyote, weasels, skunks, opossum, moles, and rodents (excluding tree and flying squirrels, and those listed as furbearers, endangered, or threatened species). (b) Fallow, sambar, sika, and axis deer may be taken only concurrently with the general deer season. (c) Aoudad, mouflon, tahr, and feral goats may be taken all year. (d) American crows (*Corvus brachyrhynchos*) may be taken only under the provisions of Section 485 and by landowners or tenants, or by persons authorized in writing by such landowners or tenants, when American crows are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance.	Taking of nongame birds and mammals	Cal. Code Regs. tit. 14, § 472	Not an ARAR	The California Department of Fish and Game has withdrawn its identification of this requirement as a potential State ARAR (see December 3, 2009, letter from Department counsel Wendy Johnson to Navy counsels Rex Callaway and Mike Waters).

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Location-Specific Applicable or Relevant and Appropriate Requirements					
Location	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
McAteer-Petris Act (California Government Code §§ 66600 through 66661)[b]					
Within the San Francisco Bay coastal zone	Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	Activities affecting the San Francisco Bay and 100 feet landward of the shoreline	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	Relevant and appropriate	The Navy has determined that the substantive provisions of the CZMA are relevant and appropriate federal location-specific requirements of IR Site 2. The CZMA requires federal agency activity be conducted in a manner consistent with approved state management programs to the maximum extent practicable. The McAteer-Petris Act is enabling legislation for the San Francisco Bay Plan, an approved state management program for the San Francisco Bay. Substantive provisions of the McAteer-Petris Act and the San Francisco Bay Plan are relevant and appropriate because their authority is derived from the CZMA, a relevant and appropriate federal requirement. The Navy will conduct the selected remedial alternatives for soil and groundwater at IR Site 2 in accordance with the substantive provisions of the San Francisco Bay Plan.

Source: Final Record of Decision (DON 2010)

Notes:

a Only the substantive provisions of the requirements cited in this table are ARARs.

b Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.

Abbreviations and Acronyms:

§ – Section
§§ – Sections
ARAR – applicable or relevant and appropriate requirement
Cal. Code Reg. – *California Code of Regulations*
Cal. – California
CESA – California Endangered Species Act
CFR – *Code of Federal Regulations*
CZMA – Coastal Zone Management Act
FESA – Federal Endangered Species Act
tit. – Title
USC – United States Code

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
EXCAVATION AND DISPOSAL OF WASTE					
FEDERAL ARARs					
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-6991[i])[a]					
On-site waste generation	Person who generates waste shall determine if that waste is a hazardous waste	Generator of waste	Cal. Code Regs., tit. 22, §§ 66262.10(a), 66262.11	Applicable	Applicable for characterization of waste generated during monitoring and construction of monitoring wells.
	Requirement for analyzing waste to determine whether waste is hazardous.	Generator of waste	Cal. Code Regs., tit. 22, § 66264.13(a) and (b)	Applicable	Applicable for characterization of waste generated during monitoring and construction of monitoring wells.
Hazardous waste accumulation	On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.171–178 or in tanks, on drip pads, inside buildings, and is labeled and dated.	Accumulate hazardous waste	Cal. Code Regs. tit. 22, § 66262.34	Applicable	Applicable for characterization of waste generated during monitoring and construction of monitoring wells.
Container storage	Containers of RCRA hazardous waste must be: • maintained in good condition, • compatible with hazardous waste to be stored, and • closed during storage, except to add or remove waste.	Storage in a container of RCRA hazardous waste not meeting small quantity generator criteria before treatment, disposal, or storage elsewhere	Cal. Code Regs. tit. 22, § 66264.171, 66264.172, and 66264.173	Applicable and relevant and appropriate	The substantive provisions are ARARs for handling small amounts of waste generated in the implementation of the remedies (for example, the construction of new groundwater monitoring wells or other investigation derived waste). The requirements are applicable if waste is determined to be RCRA hazardous or non-RCRA, state- regulated hazardous waste. These requirements are relevant and appropriate for solid waste that is designated or nonhazardous solid waste.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Container storage (continued)	Inspect container storage areas weekly for deterioration.	Storage in a container of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere	Cal. Code Regs. tit. 22, § 66264.174	Applicable and relevant and appropriate	The substantive provisions are ARARs for handling small amounts of waste generated in the implementation of the remedies (for example, the construction of new groundwater monitoring wells or other investigation derived waste). The requirements are applicable if waste is determined to be RCRA hazardous or non-RCRA, state- regulated hazardous waste. These requirements are relevant and appropriate for solid waste that is designated or nonhazardous solid waste.
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.	Storage in a container of RCRA hazardous waste not meeting small- quantity generator criteria before treatment, disposal, or storage elsewhere	Cal. Code Regs. tit. 22, § 66264.175(a), (b)	Applicable and relevant and appropriate	The substantive provisions are ARARs for handling small amounts of waste generated in the implementation of the remedies (for example, the construction of new groundwater monitoring wells or other investigation derived waste). The requirements are applicable if waste is determined to be RCRA hazardous or non-RCRA, state- regulated hazardous waste. These requirements are relevant and appropriate for solid waste that is designated or nonhazardous solid waste.
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.	Storage in a container of RCRA hazardous waste not meeting small- quantity generator criteria before treatment, disposal, or storage elsewhere	Cal. Code Regs. tit. 22, § 66264.177	Applicable and relevant and appropriate	The substantive provisions are ARARs for handling small amounts of waste generated in the implementation of the remedies (for example, the construction of new groundwater monitoring wells or other investigation derived waste). The requirements are applicable if waste is determined to be RCRA hazardous or non-RCRA, state- regulated hazardous waste. These requirements are relevant and appropriate for solid waste that is designated or nonhazardous solid waste.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Container storage (continued)	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners.	Hazardous waste	Cal. Code Regs. tit. 22, § 66264.178	Applicable and relevant and appropriate	The substantive provisions are ARARs for handling small amounts of waste generated in the implementation of the remedies (for example, the construction of new groundwater monitoring wells or other investigation derived waste). The requirements are applicable if waste is determined to be RCRA hazardous or non-RCRA, state- regulated hazardous waste. These requirements are relevant and appropriate for solid waste that is designated or nonhazardous solid waste.
Waste Pile	Alternative requirements that are protective of human health or the environment may replace design, operating, or closure standards for temporary tanks and container storage areas.	Hazardous remediation waste temporarily stored in piles	Cal. Code Regs. tit. 22, § 66264.553(b),(d), (e), and (f)	Applicable and relevant and appropriate	The substantive provisions are applicable for temporarily storing excavated soil that is RCRA hazardous or non-RCRA, state regulated hazardous waste prior to on-site relocation or off-site disposal. The substantive provisions are relevant and appropriate for temporarily storing excavated soil that is designated or nonhazardous waste.
	Allows generators to accumulate solid remediation wastes during remedial operations in a U.S. EPA designated pile for storage only, up to 2 years, without triggering LDRs.	Hazardous remediation waste temporarily stored in piles	40 CFR§ 264.554(d)(1)(i–ii) and (d)(2),(e), (f), (h), (i),(j), and (k)	Applicable and relevant and appropriate	The substantive provisions are applicable for temporarily storing excavated soil that is RCRA hazardous or non-RCRA, state regulated hazardous waste prior to on-site relocation or off-site disposal. The substantive provisions are relevant and appropriate for temporarily storing excavated soil that is designated or nonhazardous waste.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Waste Pile (continued)	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left onsite, perform postclosure care in accordance with the closure and postclosure care requirements that apply to landfills.	Waste pile used to store hazardous waste	Cal. Code Regs. tit. 22, § 66264.258(a) and (b) except references to procedural requirements	Applicable and relevant and appropriate	The substantive provisions are applicable for temporarily storing excavated soil that is RCRA hazardous or non-RCRA, state regulated hazardous waste prior to on-site relocation or off-site disposal. The substantive provisions are relevant and appropriate for temporarily storing excavated soil that is designated or nonhazardous waste.
Military Munitions Rule (40 CFR part 266 subpart M)[a]					
Management of military munitions	Identification of hazardous waste munitions and treatment and storage requirements for hazardous waste munitions.	Presence of military munitions	40 CFR §§ 266.203, 266.205, and 266.206	Applicable	The substantive provisions of these requirements are applicable to any MPPEH found while implementing the remedy.
Clean Water Act of 1977 (33 USC § 1344)[a]					
Storm Water Discharge	General requirements for a storm water management plan and implementation of best management practices.	Construction involving one acre or more of soil disturbance	40 CFR § 122.44(k)(2) and (4)	Applicable	Substantive provisions are applicable for the selected remedial alternative for soil wherein an acre or more of soil disturbance is expected.
Clean Air Act (42 USC §§ 7401–7671)[a]					
Discharge to air	A person shall not emit from any source for a period or periods aggregating more than 3 minutes in any hour a visible emission which is as dark as or darker than No. 1 on the Ringelmann chart or of such opacity as to obscure an observer's view to an equivalent or greater degree. A person shall not emit for a period or periods aggregating more than 3 minutes in any hour, an emission equal to or greater than 20 percent opacity.	Emissions	BAAQMD Regulation 6, § 6-301 and 302	Applicable	Substantive provisions are applicable for the earthwork and soil excavation activities.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
MULTILAYER SOIL COVER					
FEDERAL ARARs					
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-6991[i])a					
Site closure	Minimize the need for further maintenance controls and minimize or eliminate, to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or runoff, or waste decomposition products to groundwater or surface water or to the atmosphere.	Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66264.111(a) and (b)	Relevant and Appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Clean closure	During the partial and final closure periods, all contaminated equipment, structures, and soils shall be properly disposed or decontaminated by removing all hazardous waste and residues.	Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66264.114	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Final cover	The final cover shall be designed and constructed to function with minimum maintenance.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22 § 66264.310(a)(2)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
	The final cover shall be designed and constructed to promote drainage and minimize erosion or abrasion of the cover.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22 § 66264.310(a)(3)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
	The final cover shall be designed and constructed to accommodate settling and subsidence so that the cover's integrity is maintained.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22 § 66264.310(a)(4)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
	Landfill cover design requirements.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.228(e) through (r)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
	The final cover shall be designed and constructed to accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.310(a)(5)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Postclosure care	After closure, maintaining the integrity and effectiveness of the final cover, which includes making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events throughout the postclosure period.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.310(b)(1)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Site security	Prevent the unknowing entry, and minimize the possibility for the unauthorized entry of persons or livestock onto the active portion of the facility.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.14(a)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Clean Water Act of 1977 (33 USC § 1344)[a]					
Storm Water Discharge	General requirements for a storm water management plan and implementation of best management practices.	Construction involving one acre or more of soil disturbance	40 CFR § 122.44(k)(2)and (4)	Applicable	Substantive provisions are applicable for constructing the multilayer soil cover.
Clean Air Act (42 USC § 7401-7671)[a]					
Discharge to air	Provisions of SIP approved by the U.S. EPA under Section 110 of the Clean Air Act.	Major sources of air pollutants	40 USC § 7410; portions of 40 CFR § 52.220	Applicable	Substantive provisions are applicable for constructing the multilayer soil cover but implemented through the SIP.
Landfill gas control	The operator shall ensure that landfill gases generated at a disposal site are controlled. Methane must not exceed 1.25 percent by volume in air within on- site structures, concentrations of methane gas migrating from the landfill must not exceed 5 percent by volume in air at the property boundary, and trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds.	Cal. Code Regs. tit. 27 requirements are applicable only for waste discharged after July 18, 1997, unless otherwise noted	Cal. Code Regs. tit. 27, § 20921(a)(1),(2), and (3)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Erosion control	Diversion and drainage facilities shall be designed, constructed, and maintained to accommodate the anticipated volume of precipitation and peak flows. Collection and holding facilities associated with precipitation and drainage control systems shall be emptied immediately or otherwise managed to maintain system design capacity.	Cal. Code Regs. tit. 27 requirements are applicable only for waste discharged after July 18, 1997, unless otherwise noted	Cal. Code Regs. tit. 27, §§ 20365(c) and(d), 21090(c)(4),and 21150	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Engineered alternatives to final cover standard	Alternatives to prescriptive standards may be considered provided the prescriptive standard is not feasible and there is a specific engineered alternative that is consistent with the performance goal and affords equivalent protection against water quality impairment. The Water Board can allow any alternative final cover that it finds will continue to isolate the waste and irrigation waters at least as well as a final cover built in accordance with applicable prescriptive standards.	Cal. Code Regs. tit. 27 requirements are applicable only for waste discharged after July 18, 1997, unless otherwise noted	Cal. Code Regs. tit. 27, §§ 20080(b) and(c) and 21090(a)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Vegetative layer	Closed landfills shall be provided with an uppermost cover layer consisting of either a vegetative layer consisting of not less than 1 foot of soil capable of sustaining native or other suitable plant growth or a mechanically erosion-resistant layer.	Cal. Code Regs. tit. 27 requirements are applicable only for waste discharged after July 18, 1997, unless otherwise noted	Cal. Code Regs. tit. 27, § 21090(a)(3)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.
Final grading	The final cover of closed landfills shall be designed, graded, and maintained to prevent ponding and to prevent site erosion due to high runoff velocities. Slopes should be at least 3 percent.	Cal. Code Regs. tit. 27 requirements are applicable only for waste discharged after July 18, 1997, unless otherwise noted	Cal. Code Regs. tit. 27, § 21090(b)(1)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the multilayer soil cover.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
RADIOLOGICAL SCREENING AND MPPEH SWEEP					
FEDERAL ARARs					
Atomic Energy Act of 1954 (42 U.S.C. ch. 23, § 2011 et seq.)a					
Temporary storage of radiologically contaminated soil	The licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas.	Existing NRC-licensed site	10 CFR § 20.1801	Relevant and appropriate	This requirement is not applicable because IR Site 2 is not an NRC- licensed facility. The substantive provisions of this requirement are relevant and appropriate for staging excavated soil contaminated with ROCs at levels at or above remediation goals prior to off-site disposal.
	The licensee shall control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and that is not in storage.	Existing NRC-licensed site	10 CFR § 20.1802	Relevant and appropriate	This requirement is not applicable because IR Site 2 is not an NRC- licensed facility. The substantive provisions of this requirement are relevant and appropriate for staging excavated soil contaminated with ROCs at levels at or above remediation goals prior to off-site disposal.
WETLAND MITIGATION					
PLAN FEDERAL ARARs					
Clean Water Act of 1977 (33 USC § 1344)[a]					
Discharge of dredged material	U.S. Army Corps of Engineers requirements for permitting discharges of dredged material to waters of the United States.	Discharge of dredged material to waters of the United States, including adjacent wetlands	33 CFR § 320.4 40 CFR §§ 230.10, 230.11, 230.20-230.25, 230.31, 230.32, 230.41, 230.42 and 230.53	Applicable	Substantive provisions are applicable for the multilayer soil cover in the event that during the remedial design phase it is determined that dredged material needs to be discharged to waters of the United States to effectively implement the soil remedy.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
REMOVAL OF RADIOLOGICALLY-IMPACTED WASTE					
FEDERAL ARARs					
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-6991[i])[a]					
On-site generation of waste	Person who generates waste shall determine if that waste is a hazardous waste.	Generator of waste	Cal. Code Regs., tit. 22, §§ 66262.10(a), 66262.11	Applicable	Applicable for characterization of waste generated during removal of radiological hot spots prior to placing the multilayer soil cover.
	Requirement for analyzing waste to determine whether waste is hazardous.	Generator of waste	Cal. Code Regs., tit. 22, § 66264.13(a) and (b)	Applicable	Applicable for characterization of waste generated during removal of radiological hot spots prior to placing the multilayer soil cover.
Temporary waste pile	Alternative requirements that are protective of human health or the environment may replace design, operating, or closure standards for temporary tanks and container storage areas.	Hazardous remediation waste temporarily stored in piles.	40 CFR§ 264.554(d)(1)(i–ii) and (d)(2),(e), (f), (h), (i),(j), and (k)	Applicable and relevant and appropriate	The substantive provisions are applicable for temporarily storing excavated soil that is RCRA hazardous or non-RCRA, state-regulated hazardous waste prior to on-site relocation or off-site disposal. The substantive provisions are relevant and appropriate for temporarily storing excavated soil that is designated or nonhazardous waste.
Clean Water Act of 1977 (33 USC § 1344)a					
Storm Water Discharge	General requirements for a storm water management plan and implementation of best management practices.	Construction involving one acre or more of soil disturbance	40 CFR § 122.44(k)(2) and (4)	Applicable	Substantive provisions are applicable for the excavation of waste during removal of radiological hot spots prior to placing the multilayer soil cover.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Atomic Energy Act of 1954 (42 U.S.C. ch. 23, § 2011 et seq.)[a]					
Temporary storage of radiologically contaminated soil	The licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas.	Existing NRC-licensed site	10 CFR § 20.1801	Relevant and appropriate	This requirement is not applicable because IR Site 2 is not an NRC- licensed facility. The substantive provisions of this requirement are relevant and appropriate for staging excavated soil contaminated with ROCs at levels at or above remediation goals prior to off-site disposal.
	The licensee shall control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and that is not in storage.	Existing NRC-licensed site	10 CFR § 20.1802	Relevant and appropriate	This requirement is not applicable because IR Site 2 is not an NRC- licensed facility. The substantive provisions of this requirement are relevant and appropriate for staging excavated soil contaminated with ROCs at levels at or above remediation goals prior to off-site disposal.
GROUNDWATER MONITORING					
FEDERAL ARARs					
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-6991[i])[a]					
Groundwater monitoring	After final closure, maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of article 6 of chapter 14.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.310(b)(3)	Relevant and appropriate	The substantive provisions are relevant and appropriate for the groundwater monitoring associated with constructing the multilayer soil cover over the waste at IR Site 2. The specific provisions of chapter 14, article 6 that the Navy has identified as ARARs are discussed below.
Monitoring	The owner or operator shall establish and implement, in conjunction with the corrective action measures, a water quality monitoring program that will demonstrate the effectiveness of the corrective action program and be effective in determining compliance with the water quality protection standard and in determining the success of the corrective action measures under subsection (c) of this section.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.100(d)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Completion of response action	The corrective action program is complete when compliance with the water quality standard is demonstrated based on the results of sampling and analysis for all constituents of concern for a period of 1 year.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.100(g)(1)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.
Chemicals of concern	Identify constituents of concern including the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from waste contained in the regulated unit.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.93	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-6991[i])[a] (continued)					
Monitoring	Requirements for monitoring groundwater, surface water, and the vadose zone.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (B) and (C), 66264.97(b)(1)(D)(1) and (2), 66264.97(b)(2), 66264.97(b)(4)-(7), 66264.97(e)(6), 66264.97(e)(12)(A) and (B), 66264.97(e)(13), and 66264.97(e)(15)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.
	Requirements for a detection monitoring program.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.98(e)(1-5), (i), (j), (k)(1-3), (4)(A) and (D),(5), (7)(C) and (D),(n)(1),(2)(B), and (C)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Monitoring (continued)	Requirements for an evaluation monitoring program.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.99(b), (e)(1)–(6), (f)(3), and (g)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.
	Requires continued monitoring until the regulated unit has been in compliance with the water quality protection standard for a period of three consecutive years and all waste, waste residues, contaminated subsoils and all other contaminated geologic materials are removed or decontaminated at closure.	Hazardous waste treatment, storage, or disposal facility	Cal. Code Regs. tit. 22, § 66264.90(c)(1) and (c)(2)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.
	For compliance demonstration each "must have remained at or below its respective concentration limit during a proof period of at least one year . . . and . . . (2) each Monitoring Point must have been evenly distributed throughout the proof period and have consisted of no less than eight sampling events per year per Monitoring Point."	Waste discharged after July 18, 1997	Cal. Code Regs. tit. 27, § 20430(g)(1)	Relevant and Appropriate	The substantive provisions are relevant and appropriate for the selected remedial alternative for groundwater.
INSTITUTIONAL CONTROLS					
State ARARs					
California Civil Code (Cal. Civil Code § 1471)[a]					
Land use controls	Provides conditions under which land use restrictions will apply to successive owners of land	Transfer property from the Navy to a nonfederal agency	Cal. Civil Code § 1471	Relevant and appropriate	Substantive provisions are the following general narrative standard: "to do or refrain from doing some act on his or her own land … where (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety of the environment as a result of the presence of hazardous materials, as defined in § 25260 of the Cal. Health & Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed at the time of transfer.

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
California Health and Safety Code Land Use Controls (Cal. Health & Safety Code §§ 25202.5, 25222.1, 25232(b)(1)(A)(E), 25233(c), § 25234, § 25355.5)					
Land use controls	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the Navy to a nonfederal agency	Cal. Health & Safety Code § 25202.5	Relevant and appropriate	The substantive provisions of this section are the general narrative standards to restrict "present and future uses of all or part of the land on which the facility …is located."
	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Transfer property from the Navy to a nonfederal agency.	Cal. Health & Safety Code § 25222.1	Relevant and appropriate	Cal. Health & Safety Code § 25222.1 provides the authority for the state to enter into voluntary agreements to establish land use covenants with the owner of the property. The substantive provision of Cal. Health & Safety Code § 25222.1 is the general narrative standard: "restricting specified uses of the property."
California Health and Safety Code Land Use Controls (Cal. Health & Safety Code §§ 25202.5, 25222.1, 25233(c), § 25234, § 25355.5)					
Land use controls	Provides a process for obtaining a written variance from a land use restriction.	Transfer property from the Navy to a nonfederal entity.	Cal. Health & Safety Code § 25233(c)	Relevant and appropriate	Cal. Health & Safety Code § 25233(c) sets forth substantive criteria for granting variances from the uses prohibited in § 25232(b)(1)(A)- (E) based on specific environmental and health criteria.
	Provides a process by which DTSC can remove land use restrictions	Transfer property from the Navy to a nonfederal entity	Cal. Health & Safety Code § 25234	Relevant and appropriate	Cal. Health & Safety Code § 25234 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land-use restriction on the grounds that "…the waste no longer creates a significant existing or potential hazard to present or future public health or safety."
	Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present and future uses of the property	Transfer property from the Navy to a nonfederal entity	Cal. Health & Safety Code § 25355.5(a)(1)(C)	Relevant and appropriate	The substantive requirements of the following Cal. Health & Safety Code §25355.5(a)(1)(C) provisions are "relevant and appropriate": "…execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof , as appropriate, upon the present and future uses of the site."

TABLE 5-1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SUMMARY

Action-Specific Applicable or Relevant and Appropriate Requirements					
Action	**Requirement**	**Prerequisite**	**Citation**	**ARAR Determination**	**Comments**
Cal/EPA Department of Toxic Substances Control (Cal. Code Regs., tit. 22, § 67391.1)[a]					
Land use covenants	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Property transfer by federal government to nonfederal entity.	Cal. Code Regs., tit. 22, § 67391.1	Relevant and appropriate	Relevant and appropriate when the Navy is transferring property to a nonfederal agency. EPA considers the following portions of 22 CCR 67391.1 to be relevant and appropriate for this ROD: (a)(1), (a)(2), (d), (e)(1) and (e)(2). The Navy has selected ICs as part of the remedies for soil and groundwater. These requirements are ARARs for those ICs. EPA agrees that the substantive portions of the regulations referenced are ARARs. EPA specifically considers sections (a), (b), (d), and (e) of Cal. Code Regs. tit. 22 § 67391.1, to be ARARs for this ROD. DTSC's position is that all of the state regulation is an ARAR.

Source: Final Record of Decision (DON 2010)

Notes:

a Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs

Abbreviations and Acronyms:

§ – Section
§§ – Sections
ARAR – Applicable or relevant and appropriate requirement
BAAQMD – Bay Area Air Quality Management District
Cal. Code. Regs – *California Code of Regulations*
Cal. Civil Code – *California Civil Code*
Cal/EPA – California Environmental Protection Agency
CFR – Code of Federal Regulations
DTSC – California Environmental Protection Agency Department of Toxic Substances Control
POC – Point of compliance
SIP – State Implementation Plan
RCRA – Resource Conservation and Recovery Act
ROC – Radionuclides of concern
ROD – Record of Decision
tit. – Title
USC – *United States Code*
U.S. EPA – United States Environmental Protection Agency
Water Board – San Francisco Bay Regional Water Quality Control Board

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
McAteer-Petris Act (California Government Code §§ 66600 through 66661)		
Bay Plan at Cal. Code Regs, tit. 14, §§ 10110 through 11990	Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the San Francisco Bay.	The Bay Plan, developed under the authority of the McAteer-Petris Act, is an approved state coastal zone management program. The remedial alternative for Installation Restoration (IR) Site 2, the former landfill, as selected in the record of decision (ROD) and addressed in the Remedial Action Work Plan (RAWP), is consistent with the substantive policies of the Bay Plan to the extent practicable. The remainder of this table addresses the specific substantive relevant and appropriate provisions of the McAteer-Petris Act and the Bay Plan and presents specific information to support this consistency evaluation. See also Navy response to BCDC comments on the RAWP for further information (Attachment 13).
Part III of Bay Plan (Findings and Policies Concerning Fish, Other Aquatic Organisms and Wildlife in the Bay, Policy 1)	The Bay's tidal marshes, tidal flats, and subtidal habitat should be conserved, restored and increased to assure the benefits of fish, other aquatic organisms and wildlife for future generations, to the greatest extent feasible. Specific habitats that are needed to conserve, increase or prevent the extinction of any native species, species threatened or endangered, species that the California Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected.	Implementation of the remedy will comply with the substantive provisions of this policy. The remedy is designed to minimize damage to the tidal marshes, tidal flats, and subtidal habitat and to protect fish, other aquatic organisms, and wildlife. The wetland areas at Site 2 do not support a high diversity or density of invertebrates or mammals, and although the wetland ponds may be used by a variety of avian species, they do not support aquatic vegetation or significant invertebrate and fish populations. However, the DON (Department of Navy) will implement reasonable measures to ensure adequate protection of ecological receptors during excavation and cover placement, and the remedy will ultimately result in improved habitat. The DON will also comply with the additional Fish, Other Aquatic Organisms and Wildlife. Policy No. 2 states that specific habitats that are needed to conserve, increase or prevent the extinction of any native species, species threatened or endangered, species that the California Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected. The DON has identified the substantive provisions of the federal and California Endangered Species Act as applicable or relevant and appropriate requirements (ARARs) and will comply with the substantive provisions of the requirements identified. The habitats of listed species will be protected during remediation and upon completion through the mitigation measures identified in Attachment 7. The DON will coordinate with the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game during remedial design construction activities to ensure compliance with the substantive provisions of these ARARs. As described in Attachment 6, the DON will implement measures to avoid, minimize, and mitigate for potential impacts from remedial activities.

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
Part III of Bay Plan (Findings and Policies Concerning Tidal Marshes and Tidal Flats around the Bay, Policy 1)	Tidal marshes and tidal flats should be conserved to the fullest possible extent. Projects harming tidal marshes and tidal flats should be allowed only for purposes providing substantial public benefits and only if there is no feasible alternative. Restoration projects should include a monitoring program with biological and physical goals and success criteria.	Tidal marshes and tidal flats will be conserved to the fullest possible extent and the filling of 0.89 acre of tidal wetland will provide substantial public benefits as explained below. The evaluation presented in Section 5.6.6.1, and Attachment 1, and Section 3, Attachment 7, of the Remedial Design/Remedial Action Work Plan (RAWP) establishes that there is no feasible alternative to installing the soil cover that will anchor into the margin of the intertidal zones and wetlands at IR Site 2. Bulldozing the landfill back from the wetland margin in an effort to consolidate the footprint eliminates destruction of the wetland margin, in theory, but the re-grading and placement of contaminated material creates unnecessary risk for releases, the larger mass being moved during consolidation has a similar potential to disturb the surrounding wetlands, there is unnecessary potential for worker exposures, and the consolidation approach had significant cost and schedule increases. The approved remedy incorporates appropriate actions to minimize adverse impacts to San Francisco Bay such as erosion controls (Attachment 8), and on-site mitigation of lost wetlands with equal or better value. Total affected wetland area is 0.89 acre of tidal wetland. The success criteria are outlined in Section 11 of Attachment 7. The remedy also complies with the other Tidal Marshes and Tidal Flats policies, which include: • Thoroughly evaluating any proposed filling, diking or dredging project to determine the effect of the project on tidal marshes and tidal flats, and designing projects to minimize, and if feasible, avoid any harmful effects • Designing projects to avoid, or minimize adverse impacts on any transition zone present between tidal and upland habitats • Including clear long- and short-term biological and physical goals, success criteria and monitoring of ecosystem restoration projects Through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, and particularly through the Feasibility Study, the DON thoroughly evaluated the remedy and considered the impact on tidal areas. The DON, with the approval of the regulatory agencies, selected this remedy which has been designed to minimize any harmful effects. In addition, the DON will monitor the success of the mitigation as outlined in Attachment 7, Section 11.

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
McAteer-Petris Act (California Government Code §§ 66600 through 66661) [b] *(continued)*		
Part IV of Bay Plan (Findings and Policies Concerning Mitigation, Policies 1 through 8)	Policy No. 1: Projects should be designed to avoid adverse environmental impacts to Bay natural resources such as to water surface area, volume, or circulation and to plants, fish other aquatic organisms and wildlife habitat, subtidal areas, or tidal marshes or tidal flats. Whenever adverse impacts cannot be avoided, they should be minimized to the greatest extent practicable. Finally, measures to compensate for unavoidable adverse impacts to the natural resources of the Bay should be required. Mitigation is not a substitute for meeting the other requirements of the McAteer-Petris Act.	The evaluation presented in the ROD verifies that there is no practicable alternative to addressing site contaminants within the intertidal zones and wetlands at IR Site 2 in a manner that avoids disturbance. The Navy proposed on-site mitigation for the tidal marshes in the IR Site 2 ROD. Damage to other natural resources of the bay, including on-site tidal flats, would be avoided because excavation would not extend into shoreline areas located below mean sea level. The Navy will perform mitigation in accordance with the substantive provisions of 40 Code of Federal Regulations (CFR) Part 230, 33 CFR Part 320, and Part IV of the San Francisco Bay Plan. Included in the RAWP as Attachment 7 is a detailed wetlands mitigation program intended to address any adverse impacts. Approximately 2.27 acres of seasonal wetland and 0.89 acre of tidal wetland will be filled during construction and will be replaced with an equivalent area of similar or higher-quality wetlands outside of the landfill cover but within the Site 2 boundary. The wetlands have been avoided to the extent possible, but given the capacity and design requirements of the landfill, the remaining wetland impacts are considered unavoidable. In addition, Attachment 6, Section 6.3 sets forth additional project mitigation measures, which include: • Training all personnel who will work at the site during construction • Ecological surveys that will be conducted by a qualified biologists • Documentation and reporting including a preconstruction survey report
	Policy No. 2: Individual compensatory mitigation projects should be sited and designed within a Bay-wide ecological context, as close to the impact site as practicable to: (1) compensate for the adverse impacts; (2) ensure a high likelihood of long-term ecological success; and (3) support the improved health of the Bay ecological system. Determination of the suitability of proposed mitigation locations should be guided in part by the information provided in the Baylands Ecosystem Habitat Goals report.	The compensatory mitigation is sited within Site 2 in an area as close as practicable to the impact area. The mitigation will compensate for adverse impacts and monitoring will be implemented to ensure a high likelihood of long-term ecological success (see Attachment 7, Section 11).
	Policy No. 3: When determining the appropriate location and design of compensatory mitigation, the Commission should also consider potential effects on benefits	The remedy has been designed to address erosion control (see Attachment 8) and to accommodate potential recreational uses of the site as a trail.

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
	provided to humans from Bay natural resources, including economic (e.g., flood protection, erosion control) and social e.g. aesthetic benefits, recreational opportunities.	
	Policy No. 4: The amount and type of compensatory mitigation should be determined for each mitigation project based on a clearly identified rationale that includes an analysis of the probability of success of the mitigation project; the expected time delay between the impact and the functioning of the mitigation site; and the type and quality of the ecological functions of the proposed mitigation site as compared to the impacted site.	Section 11 of Attachment 7 addresses this policy.
	Policy No. 5: To increase the potential for the ecological success and long-term sustainability of compensatory mitigation projects, resource restoration should be selected over creation where practicable, and transition zones and buffers should be included in mitigation projects where feasible and appropriate. In addition, mitigation site selection should consider site-specific factors that will increase the likelihood of long-term ecological success, such as existing hydrological conditions, soil type, adjacent land uses, and connections to other habitats.	Section 11 of Attachment 7 addresses this policy.
	Policy No. 6: Mitigation should, to the extent practicable, be provided prior to, or concurrently with those parts of the project causing adverse impacts.	Mitigation will be conducted as part of the remediation process and is expected to be conducted concurrently.
	Policy No. 7: When compensatory mitigation is necessary, a mitigation program should be reviewed and approved by or on behalf of the Commission as part of the project. Where appropriate, the mitigation program should describe the proposed design, construction and management of mitigation areas and	Attachment 7 complies with the substantive provisions of this policy. Because the DON is not required to comply with the procedural requirements under CERCLA, the DON is not required to obtain formal approval of the mitigation plan.

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
	include: (a) Clear mitigation project goals (b) Clear and measurable performance standards for evaluating the success of the mitigation project, based on measures of both composition and function, and including the use of reference sites (c) A monitoring plan designed to identify potential problems early and determine appropriate remedial actions. Monitoring and reporting should be of adequate frequency and duration to measure specific performance standards and to assure long-term success of the stated goals of the mitigation project (d) A contingency plan to ensure the success of the mitigation project, or provide measure to ensure alternative appropriate measures are implemented if the identified mitigation cannot be modified to achieve success. The Commission may require financial assurances, such as performance bonds or letters of credit, to cover the cost of mitigation actions based on the nature, extent and duration of the impact and/or the risk of the mitigation plan not achieving the mitigation goals (e) Provisions for the long-term maintenance, management and protection of the mitigation site, such as a conservation easement, cash endowment, and transfer of title.	

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
	Policy No. 8: Mitigation programs should be coordinated with all affected local, state and federal agencies having jurisdiction or mitigation expertise to ensure, to the maximum practicable extent, a single mitigation program that satisfies the policies of all the affected agencies.	The mitigation program has been coordinated with all appropriate local, state, and federal agencies through the CERLCA process.
Part IV of Bay Plan (Findings and Policies Concerning Appearance, Design and Scenic Views Policy No.2)	All bayfront development should be designed to enhance the pleasure of the user or viewer of the Bay. Maximum efforts should be made to provide, enhance, or preserve views of the Bay and shoreline, especially from public areas, from the Bay itself, and from the opposite shore. To this end, planning of waterfront development should include participation by professionals who are knowledgeable of the Commission's concerns, such as landscape architects, urban designers, or architects, working in conjunction with engineers and professionals in other fields.	The proposed future use at IR Site 2 includes low-impact recreational uses such as a recreational trail around the site. However, the redevelopment plans are not finalized, and the DON will not be constructing the recreational trail. All development, including the future shoreline trail, will be conducted by the transferee. Therefore, this policy does not apply and is not "relevant and appropriate" to the DON's implementation of the remedy.
Part IV of Bay Plan (Findings and Policies Concerning Public Access Policy Nos. 4 and 5)	Policy No. 4: Public access should be sited, designed and managed to prevent significant adverse effects on wildlife. To the extent necessary to understand the potential effects of public access on wildlife, information on the species and habitats of a proposed project site should be provided, and the likely human use of the access area analyzed. In determining the potential for significant adverse effects (such as impacts on endangered species, impacts on breeding and foraging areas, or fragmentation of wildlife corridors), site specific information provided by the project applicant, the best available scientific evidence, and expert advice should be used. In addition, the determination of significant adverse effects may also be considered within a regional context. Siting, design and management strategies should be employed to avoid or minimize adverse effects on wildlife, informed by the advisory principles in the Public Access Design Guidelines. If significant adverse effects cannot be avoided or reduced to a level below significance through siting, design and management strategies, then in lieu public access	The proposed future use at IR Site 2 includes low-impact recreational uses such as a recreational trail around the site. However, the redevelopment plans are not finalized, and the DON will not be constructing the recreational trail. All development, including the future shoreline trail, will be conducted by the transferee. Therefore, this policy does not apply and is not "relevant and appropriate" to the DON's implementation of the remedy.

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
	should be provided, consistent with the project and providing public access benefits equivalent to those that would have been achieved from on-site access. Where appropriate, effects of public access on wildlife should be monitored over time to determine whether revisions of management strategies are needed.	
	Policy No. 5: Public access should be sited, designed, managed and maintained to avoid significant adverse impacts from sea level rise and shoreline flooding.	The proposed future use at IR Site 2 includes low-impact recreational uses such as a recreational trail around the site. However, the redevelopment plans are not finalized, and the DON will not be constructing the recreational trail. All development, including the future shoreline trail, will be conducted by the transferee. Therefore, this policy does not apply and is not "relevant or appropriate" to the DON's implementation of the remedy.
California Government Code Section 66605(a), (c) and (d) (McAteer-Petris Act)	The Legislature further finds and declares: (a) That further filling of San Francisco Bay and certain waterways specified in subdivision (e) of Section 66610 should be authorized only when public benefits from fill clearly exceed public detriment from the loss of the water areas and should be limited to water-oriented uses (such as ports, water-related industry, airports, bridges, wildlife refuges, water-oriented recreation, and public assembly, water intake and discharge lines for desalinization plants and power generating plants requiring large amounts of water for cooling purposes) or minor fill for improving shoreline appearance or public access to the bay; (c) That the water area authorized to be filled should be the minimum necessary to achieve the purpose of the fill; (d) That the nature, location, and extent of any fill should be such that it will minimize harmful effects to the bay area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes or fish or wildlife resources, or other conditions impacting the environment, as defined in Section 21060.5 of the Public Resources Code	Attachment 7 explains in detail the wetlands mitigation program. It explains that the wetlands that will be filled during the project total 0.89 acre and will be replaced with an equivalent area of similar or higher-quality wetlands. The justification for filling the wetlands has been documented throughout the CERCLA process and has been approved by the regulatory agencies. The filling of the 0.89 acre satisfies the substantive requirements of Section 66605(a) and (d) and is necessary to implement the remedy. Ultimately, the fill will result in increased protection of human health and the environment because the site will be remediated and the wetlands will be of higher quality. The fill is necessary to implement the remedy. Remediating the contamination at the site is a public benefit that exceeds the public detriment from the loss of water. The DON has considered the McAteer-Petris Act as an applicable or relevant and appropriate requirement (ARAR) throughout the CERCLA process, and the remedy was designed to comply with the substantive requirements. The selected remedy was developed and selected with the approval of the regulatory agencies and, at this time, the DON does not plan to develop an alternative cover approach.

Table 5-2 CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site2, Former Landfill, Alameda Point California (Remedial Design/Remedial Action Work Plan, IR Site 2 Former Landfill, Alameda Point, California)

Citation	Requirement	Information in Support of Evaluation
California Government Code Section 66632(f)(1) (McAteer-Petris Act)	(f) The commission shall take action upon an application for a permit, either denying or granting the permit, within 90 days after it files the application. The permit shall be automatically granted if the commission shall fail to take specific action either denying or granting the permit within the time period specified in this section. A permit shall be granted for a project if the commission finds and declares that the project is either (1) necessary to the health, safety or welfare of the public in the entire bay area, or (2) of such a nature that it will be consistent with the provisions of this title and with the provisions of the San Francisco Bay Plan then in effect.	Because permits are not required for CERCLA actions, the DON does not need to comply with the permit requirement of this section. The DON recognizes that the public health, safety, or welfare is one of the statutory justifications for fill placement. The DON believes that it has established through the CERCLA process the justification for the remedy.

Abbreviations and Acronyms:

§	Section
§§	Sections
ARAR	applicable or relevant and appropriate requirement
Bay Plan	San Francisco Bay Plan
BCDC	Bay Conservation and Development Commission
Cal. Code Regs.	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DON	Department of the Navy
FS	Feasibility Study
IR	Installation Restoration
ROD	record of decision
tit.	Title
USFWS	U.S. Fish and Wildlife Service

Source:

Tetra Tech EC, 2012. Draft Remedial Action Work Plan, IR Site 2, Alameda Point, Alameda, California. May.

TABLE 6-1

MAMMALIAN SPECIES OBSERVED AT IR SITE 2

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
Long-tailed weasel	*Mustela frenata*			Y	u		Yes	c
Domestic rabbit	*Oryctolagus cuniculus*	7/4		Y	u		Yes	h
Black-tailed hare	*Lepus californicus*	52/10		Y	u	w	Yes	h
Botta pocket gopher	*Thomomys bottae*			Y	u		Yes	h
California ground squirrel	*Spermophilus beecheyi*	35/8		Y	u		Yes	o
Raccoon	*Procyon lotor*			Y	u	w	Yes	o
Striped skunk	*Mephitis mephitis*			Y	u	w	Yes	o
House cat	*Felis domesticus*			Y	u	u	Yes	o
Red fox	*Vulpes vulpes*			Y	w	u	Yes	c
Norway rat	*Rattus norvegicus*			Y	bw		Yes	o

Notes:

[a] Total number of individuals observed/number of survey events (e.g., a total of 52 black-tailed hare were observed over the course of 10 sampling events).

[b] Feeding guild information is based on PRC 1996 (Appendix G).

Abbreviations and Acronyms:

bw – break water
c – carnivore
CE – California endangered
CSC – California species of special concern
F – fall
FE – Federally endangered
FT – Federally threatened
h – herbivore
i – insectivore
o – omnivore
ow – open water (i.e., pond or bay)
S – summer
u – upland
w – wetland
W – winter
Y – year round

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TABLE 6-2

AVIAN SPECIES OBSERVED AT IR SITE 2

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
Red-throated loon	*Gavia stellata*			W	o			c
Common loon	*Gavia immer*		CSC	W	o			c
Pied-billed grebe	*Podilymbus podi*			W	o			c
Horned grebe	*Podiceps auritus*			W	o			c
Eared grebe	*Podiceps nigricollis*	2/1		W	o			c
Western grebe	*Aechmophorus occidentalis*	5/4		W	o			c
Clark's grebe	*Aechmophorus clarkii*			W	o			c
Sooty shearwater	*Puffinus griseus*			T	o			c
Fork-tailed storm petrel	*Oceanodroma furcata*		CSC	T	o			c
American white pelican	*Pelecanus erythroorhynchos*		CSC	T	o	w		c
California brown pelican	*Pelecanus occidentalis californicus*	2/1	FE	T	o			c
Double-crested cormorant	*Phalacrocorax auritis*	36/3	CSC	Y	o			c
Brandt's cormorant	*Phalacrocorax penicillatus*	20/2		Y	o			c
Pelagic cormorant	*Phalacrocorax pelagicus*	1/1		Y	o			c
Great blue heron	*Ardea herodias*	13/5		Y	w	o		c
Cattle egret	*Bubulcus ibis*			W	w	u		c
Great egret	*Casmerodius albus*	6/3		Y	w	u		c
Snowy egret	*Egretta thula*	2/2		Y	w	b		c
Black-crowned night heron	*Nycticorax nycticorax*	1/1		Y	w			c
Snow goose	*Chen caerulescens*			W	w			h
Canada goose	*Branta canadensis*	1100/10		W	w	u	yes	h
Green-winged teal	*Anas crecca*	2/1		W	w			h

TABLE 6-2

AVIAN SPECIES OBSERVED AT IR SITE 2
(Continued)

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
Mallard	*Anas platyrhynchos*	371/10		Y	w	o	yes	h
Northern pintail	*Anas acuta*	17/3		Y	w			h
Cinnamon teal	*Anas cyanoptera*	6/3		Y	w			h
Northern shoveler	*Anas clypeata*	212/6		Y	w			o
Gadwall	*Anas strepera*	27/4		W	w		yes	h
Eurasian wigeon	*Anas penelope*	6/3		W	w			h
American wigeon	*Anas americana*	281/6		W	w	o		h
Canvasback	*Aythya valineria*	7/2		W	o	w		o
Greater scaup	*Aythya marila*			W	o			o
Lesser scaup	*Aythya affinis*	38/3		W	o			o
Oldsquaw	*Clangula hyemalis*			W	o			o
Black scoter	*Melanitta nigra*			W	o			o
Surf scoter	*Melanitta perspicillata*	5/2		W	o			o
White-winged scoter	*Melanitta fusca*			W	o			o
Black-necked stilt	*Himantopus mexicanus*	130/10		Y	w		yes	c
American avocet	*Recurvirostra americana*	174/7		Y	w		yes	o
Black bellied plover	*Pluvialis squatarola*	5/2		Y	w	b		c
Western snowy plover	*Charadrius alexandrinus nivosus*		FT	Y	w		yes	c
Semipalmated plover	*Charadrius semipalmatus*	4/1		W,F,Sp	w	b		c
Killdeer	*Charadrius vociferus*	80/10		Y	u	w	yes	c
Willet	*Cataptrophorus semipalmatus*	3/1		W	b	w		c
Long-billed curlew	*Numenius americanus*		CSC	W	w			c
Marbled godwit	*Lemosa fedoa*			W	b	w		c

TABLE 6-2

AVIAN SPECIES OBSERVED AT IR SITE 2
(Continued)

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
Least sandpiper	*Calidris minutilla*	107/7		S,F,W	w	b		o
Dunlin	*Calidris alpina*	9/2		W	w	b		c
Short-billed dowitcher	*Limnodromus griseus*	126/7		W	b	w		o
Long-billed dowitcher	*Limnodromus scolopaceus*			W	w			o
Common snipe	*Gallinago gallinago*			W	w			c
Red-necked phalarope	*Phalaropus lobatus*			T	w	o		c
Greater yellowlegs	*Tringa melanoleuca*	49/3						
Pomarine jaeger	*Stercorarius pomarinus*			T	o			c
Parasitic jaeger	*Stercorarius parasiticus*			T	o			c
Bonaparte’s gull	*Larus philadelphia*			T	o			c
Heermann’s gull	*Larus heemanni*			F,S	o			c
Mew gull	*Larus canus*			W	o	w		c
Ring-billed gull	*Larus delawarensis*	162/4		Y	b	w,o		o
California gull	*Larus californicus*	2741/8	CSC	Y	b	w		c
Herring gull	*Larus argentatus*	16/4		W	o	w		o
Thayer’s gull	*Larus thayeri*	5/1		w	o	w		c
Western gull	*Larus occidentalis*	721/8		Y	o	w		o
Glaucous-winged gull	*Larus glaucescens*			W	o	w		o
Black tern	*Chlidonias niger*			F,Sp	o	w		c
Caspian tern	*Sterna caspia*	1082/6		S	o	w	yes	p
Elegant tern	*Sterna elegans*		CSC	S	o			P
Forster’s tern	*Sterna forsteri*	9/3		Y	o	w		c
Least tern	*Sterna antillarum brownii*		FE	S	o	w	yes	p

TABLE 6-2

AVIAN SPECIES OBSERVED AT IR SITE 2
(Continued)

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
Common murre	*Uria aalge*			T	o			c
Turkey vulture	*Cathartes aura*	2/2		Y	u	w		c
Osprey	*Pandion haliaetus*		CSC	W	o	w,u		c
Black-shouldered kite	*Elanus caeruleus*		cfp	Y	w	u		c
White-tailed kite	*Elanus caeruleus*			Y	u	w		c
Northern harrier	*Circus cyanus*	16/5	CSC	Y	u	w	yes	c
Cooper's hawk	*Accipiter cooperii*			Y	u	w		c
Red-tailed hawk	*Buteo jamaicensis*			Y	u	w		c
Red-shouldered hawk	*Buteo lineatus*	1/1		Y	u			c
Rough-legged hawk	*Buteo lagopus*			W	u			c
Golden eagle	*Aquila chrysaetos*	1/1		T	o	u		c
American kestrel	*Falco sparverius*			Y	u			c
Merlin	*Falco columbarius*		CSC	W	u			c
American peregrine	*Falco peregrinus anatum*			Y	o	u		c
Ring-necked pheasant	*Pahsianus colchicus*			Y	u			o
Rock dove	*Columba livia*	21/6		Y	u			h
Mourning dove	*Zenaida macroura*	3/1		Y	u			h
Great-horned owl	*Bubo virginianus*			Y	u	o		c
Barn owl	*Tyto alba*			Y	u			c
Burrowing owl	*Athene cunicularia*		CSC	Y	u		yes	c
Anna's hummingbird	*Clypte anna*			Y	u			o
White-throated swift	*Aeronautes saxatalis*			Y	u			o
Belted kingfisher	*Ceryle alcyon*			Y	w			c

TABLE 6-2

AVIAN SPECIES OBSERVED AT IR SITE 2
(Continued)

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
Northern flicker	*Colaptes auratus*		SE	Y	w			o
Black phoebe	*Sayornis nigricans*			Y	w			i,o
Say's phoebe	*Sayornis saya*			W	u			i
Western Kingbird	*Tyrannus veritcalis*	2/2		S	u			i
California horned lark	*Erimophila aplestris actia*	1/1	CSC	Y	u		yes	o
Cliff swallow	*Hirundo pyrrhonota*			S	u	w		o
Tree swallow	*Tachycineta bicolor*			Y	u	w		i,o
Violet-green swallow	*Tachycineta thalassina*			Y	u	w		i,o
Northern rough-winged swallow	*Stelgidopteryx serripennis*			Y	u	w	yes	i,o
Barn swallow	*Hirundo rustica*	20/5		S	u			i
Scrub jay	*Aphelocoma coerulescens*			Y	u			o
American crow	*Corvus brachyrhynchos*			Y	u			o
Common raven	*Corvus corax*			Y	u			o
American robin	*Turdus migratorius*			Y	u			o
Loggerhead shrike	*Lanius ludovicianus*		FE	Y	u	u	yes	c
Northern mockingbird	*Mimus polyglottus*			Y	u			o
American pipit	*Anthus rubescens*			W	u			o
European starling	*Sturnus vulgaris*	301/5		Y	u			o
Yellow-rumped warbler	*Dendroica coronata*			W	u			o
Savannah sparrow	*Passerculus sandwichensis*	2/1	CE	Y	u	w		o
Alameda song sparrow	*Melospiza melodia pusillula*	30/1	CSC	Y	w	u		o
Chipping sparrow	*Spizella passerina*			S	u			o

TABLE 6-2

AVIAN SPECIES OBSERVED AT IR SITE 2
(Continued)

Common Name	Scientific Name	Observed in 1997[a]	Special Status?	SF Bay Resident	Primary Habitat	Secondary Habitat	Breeding	Feeding Guild[b]
White-crowned sparrow	*Zonotrichlia leucophrys*			Y	u			o
Golden-crowned sparrow	*Zonotrichlia atricapilla*			W	u			h
House sparrow	*Passer domesticus*			Y	u			o
Brown-headed cowbird	*Molothrus ater*			Y	u			o
Red-winged blackbird	*Agelaius pheoniceus*	743/10		Y	w			o
Salt marsh common yellowthroat	*Geothlypis trichas sinuosa*		CSC	Y	w			o
Western meadowlark	*Sturnella neglecta*	48/5		Y	u			o
Brewer's blackbird	*Euphagus cyanocephalus*	2/1		Y	u			o
Pine siskin	*Cardelus pinus*			Y	u			o
House finch	*Carpodacus mexicanus*	76/5		Y	u		yes	o
American goldfinch	*Carduelis tristis*	30/2		Y	u	w		o

Notes:

[a] Total number of individuals observed/number of survey events (e.g., a total of 13 great blue herons were observed over the course of five sampling events).

[b] Feeding guild information is based on PRC 1996 (Appendix G).

Abbreviations and Acronyms:

b – beach
bw – break water
c – carnivore
CE – California endangered
CSC – California species of special concern
F – fall
FE – Federally endangered
FT – Federally threatened
h – herbivore
i – insectivore
o – omnivore
ow – open water (i.e., pond or bay)
p – piscovore
S – summer
Sp – spring
u – upland
w – wetland
W – winter
Y – year round

ATTACHMENT 7

WETLAND MITIGATION PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 7

FINAL

WETLAND MITIGATION PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

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Project Manager

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FIGURES

APPENDICES

1.0 INTRODUCTION

This Wetland Mitigation Plan for IR Site 2 has been developed to support implementation of the remedial action at IR Site 2, Alameda Point, Alameda, California (Figure 1). Landfill construction will require the fill of intermittent, seasonal wetland and tidal wetland, for which the Navy proposes to mitigate on-site. Tetra Tech EC, Inc. (TtEC) was contracted by the Department of the Navy (DON) to prepare the Remedial Action Work Plan (RAWP) under Contract Task Order (CTO) 0009, Contract No. N62473-10-D-0809 for the Base Realignment and Closure (BRAC) Program Management Office (PMO) West under Naval Facilities Engineering Command Southwest (NAVFAC SW). The selected remedy for soil, as outlined in the Record of Decision (ROD) for IR Site 2, is the installation of a multilayer soil cover, engineering and institutional controls (ICs), and monitoring (DON, 2010). The selected remedy for groundwater is natural attenuation and monitoring. The RAWP in conjunction with the Remedial Design (Attachment 1 to the RAWP) provides details, specifications, and design drawings for the construction of the multilayer soil cover.

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2.0 PROJECT LOCATION AND DESCRIPTION

Alameda Point is located on the western end of Alameda Island, California (Figure 1). IR Site 2 is approximately 110 acres located at the southwestern end of Alameda Point, with land areas in Alameda and San Francisco Counties. IR Site 2 consists of the landfill, which covers approximately 60 acres; the wetlands, which cover the area immediately south and west of the landfill; and 17 acres referred to as the interior and coastal margin (this area is primarily the levee that surrounds the landfill and wetlands). IR Site 2 is bounded to the south and west by San Francisco Bay and to the east and north by runways, tarmacs, and related features (KCH 2011).

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3.0 BRIEF SUMMARY OF PROJECT

The IR Site 2 landfill cover at Alameda Point is a design/build project to cover an existing Navy landfill with soil to isolate buried waste and soil contaminants, and discourage animal burrowing pursuant to the Final ROD. Since monitored natural attenuation is the groundwater remedy, placement of a hydrogeological membrane or liner is not required. Historical documents indicate that the landfill accepted up to 1.6 million tons of waste from 1956 to 1978.

The 78.8-acre landfill cover will comprise a HDPE geonet animal intrusion barrier placed over the subgrade, a 1.5-foot thick foundation layer of soil, and a 0.5-foot thick vegetative layer on top seeded with native species. After the surface of the subgrade is scanned for radiological hotspots and hotspot material is removed, it will be graded to provide 1.5 percent slopes, and a 2-foot-thick soil cover will be constructed. After the cover construction is complete, the area will be radiologically re-scanned to confirm that the cover is acting as an effective barrier to isotopes in the landfill. Fencing, monitoring wells, settlement monuments, and other ancillary features will also be installed.

Although most of the wetland area in the southwest corner of the site will not be disturbed, approximately 2.27 acres of seasonal wetland and 0.89 acre of tidal wetland will be filled during construction, and will be replaced with an equivalent area of similar or higher quality wetlands outside of the landfill cover but within the IR Site 2 boundary. The wetlands have been avoided to the extent possible, but given the capacity and design requirements of the landfill cover, the remaining wetland impacts are considered to be unavoidable.

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4.0 RESPONSIBLE PARTY AND OWNERSHIP

The U.S. Navy is the property owner and is solely responsible for the proposed project as well as the wetlands mitigation area, including the culvert (Figure 2).

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5.0 HABITAT TYPES AND VALUES

Existing habitat types in the proposed wetland mitigation area are displayed in Figure 2. A wetland delineation report was prepared under separate contract, and is attached as Appendix A (KCH 2011). This report identified three distinct wetland and water features:

- **Open Water/Mudflat:** Open water/mudflat is found in two large ponds in the southwest corner of the landfill area (Figure 2). Both of the ponds have been identified as Palustrine Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded (PUBFh) by the NWI (USFWS 2010), a classification that appeared to be accurate based on field observations made by Tetra Tech staff on October 26, 2011. The North Pond, referred to as WTR-1 in the wetland delineation report (Appendix B, Photo 1) is hydrologically connected to San Francisco Bay by a 36-inch-diameter culvert that penetrates the perimeter berm and seawall. The culvert appears to be appropriately sized to allow full tidal exchange on a diurnal basis, as the tidal wetland drains and fills completely twice a day.

  The South Pond (Appendix B, Photos 2 and 4), referred to as WTR-2 in the wetland delineation report (Appendix A) was created as a borrow pit, and fills with groundwater and precipitation for all or most of the year. This area is not tidally connected, and surface water levels do not appear to be influenced by tidal elevations. A full hydrologic analysis of this pond was not prepared, but photos from July 2010 show a mix of standing water and mudflats - conditions that were also found in this pond in late October, 2011 - and the delineation report (Appendix A) also concluded that this area was not tidally influenced. Most of this pond is either shallow standing water or mudflats, with a fringe of pickleweed (*Salicornia virginica*) forming the transitional plant community between the mudflats and nearby uplands. Freshwater seasonal pond and transitional mudflat habitats such as this have been identified in the Baylands Ecosystem Habitat Goals Project (SFEI 2001) as rare and important habitat components.

  The South Pond and mudflat matrix is high-value habitat in that it offers high tide refugia for wading shorebirds, and low tide refugia for ducks and geese. Because pond water surface elevations in this area are maintained by groundwater and precipitation, they do not fluctuate on a diurnal basis as they do in the northern (tidal) pond. Since this area normally has both mudflats and open water, it is available as foraging habitat year-round. At the time of the reconnaissance survey in late October, an estimated 500 birds representing at least eight species were observed foraging in this pond and mudflat.

- **Seasonal wetland:** Seasonal wetland is found in numerous small patches in the northwest corner of IR Site 2 and near the South Pond (Figure 2). A large, contiguous area of seasonal wetland is also found along the south edge of the site.

  The seasonal wetlands in the north and northeast corner of the site, which are the seasonal wetlands that would be filled, appear to be hydrologically disconnected from other wetlands or water bodies (Appendix B, Photo 3). Moisture in these wetlands appears to derive from direct precipitation and rainfall runoff from the nearby airstrip, which ponds temporarily at the toe of the adjacent levee, or in runoff swales. Dominant species in these wetlands are pickleweed and saltgrass (*Distichlis spicata*). Curly dock (*Rumex crispus*), sweetclover (*Melilotus indicus*), and spear saltbush (*Atriplex patula*) were also present. Due to their patchy and isolated nature, the seasonal wetlands at the north end of the site, which are the seasonal wetlands that would be filled, offer minimal habitat value. These wetlands may offer habitat for small mammals that could escape to nearby uplands when the wetlands are inundated, and occasional foraging birds, but because these wetlands are surrounded by either highly developed areas or the open water of the bay, access to them by small mammals is very restricted; therefore their value as habitat is similarly restricted.

  The large seasonal wetland on the south edge of the site (Appendix B, Photo 4) is composed primarily of dense pickleweed, with sparse saltgrass and some rabbitsfoot grass (*Polypogon monspeliensis*). This type of wetland could offer marginal habitat for the endangered salt-marsh harvest mouse (*Reithrodontomys raviventris*) and the clapper rail (*Rallus longirostris*) but these species have not been reported at this site. Due to this site's isolation from other populations of these species, the seasonal nature of this wetland, and the relatively small area of pickleweed marsh found at the site, the salt marsh harvest mouse and clapper rail are not likely to be present.

- **Tidal wetland:** Tidal wetlands were found surrounding the tidal open water North Pond. These wetlands are characterized by dense pickleweed with small amounts of saltgrass and spear saltbush mixed in. Although extensive pickleweed habitat was found at the site and was not identified as wetland, the areas identified as tidal wetlands in the wetland delineation report appear to be those areas that receive frequent tidal inundation. All other pickleweed habitat does not meet hydrology criteria needed for a wetland designation to be applied. The tidal wetland portion of the proposed project area, which comprises part of the area that would be filled, does not support waterfowl and shorebirds breeding requirements, nor is pickleweed their primary choice for foraging habitat. However, this habitat may offer good foraging habitat for raptors, and by providing detritus to the tidal mudflat area that it is adjacent to, supports the food web that sustains waterfowl and shorebirds. Various bird species observed in the area include waterfowl such as Canada goose (*Branta* *canadensis*), mallard (*Anas platyrhynchos*), and American coot (*Fulica americana*) which forage in open water and nest in dense patches of adjacent floating or upland vegetation (field observations; CDFG 2011; Cornell Lab of Ornithology 2011). Common shorebird species such as killdeer (*Charadrius vociferus*), least sandpiper (*Calidris minutilla*), dowitcher (*Limnodromus* sp.*)*, western sandpiper (*Calidris mauri*), black-necked stilt (*Himantopus mexicanus*), and American avocet (*Recurvirostra americana*) typically forage or loaf in shallow water and on mudflats (field observations; CDFG 2011; Cornell Lab of Ornithology 2011) and nest in open areas on bare ground (CDFG 2011; Cornell Lab of Ornithology 2011). Gulls such as western gull (*Larus occidentalis*) and ringed-billed gull (*Larus delawarensis*) winter in the area and are associated to mudflats and open water (field observations; CDFG 2011; Cornell Lab of Ornithology 2011). Two raptor species were also observed in the IR Site 2 area; northern harrier (*Circus cyaneus*) and red-tailed hawk (*Buteo jamaicensis*), which hunt in the area either on the wing or from perch sites. Various passerines may forage in the pickleweed marsh at times.

- **Uplands:** The upland plant communities (Appendix B, Photo 5) in the vicinity of the wetlands are composed almost entirely of noxious invasive species including iceplant (*Carpobrorus edulis*), Pampas grass (*Cortaderia jubata*), sweet fennel (*Foeniculus vulgarum*), surrounded by less noxious ruderal species including black mustard (*Brassica negra*), Italian thistle (*Carduus pycnocephalus*) and wild radish (*Raphanus raphanistrum*). A small patch (approximately 1 acre) of good quality coyote brush (*Baccharis pilularis*) and grassland habitat is found near the South Pond.

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6.0 HABITAT AND SPECIES VALUE

6.1 SPECIAL STATUS SPECIES

Surveys for avian species and wildlife were conducted at IR Site 2 in 1998 (TtEMI 1998). Three endangered or threatened bird species may occur in the general area. These include the endangered California clapper rail (*Rallus longirostris obsoletus*), the endangered California least tern (*Sterna antillarum browni*), and the threatened western snowy plover (*Charadrius alexandrinus nivosus*) (Shuford et al. 2008). A single listed mammal species, the endangered salt-marsh harvest mouse, is also found in pickleweed habitats in San Francisco Bay. Species identified in the area during previous surveys (please see Tables 6-1 and 6-2 of the Environmental Protection Plan, included as Attachment 6) including the California brown pelican (*Pelecanus occidentalis californicus*) and the American peregrine (*Falco peregrinus anatum*) have been delisted in recent years.

6.1.1 California Clapper Rail

The clapper rail, which is normally found in pickleweed marsh wetland, could occur; however, due to the marsh's relatively small size and isolation from known populations of clapper rails, it is unlikely to be inhabited by clapper rails. Clapper rails prefer to forage along dendritic tidal channels, a habitat feature not found in this location

6.1.2 Western Snowy Plover

The western snowy plover is generally found on barren or sparsely vegetated sand beaches along the coast, and on alkaline flats and river bars farther inland; therefore it is not considered likely to occur at this site.

6.1.3 California Least Tern

The least tern is also not generally found in pickleweed marshes, preferring instead to nest in sandy or gravely flats and to forage over open estuarine or lagoon areas. Although it is found on the abandoned runway of NAS Alameda, it is considered unlikely to occur in this marsh.

6.1.4 Salt-marsh Harvest Mouse

The salt-marsh harvest mouse (*Reithrodontomys raviventris*) is dependent on dense pickleweed for most of its habitat needs but also uses adjacent mid- to high-marsh habitat for high-tide refugia. Because this site is small, isolated from other habitat areas that contain populations of salt-marsh harvest mice, and there is no overland connection to other populations, the salt-marsh harvest mouse is considered unlikely to occur here.

6.1.5 Amphibians

Amphibians are likely to occur in the seasonal wetlands in the north and northeast parts of the proposed landfill area. Frogs and salamanders may breed and forage in these areas. However, there are no sensitive or protected amphibian species that are likely to occur in the project area.

7.0 HYDROLOGY

IR Site 2 is situated in an area that was originally open water of San Francisco Bay. In 1956, a seawall was constructed along the southern and western shorelines of IR Site 2, and dredged fill was hydraulically placed inside the seawall. The seawall crest elevation is currently about 15 feet. A National Oceanic and Atmospheric Administration (NOAA) tidal station (Station ID: 9414750) was established in 1939, and the present installation along the eastern edge of the seaplane port was completed in November 1991. This gage is located about 2.5 miles from the North Pond culvert connection to the bay. The mean tide level of this gage is about 4.2 feet NGVD29 (determined by subtracting the mean tide level of 6.9 feet NAVD88 by the local conversion of -2.7 feet to convert from NAVD88 to NGVD29), and the mean tidal range (the difference in height between mean high water and mean low water) is 4.84 feet. The highest observed water level at this location was 12.98 feet in December 1983, and the lowest observed water level was 0.76 feet in January 2009.

The only input of fresh water to IR Site 2 is direct rainfall and runoff on the 110-acre area. The area that is ringed by the seawall and adjacent levee contains a capped landfill that is gently sloped, typically less than 2 percent (KCH 2011). About a third of the 60 acres of landfill and 17 acres of uplands drain to the wetlands. The North Pond is connected to the San Francisco Bay by a 36-inch corrugated metal pipe which allows tidal exchange between the pond and the bay.

At this stage of the design, groundwater elevations have not been studied in the southwest section of IR Site 2. A 90 percent design assumption is that the underlying soils of the mitigation areas will retain water at the same rate as the adjacent existing wetland areas. Before construction, soil borings and groundwater piezometer studies are recommended to determine the similarities of the soil and groundwater characteristics of the existing and proposed wetland areas. The hydrologic performance criteria for the wetland mitigation areas are set forth in Section 11.1.

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8.0 SOILS

IR Site 2 was originally a part of San Francisco Bay. A seawall was constructed in 1956 and sand dredged from beach areas was hydraulically pumped behind the seawall to establish the land area of IR Site 2. The soils of IR Site 2 are mapped as Xeropsamments fill (USDA 2010), with about 10 percent of the area underlain by strongly alkaline clay to a depth of 36 to 48 inches (KCH 2011).

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9.0 PROJECT GOAL

The overall goal of this mitigation plan is to replace lost wetland and functional values with habitat of the same or better quality. Tidal wetlands that will be filled during the project total 0.89 acre and will be replaced in-kind, on-site. Seasonal wetlands that will be filled total 2.27 acres and will be replaced on-site with freshwater open marsh and mudflat. Although it is understood that in-kind replacement is generally preferred, in this case out-of-kind mitigation is considered appropriate since the transitional mudflat-pickleweed habitat is preferred.

Because mitigation wetlands will be created at the same time that the original wetlands are filled, and because the new wetland and open water/mudflat habitat will be of higher value than the filled seasonal wetlands, this plan assumes a 1:1 replacement ratio in accordance with the ROD (DON 2010) at a minimum. Extent of pickleweed in proposed mitigation areas A and B was examined during the preconstruction ecological surveys conducted on January 30–31, 2013, during which the percent of pickleweed-dominated habitat was estimated to be approximately 2 percent of Mitigation Area A and approximately 5 percent of Mitigation Area B. Due to construction efficiencies and to compensate for the 2 percent to 5 percent pickleweed that currently exists in the seasonal mitigation areas, actual mitigation acreage is more than 1:1.

Habitat Type	Area Affected	Minimum Proposed Area to be Created
Seasonal Wetland	2.27 acres	3.4 acres
Tidal Wetland	0.89 acre	1.4 acres

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10.0 IMPLEMENTATION

The goal of this mitigation plan is to replace lost wetlands with habitat of the same or better quality. This process is described below, and the conceptual mitigation plan is shown in Figure 3.

10.1 TIDAL WETLAND MITIGATION

To mitigate for the lost tidal wetlands, which are found on the north and east sides of the tidal pond, a new pickleweed marsh (labeled "Tidal Wetland Mitigation Area" in Figure 3) will be constructed at the south side of the North Pond. This will be accomplished by grading upland habitat to the average elevation of 2 feet NGVD29 found in the adjacent pickleweed wetland and allowing tidal inflow to this area. The newly graded marsh plain will tie into the edge of existing tidal wetland and will have similar hydrologic features. It is expected that, like the rest of the pickleweed wetlands in the area, this area will be tidally-inundated and drained on a diurnal basis. Revegetation is not proposed in this area, since the dense pickleweed marsh that surrounds it will provide plentiful propagules, and the site is expected to revegetate naturally very quickly. Similar projects across the bay, at Piers 94 and 98 in San Francisco, were similarly excavated and allowed to revegetate naturally, and showed abundant pickleweed seedlings within a single season (Port of San Francisco 2008).

No cordgrass (*Spartina sp.*) or pepperweed (*Lepidium latifolium*) specimens were identified in the mitigation area, therefore the threat of invasion of these species in the new tidal marsh area is considered to be relatively low. Extensive iceplant was identified in the upland portions of the proposed mitigation area, but it does not appear to grow lower than the high-tide line. Other non-native species identified in the area included sparse bindweed (*Convulvulus sepium*), Mediterranean saltwort (*Salsola soda*), pampas grass, and New Zealand spinach (*Tetragonia tetragonioides*). Pampas grass and bindweed would not normally be found in the same tidal zone as pickleweed, and saltwort and New Zealand spinach do not compete well with dense pickleweed.

10.2 SEASONAL WETLAND MITIGATION

Seasonal wetland will be mitigated for on-site, out-of-kind. The reason for mitigating out-of-kind is that the open water/mudflat/pickleweed habitat matrix proposed to be developed will offer improved foraging habitat and tidal refugia for shorebirds and waterfowl.

The area proposed to mitigate for lost seasonal wetland is also shown in Figure 3. The existing freshwater South Pond is roughly shaped like an unfinished "A". Under this plan, a portion of the upland component of the crosspiece of the "A" (labeled as "Seasonal Wetland Mitigation Area A" in Figure 3), as well as a larger area west of the crosspiece (labeled as "Seasonal Wetland Mitigation Area B" in Figure 3), would be excavated to match the existing grade of the adjacent open water/mudflat/pickleweed matrix. The two areas would be separated by a pickleweed corridor to allow escape cover for shorebirds that might forage there. These areas have been specifically chosen as the mitigation sites for two reasons: 1) They are adjacent to coyote brush *(Baccharis pilularis)* and grassland habitat that offers high quality nesting habitat for songbirds, and 2) the proposed excavation areas are currently infested with Pampas grass, and excavating these areas will offer a good opportunity to eradicate at least part of the population of this noxious invasive species at IR Site 2.

A detailed grading plan was developed to allow construction of these features. The CAD drawings show plans and cross sections for the two areas, featuring a gradient starting at the same elevation as existing open water and mudflat habitat (approximately -0.4 feet NGVD29), grading gently through pickleweed marsh habitat found at approximately 0.3 to 0.8 feet NGVD29, and then tying into upland habitat starting at elevations around 3 to 4 feet NGVD29. Topography is shown with 1-foot contours and was based on a recent topographic survey conducted specifically for the purposes of identifying the elevations of vegetative breaks, low-, mid- and high-marsh elevations, and gradient of the marsh plain.

IR Site 2 mitigation activity by the Navy will be respectful of existing stands of pickleweed, and avoid to the maximum extent practicable damaging established stands of pickleweed in and around the areas to be mitigated.

11.0 MONITORING AND MAINTENANCE

A baseline vegetation and wildlife survey that will occur immediately prior to construction will establish overall percent cover and document the composition of the vegetative community, and establish average daily use of the reference areas by shorebirds and waterfowl. Hydrologic success will also be considered.

11.1 SUCCESS CRITERIA FOR VEGETATION

During the vegetation survey, permanent 1-meter-square reference plots will be established on transects running through the entire mitigation sites. These transects and monitoring plots will be assessed on a yearly basis using the same criteria as those used to establish baseline conditions. The survey will document mortality, weed invasion, and rate of colonization. Success criteria for vegetation are as follows:

- In the tidal marsh area, existing conditions show a pickleweed community cover density of approximately 75 to 100 percent in the wetland areas that will be affected. The 5-year monitoring goal is to attain this same density and the same plant community composition as under existing conditions. The Year 1 goal is to show 10 percent pickleweed cover, increasing to 25 percent at Year 2, 50 percent in Year 3, and 75 percent in Year 4. If these goals are not met, the restored area will be assessed to determine if site conditions are not conducive to plant growth. If needed, corrective actions including planting pickleweed plugs taken from a nearby location will be implemented. Corrective actions would be implemented in Year 2 and beyond if needed.
- There is no invasive cordgrass or pepperweed in the tidal marsh at this time. Success criteria require that this state be attained and maintained in the mitigation area for the duration of the 5-year monitoring period.
- In the open water/mudflat habitat, there will be little to no vegetation in the low-marsh (mudflat) areas, and the mid- and high-marsh areas are projected to be vegetated almost exclusively with pickleweed to reflect current conditions. Success criteria are such that the mudflat area will have less than 10 percent vegetation below -0.2 feet NGVD29, and this vegetation will be a minimum of 80 percent pickleweed. Above -0.2 feet, pickleweed will increase in density to 75 to 100 percent over 5 years. The pickleweed fringe will be maintained by work crews who will remove cordgrass and pepperweed by hand or other approved method to ensure no encroachment of these weed species.
- If success criteria are not met, corrective action will be taken. For vegetation establishment, this means that pickleweed plugs will be planted in quantities needed

to attain goals if goals are not met at Years 2 and beyond. For invasive species, this means that all invasive cordgrass or pepperweed will be removed on a yearly basis, on a date preceding normal seedset.

11.2 SUCCESS CRITERIA FOR WILDLIFE

For wildlife, bird counts will occur at the appropriate time of year and will occur over successive tidal cycles. Bird usage of the tidal pond, the mudflats, and freshwater pond will be documented, and used to create the baseline conditions against which to measure success. Success criteria for bird use of the mitigation sites is such that bird use would increase incrementally over a 5-year period as the invertebrate community in the substrate increased, and would match the rate of bird use in the reference (adjacent) areas at the end of the 5-year monitoring period.

11.3 SUCCESS CRITERIA FOR HYDROLOGY

Although a detailed hydrologic study of the site has not been completed, success criteria are such that hydrological features found at the reference areas (meaning wetlands directly adjacent to the mitigation areas) will be found in the mitigation areas as well. In the tidal areas, this means that the constructed wetlands will be tidally inundated and drained on a diurnal basis on the same intervals as the reference area. The Navy recognizes that the existing culvert (Figure 2) is critical to the life of these IR Site 2 tidal wetlands, as without the culvert, there would be no tidal circulation. As a part of defining successful hydrology for the tidal wetlands, the Navy will perform a qualified structural engineering evaluation of the culvert (as it is known to be significantly rusted and damaged) as soon as is practical during cover construction activities. Further, the Navy will make necessary repairs, modifications or replacement to maintain tidal circulation as recommended by the structural assessment of the culvert, and do so during remedy construction if warranted. In the potential event that tidal circulation is inhibited or blocked due to culvert failure, the Navy will restore tidal circulation within 7 days.

In the open water/mudflat/pickleweed freshwater areas near the South Pond, the mitigation wetlands will have been graded to the same elevation as the reference habitat;-, therefore, success criteria are such that surface water levels and mudflats will mimic conditions found in the surrounding areas that have the same surface elevation. In general, this means that surface water levels will be highest in the period from December through April, and will diminish thereafter. In dry years, the freshwater open water area and mudflat may dry completely in late summer.

Hydrologic features of the site will not be manipulated during construction; however, if after project implementation hydrological features do not appear to be operating as planned, a hydrologic assessment of the area will be performed by a hydrologist and recommendations for further grading will be made.

12.0 LONG-TERM MANAGEMENT PLAN

The U.S. Navy is developing a long-term Operations and Maintenance Plan for the IR Site 2 area. This management plan will include maintenance and monitoring of the wetland area in accordance with the monitoring plan outlined above. Management items will include access to the wetland area, invasive species management, native species maintenance, maintenance of hydrologic features, including the culvert, and wildlife monitoring.

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13.0 REFERENCES

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FIGURES

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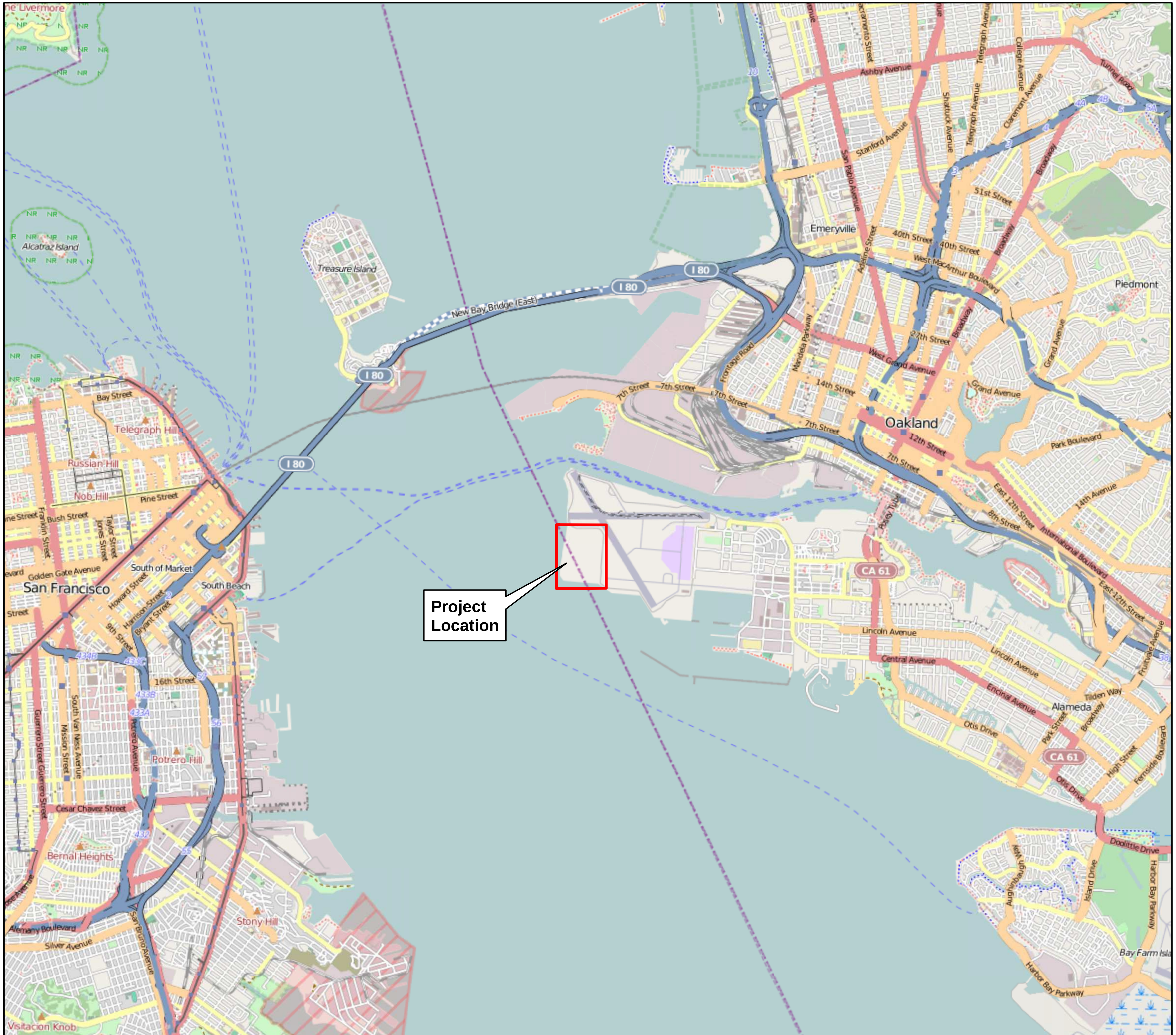

Location Overview

0 2,500 5,000 10,000 Feet

Figure 1.
Alameda NAS IR Site 2
Wetland Mitigation Plan
Project Location

TETRA TECH

Legend

Existing Conditions *

- 1ft Contours
- Open Water/Mudflat
- Seasonal Wetland
- Tidal Wetland
- Upland
- Site Boundary

0 150 300 600 Feet

***Source:**

Huddleston, R. & A. Estabrook. 2011

Wetland Delineation Installation Restoration Site 2
Alameda Point, Alameda, CA. U.S. Dept. of the Navy Base Realignment & Closure Program Management Office West. August 2011.

Figure 2.
Alameda NAS IR Site 2
Wetland Mitigation Plan
Existing Conditions

TETRA TECH

Legend

Existing Conditions *

- 1ft Contours
- Open Water/Mudflat
- Proposed Landfill Cap
- Seasonal Wetland
- Tidal Wetland
- Upland

Wetland Mitigation Features

- Seasonal Wetland Mitigation Area
- Tidal Wetland Mitigation Area

Note:
All wetlands within landfill cap will be filled. 2.27 acres of seasonal wetland will be filled by the project, and 0.89 acre of tidal wetland will be filled.

Habitat Type		Minimum Proposed Area to be Created
Seasonal Wetland	Area A	0.64 acres
	Area B	2.73 acres
	Total	3.37 acres
Tidal Wetland		1.43 acres

N

0 150 300 600 Feet

***Source:**
Huddleston, R. & A. Estabrook. 2011

Wetland Delineation Installation Restoration Site 2
Alameda Point, Alameda, CA. U.S. Dept. of the Navy Base Realignment & Closure Program Management Office West. August 2011.

Figure 3.
Alameda NAS IR Site 2
Wetland Mitigation Plan
Proposed Conditions

TETRA TECH

APPENDIX A

JURISDICTIONAL WETLAND DELINEATION
(on CD only)

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Final

Wetland Delineation

Installation Restoration Site 2
Alameda Point, Alameda, California

Contract Number: N62473-09-D-2622
Solicitation Number: Modification 01
Contract Task Order Number: 0006
Document Control Number: KCH-2622-0006-0029

August 2011

Prepared for

U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West

Prepared by

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Acronyms and Abbreviations

°F	degree(s) Fahrenheit
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
FAC	facultative
FACW	facultative wetland plant
IR	Installation Restoration
KCH	CH2M HILL Kleinfelder, A Joint Venture
NAS	Naval Air Station
Navy	U.S. Department of the Navy
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OBL	obligate wetland species
PEMA	Palustrine, Emergent, Temporarily Flooded
PUBFh	Palustrine Unconsolidated Bottom, Semipermanently Flooded, Diked/ Impounded
PUSCh	Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded
RWQCB	Regional Water Quality Control Board
UCIPMP	University of California Statewide Integrated Pest Management Program
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
USGS	United States Geological Survey
yd^3	cubic yards

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Executive Summary

A wetland delineation was conducted at Installation Restoration (IR) Site 2 Alameda Point, Alameda, California. This work was performed in accordance with Naval Facilities Engineering Command Southwest Contract No. N62473-09-D-2622, Modification 1, under Contract Task Order No: 0006 for the U.S. Department of the Navy, Base Realignment and Closure Program Management Office West. Field surveys were completed by CH2M HILL Kleinfelder, A Joint Venture (KCH) biologist on July 27, 2010, and March 31, 2011. The results of the wetland delineation identified the presence of 9.40 acres of open waters including 4.41 acres of tidal waters, and 11.91 acres of wetlands, including 3.22 acres of tidal wetlands, within the boundaries of the 110-acre IR Site 2. All of these waters and wetlands were considered to be adjacent to San Francisco Bay and were therefore considered potential jurisdictional waters of the United States subject to regulation under the federal Clean Water Act. The results and conclusions of this delineation are preliminary pending verification by the United States Army Corps of Engineers.

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1.0 Introduction

CH2M HILL Kleinfelder, A Joint Venture (KCH), has prepared this Wetland Delineation report to provide information regarding the location and extent of wetlands and other waters within the 110-acre Installation Restoration (IR) Site 2 located on the Former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California. This work was performed in accordance with Naval Facilities Engineering Command Southwest Contract No. N62473-09-D-2622, Modification 1, under Contract Task Order No: 0006 for the United States Department of the Navy (Navy), Base Realignment and Closure (BRAC) Program Management Office West.

A general description of the project and the environmental setting follows. Study methods and the survey results are provided in Sections 2 and 3, respectively.

1.1 Project Description

IR Site 2 is located on the southwest corner of Alameda Point and is approximately 110 acres (Figure 1). The area of present-day IR Site 2 was originally open water. In 1956, a seawall was constructed along the southern and western shorelines of IR Site 2 to confine and protect the area. Dredged fill of varying origins was hydraulically placed inside the seawall, essentially creating IR Site 2.

The site consists of the former West Beach Landfill, which occupies approximately 60 acres. Approximately 33 acres immediately south and west of the landfill are characterized by a mosaic of open water, wetlands, and upland habitat. The remaining 17 acres within the IR Site 2 boundary are represented by areas known as the interior margin and the coastal margin.

The former landfill was reportedly used for disposal of wastes generated by former NAS Alameda activities from 1956 through early 1978. After landfill operations ceased in 1978, an earthen berm was constructed around the perimeter of the landfill site.

In 1978, the Navy developed plans to close the landfill in accordance with the requirements of the San Francisco Regional Water Quality Control Board (RWQCB) Minimum Criteria for Proper Closure of Class II Solid Waste Disposal Sites (Resolution No. 77-7). In 1983, the RWQCB issued Order No. 83-35 not only to implement final cover, a leachate cutoff barrier, methane gas control, earthquake damage control, drainage control, and erosion control, but also to generate compliance reports for the landfill. The Navy complied between 1983 and 1985 by placing a partial clay-soil cover, installing an 820-foot-long, 2-foot-wide, 20- to 30-foot-deep, slurry wall to restrict potential contaminant migration to San Francisco Bay. The Navy also installed a gas venting system and completed repairs to the seawall at that time. Closure activities were discontinued in 1984 because the RWQCB required that the Navy first complete a solid waste assessment test. In 1986, the Navy spread 20,000 cubic yards (yd^3) of imported soil material on the landfill and later graded the material to eliminate depressions that could result in ponding. That volume represented a shortfall of

55,000 yd^3 to achieve a uniform cover layer of appropriate thickness over the landfill area. In August 1999, IR Site 2 (along with other sites at the former NAS) was officially added to United States Environmental Protection Agency's (USEPA) National Priority List of Superfund sites and assigned Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Information System Identification CA2170023236. Several investigations and removal actions have taken place since the listing.

The final Proposed Plan prepared by the Navy includes the following cleanup approaches to address contaminants in soil and groundwater at IR Site 2:

- Install a multilayer soil cover to isolate buried waste and soil contaminants and to prevent animal burrowing; implement engineering and institutional controls to protect human health and the soil remedy; mitigate wetlands; and monitor the soil cleanup action and wetlands mitigation to ensure its proper construction and long-term effectiveness. Conduct methane gas monitoring, as appropriate.
- Conduct monitored natural attenuation for site groundwater by regularly monitoring groundwater quality using a network of shoreline groundwater monitoring wells, and implement engineering controls to protect human health and the groundwater remedy.

1.2 Project Location

IR Site 2 is located at the southwestern end of the Alameda Point on the east side of San Francisco Bay in Alameda County, California. The site is bound to the south and west by San Francisco Bay and to the east and north by runways and tarmacs (Figure 1). IR Site 2 is in Section 05 Township 02 south, Range 04 west (Mt. Diablo Meridian), in the Oakland West United States Geological Survey (USGS) 7.5-minute topographic quadrangle. The approximate center of the site is at 37.78484 degrees north latitude and -122.32856 degrees west longitude.

1.3 Environmental Setting

Alameda Point is located at the western edge of the East Bay Terraces and Alluvium ecological subsection of the Central California Coast subregion (Miles and Gouday, 1998). This subsection is generally characterized by the alluvial plain between the east bay hills and San Francisco Bay. Descriptions of the terrestrial habitats, climate, hydrology and soils associated with IR Site 2 are provided below. Descriptions of wetlands and waters are provided in the results section of this report.

1.3.1 Terrestrial Vegetation

Terrestrial vegetation associated with IR Site 2 is characterized by a variety of weedy native and naturalized grasses and forbs that reflect the historical origins and disturbance history of the site. Common species observed on the levee, landfill, and other upland areas include rip-gut brome (*Bromus diandrus*), wild oat (*Avena barbata*), rat-tail fescue (*Vulpia myuros*), Italian thistle (*Carduus pycnocephalus*), field mustard (*Hirschfeldia incana*), wild radish (*Raphanus sativus*), tarweeds (*Madia gracilis* and *Centromadia fitchii*), fennel (*Foeniculum vulgare*), and yellow star-thistle (*Centaurea solstitialis*). A small dense patch of tall fescue

(*Festuca arundinacea*) is present in the northern part of the site, and dense patches of ice plant (*Carpobrotus edulis*) are common to the southwest and northeast of the landfill area. Coyote bush (*Baccharis pilularis*) shrubs and pampas grass (*Cortaderia jubata*) occur in scattered locations across the site. A small clump of trees, including black wood acacia (*Acacia melanoxylon*) and arroyo willow (*Salix lasiolepis*), is present near the northeastern corner of the site.

1.3.2 Climate and Hydrology

The regional climate is moderated by maritime influences and is characterized by mild temperatures with generally wet winters and dry summers with a year-round growing season. Average temperatures range from a low of 44 degrees Fahrenheit (°F) in December and January to a high of 75°F in September. Average annual precipitation is 23.10 inches, most of which occurs between November and March (United States Department of Agriculture [USDA], 2002). IR Site 2 is located in the East Bay Cities Hydrologic Area, which has a drainage area of 83,633 acres (California Interagency Watershed Map, 2004), and is in the San Francisco Bay Hydrologic Unit (Hydrologic Unit Code 18050004).

1.3.3 Soils

Soils associated with IR Site 2 are mapped as Xeropsamments fill (USDA, 2010) as shown in the soil maps included in Appendix A. This unit consists of sandy material that was dredged from old beach areas. Elevation ranges from near sea level to 10 feet above sea level with slopes of less than 2 percent. Approximately 10 percent of the map area consists of areas that are underlain by strongly alkaline clay to a depth of 36 to 48 inches. An additional approximately 5 percent of the map area includes concave areas that have a shallow water table (approximately 36 inches) and may be ponded during the winter. These soils are rapidly permeable, but the root zone is restricted to a depth of 40 to 60 inches for water-sensitive plants (USDA, 1981).

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2.0 Methods

The United States Army Corps of Engineers (USACE) defines wetlands as areas that are "inundated by surface water or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (Title 40 Code of Federal Regulations [CFR] Section 230.3 and Title 33 CFR Section 238). The survey methodology followed USACE's 1987 *Wetland Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE, 2008).

USACE uses a three-criteria approach (vegetation, soils, and hydrology) to determine the presence of wetlands. As a general rule, under this method, evidence of a minimum of one positive indicator for each criterion must be found (under normal circumstances and in nonproblem areas) to make a positive wetland determination. In general, wetlands will meet the following criteria:

Hydrophytic Vegetation: More than 50 percent of the dominant vegetation is composed of plant species that are adapted to survive and grow in hydrophytic (wet) conditions. The *National List of Plants that Occur in Wetlands* (Reed, 1988) was originally developed as an appendix to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979) to aid in the consistent application of this classification system for wetlands in the field. The list assigns a wetland indicator value to a particular plant species based on the probability of the species occurring in a wetland. An obligate wetland plant species (OBL), occurs almost always (estimated probability over 99 percent) under natural conditions in wetlands. A plant species listed as a facultative wetland (FACW) usually occurs in wetlands (estimated probability 67 to 99 percent), but is occasionally found in nonwetlands. A facultative (FAC) plant species is considered equally likely to occur in wetlands or nonwetlands.

Hydric Soils: The Natural Resources Conservation Service (NRCS) defines hydric soil as "soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register, July 13, 1994). The criteria for establishing the presence of hydric soils vary among soil types, drainage classes, and land resource regions. The USDA (2006) field indicators for identification of hydric soils have been included in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE, 2008). These indicators rely on soil characteristics such as texture, color, and the presence of redoximorphic features to determine if soils are hydric.

Wetland Hydrology: Areas with wetland hydrology are defined as "inundated either permanently or periodically at mean water depths less than 2 meters (6.6 feet), or the soil is saturated to the surface at some time during the growing season" (Environmental Laboratory, 1987). This saturation or inundation must be present for at least 5 percent of the growing season for an area to meet the minimum wetland hydrology criterion.

2.1 Pre-Field Investigation

Prior to conducting the field surveys, existing available information pertaining to potential wetlands and waters located at IR Site 2, including the Oakland West USGS topographic map, the Alameda County Soil Survey (USDA, 1981) and aerial photographs, were reviewed. Information from the National Wetlands Inventory (NWI) was also reviewed prior to the field survey. The NWI is maintained by The U.S. Fish and Wildlife Service and is intended to provide information on the extent and status of the nation's wetlands.

2.1.1 Field Survey

Pedestrian surveys were conducted throughout the 110–acre wetland survey area on July 27, 2010, by Russell Huddleston and Holly Barbare to determine if wetland or other water features were present on IR Site 2. Because the July 2010 field surveys were completed during the dry part of the year and potential radiological contamination precluded collection of soil information, Mr. Huddleston conducted an additional field survey on March 31, 2011. The purpose of the March 2011 field survey was to collect supplemental information on wet season hydrological conditions, as well as collect soil information while radiological monitoring staff was onsite. Some additional upland and wetland data points also were collected during the March 2011 survey.

A total of 37 sample points were established in potential wetland areas and in adjacent upland habitats (Figure 2). Vegetation, soils, and hydrology observations at each sample point were recorded on standard USACE wetland determination data sheets. The wetland determination data sheets are included in Appendix B, and representative site photographs are included in Appendix C.

At each sample point, the dominant plant species were identified, and the percent cover was visually estimated and recorded. All taxonomic designations adhere to the *Jepson Manual of Higher Plants of California* (Hickman, 1993) or the updated taxonomy per the *Jepson Online Interchange for California Floristics* (University of California, 2011). The wetland indicator status was determined using the *National List of Plant Species that Occur in Wetlands* (Reed, 1988). Dominant species within each vegetation strata (tree, shrub, and herb) included the most abundant species whose cumulative cover accounted for at least 50 percent of the total cover, as well as any single species that accounted for at least 20 percent of the total vegetative cover. Strata that contained less than 5 percent total cover were not considered in the dominance test. The sample area for herbaceous species generally included a 5-foot radius from the sample point. A list of plant species observed at the sample locations is provided in Appendix D.

During the March 31, 2011, field survey soil morphological features, such as texture, color, and redoximorphic features (if present), were logged at several hand-augered soil borings, between 6 to 12 inches deep. Soils texture was estimated in the field by feel (Thein, 1979), and moist soil colors were determined using Munsell® color charts. In some situations, where saturated soils were present, alpha alpha-Dipyridyl (a chemical dye) was used to test for the presence of reduced iron (Childs, 1981). Hydric soils were assumed present in wetland areas that lacked hydric indicators where the dominant vegetation consisted entirely of OBL and FACW plant species. There was evidence of seasonal wetland hydrology, and there was a notable difference between the wetland and adjacent upland habitat (Environmental Laboratory, 1987).

Wetland hydrology was determined in the field based on observations made both during the dry season (July 2010) survey, as well as the wet season (March 31, 2011) survey. Dry season observations included indicators of wetland hydrology, such as algal matting and soil cracks, while the wet season observations included surface inundation, soil saturation and aquatic invertebrates such as seed shrimp (*Ostracods*).

Wetland boundaries were determined in the field based on changes in plant species composition and cover, the presence or absence of hydric soil, hydrologic indicators and local micro-topography. The wetland boundaries were mapped in the field using a Trimble® Geo-XT global position system device.

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3.0 Results and Discussion

A total of 9.40 acres of open water, including 4.41 acres of tidal waters, and 11.91 acres of wetlands, including 3.22 acres of tidal wetlands, were identified within the 110-acres IR Site 2 wetland study area (Table 1, Figure 2). General descriptions of these features are provided in the following sections. Data sheets and representative photographs are provided in Appendix B and C, respectively.

3.1 Open Waters

Two large open water features are located to the southwest of the landfill area (Figure 2). Both of these surface water features have been identified as Palustrine Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded (PUBFh) wetlands by the NWI (Appendix E) and are identified as open water features on the Oakland West USGS quadrangle (Appendix F). The northernmost of the two ponds (WTR-1) is hydrologically connected to San Francisco Bay through a 36-inch-diameter culvert that penetrates the perimeter berm and seawall. This tidal pond area appears to contain water year-round. The southern pond (WTR-2) was created by excavating soil for use as landfill cover, and it appears to be dry during the late summer months then subsequently filled with fresh water via precipitation during the winter and early spring. In July 2010 the area mapped as WTR - 2 was largely characterized by exposed soils and areas of shallow inundation. In contrast, the entire basin was completely inundated during the March 2011 survey. There is no direct surface connection between WTR-2 and the San Francisco Bay.

TABLE 1
Summary of Wetland and Water Features

Feature Name	Acreage
Waters	
WTR-1 (Tidal)	4.41
WTR-2	4.99
Total Waters	9.40
Wetlands	
W-1	0.43
W-2	0.77
W-3	0.11
W-4	0.04
W-5	0.17
W-6	0.37
W-7	0.06
W-8	0.12

TABLE 1
Summary of Wetland and Water Features

Feature Name	Acreage
W-9	0.02
W-10	0.13
W-11 (Tidal)	3.22
W-12	6.15
W-13	0.15
W-14	0.16
W-15	0.01
Total Wetlands	**11.91**

3.2 Wetlands

Wetlands are present in the southwest part of IR Site 2 in the vicinity of the open water habitats, as well as in the northern part of the site (Figure 2). Three of the wetland areas (W-1, W-2, and W-12) generally correspond with areas included in the NWI (Figure 2 and Appendix E).

The NWI includes a Palustrine, Emergent, Temporarily Flooded (PEMA) wetland along the north side of the IR Site 2 that generally corresponds to wetlands W-1 and W-2 (Appendix E and Figure 2). Wetland W-1 is characterized by a mixture of pickleweed (*Salicornia virginica*) and saltgrass (*Distichlis spicata*) with sparse rabbitsfoot grass (*Polypogon monspeliensis*), spear saltbush (*Atriplex patula*), and brass buttons (*Cotula coronopifolia*). Algal matting was observed in this area during the July 2010 field survey and 6 inches of ponded water was present in March 2011. Soils in this area are a dark grayish-brown (10 YR 4/2) sand with no redoximorphic features. No reaction to alpha alpha-Dipyridyl was observed during the March 2011 field survey (see Section 3.5 for a discussion of problem soils). Hydric soils were assumed present at this location based on the abundance of OBL and FACW vegetation, evidence of seasonal wetland hydrology, and notable absence of upland plant species in this area.

Wetland W-2 is characterized by a mixture of FACW and FAC plant species, including saltgrass, spear saltbush, and yellow sweetclover (*Melilotus indicus*). Other plants observed in this area included bird's-foot trefoil (*Lotus corniculatus*), curly dock (*Rumex crispus*), and sparse pickleweed. Algal matting was observed in this area in July 2010, and 6 inches of ponded water covered the area during the March 2011 field survey. Soils are a very dark gray (10YR 3/2) sandy clay loam with less than 2 percent strong brown (7.5YR 4/6) concentrations present in the upper 12 inches. The soil in this area does not meet any hydric criteria, and no reaction to alpha alpha-Dipyridyl was observed during the March 2011 field survey. Hydric conditions were assumed present based on the presence of wetland vegetation and observations of seasonal hydrology indicators observed during both the July 2010 and March 2011 field surveys and the absence of upland plant species.

The NWI also includes a large Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded (PUSCh) wetland along the southeastern edge of the southern open water pond. This feature generally corresponds to the large area mapped as wetland W-12 (Appendix E and Figure 2). Vegetation in this area is characterized by dense pickleweed with sparse saltgrass and rabbitsfoot grass in some areas. Areas of dense algal matting were observed in the northeastern part of this area during the July 2010 surveys and extensive inundation was observed through the entire wetland during the March 2011 surveys. During the March 31, 2011, field surveys this area was inundated with 9 to 15 inches of standing water. Surface soils include a dark grayish-brown (2.5 Y 4/2) sand in the southwestern part of the wetlands, along with mixed dark grayish-brown (10 YR 4/2) clay, light brownish-gray (2.5 Y 6/2) silty clay, and dark gray (10 YR 4/1) sandy clay in the northeast part of the wetland. No hydric soil indicators were observed, and there was no reaction to alpha alpha-Dipyridyl in March 2011. Hydric soils were assumed present based on the abundance of OBL plant species, evidence of wetland hydrology, and absence of upland plants.

Wetland W-12 also includes a narrow, nearly continuous fringe of pickleweed along the banks and outer edges of the open water area WTR-2. In July 2010, this area was above the water line, but the entire fringe wetland area was inundated with up to 3 inches of water during the March 2011 survey. The upper 12 inches of soil in this area is a dark grayish-brown (10 YR 4/2) sandy clay loam. No hydric indicators were observed, and there was no reaction to alpha alpha-Dipyridyl. Hydric soils were assumed present based on the abundance, evidence of wetland hydrology, and absence of upland plants.

In addition to the wetland areas included in the NWI, several other wetland features were identified within the boundaries of IR Site 2. These additional wetland areas include an adjacent wetland around the tidal open water pond (wetland W-11), as well as numerous linear swale-like wetlands and small depressional wetlands (Figure 2). The wetland (W-11) associated with the tidal open water area (WTR-1) is characterized by dense pickleweed with small amounts of saltgrass and spear saltbush also present. Soils were moist but not saturated at the outer extent of this wetland area in July 2010, and the entire area was inundated with between 1.5 and 3.5 inches of water during the March 2011 survey. This wetland is contiguous with the tidally connected open water area WTR-1; therefore, the extent of saturation and inundation is likely variable with changing tidal elevations. The surface soil in the northwest part of the wetland is a dark grayish-brown (10 YR 4/2) sandy clay loam. Soil in the southeast corner consists of mixed grayish-brown (2.5 Y 5/2) and dark grayish-brown (2.5 Y 4/2) clay with over 2 percent strong brown (7.5 YR 4/6) concentrations in the in the matrix below 5 inches. The mixed-clay soil in the southeast corner meets the criteria for a depleted matrix. No reaction to alpha alpha-Dipyridyl was observed at either soil sample location during the March 2011 survey. Soils throughout this area were considered to be hydric based on the abundance of OBL vegetation, observations of wetland hydrology, and absence of upland plant species.

Three linear, swale-like wetlands are present along the western side of the site (W-8, W-9, and W-10) as shown in Figure 2. Wetland W-8 is located on the west side of the levee that surrounds the landfill. Wetlands W-9 and W-10 are located immediately east (inside) of the landfill levee along the western side of IR Site 2. All three of these wetlands are characterized by pickleweed. These wetland areas were all dry during the July 2010 field survey, but they were all were inundated with several inches of water during the March 2011 field survey. Based on the presence of driftwood and other debris along the base of the outer landfill levee, it appears that wetland W-8 may be subject to sea waves during heavy storm events and extreme high tides; however, the wetland hydrology appears to be due to seasonal rainwater perched above a restrictive clay layer. The surface soil in this area is a dark gray (2.5 Y 4/1) sandy clay loam to a depth of 5 inches that was saturated at the time of the March survey. Below 5 inches the soil is a dark grayish-brown (2.5 Y 4/2) heavy clay. While the wetland feature contained several inches of standing water in some areas and had saturated surface soils at the outer edges, the interior of the clay soil below 5 inches was only slightly moist during the March 2011 survey, suggesting that water is not percolating through this dense clay layer. No hydric soil indicators were observed in this area, but a faint reaction to alpha alpha-Dipyridyl was noted in the upper 5 inches of saturated soil.

Wetlands W-9 and W-10, on the east side of the levee, were inundated with 6 and 11 inches of water, respectively, on March 31, 2011. Soils associated with wetland W-9 are a dark grayish-brown (10 TR 4/2) sandy clay loam. No redoximorphic features or other hydric soil indicators were observed, and there was no reaction to alpha alpha-Dipyridyl at this location in March 2011. Hydric soils were assumed present based on the abundance of OBL wetland vegetation, observations of seasonal wetland hydrology and absence of upland plants. Soil associated with wetland W-10 is a dark gray (2.5 Y 4/1) sandy clay loam with approximately 2 percent strong brown (7.5 YR 4/6) concentrations in the upper 6 inches. This soil meets the criteria for a depleted matrix, and hydric conditions are likely present based on abundance of OBL vegetation, observation of seasonal ponding during the March 2011 survey, and absence of upland plants in this area.

Three smaller depressional wetland features (W-13, W-14, and W-15) were identified in the southwest part of IR Site 2 (Figure 2). All three of these areas are characterized by abundant pickleweed and were inundated with 11 to 19 inches of water on March 31, 2011. Other wetland vegetation associated with these areas included scattered spear saltbush and curly dock. Surface soils in all three locations are characterized by dark grayish-brown (10 YR 4/2) sand to sandy clay loam. None of the soils had a reaction to alpha alpha-Dipyridyl in March 2011 and no other hydric soil indicators were observed. Hydric soils were assumed present in all three of these areas based on the abundance of OBL wetland vegetation, observations of seasonal wetland hydrology, and notable lack of upland vegetation.

Several depressional wetlands (W-3 through W-7) are present in the northeastern corner of IR Site 2 (Figure 2). With the exception of wetland W-13 which was characterized by dense saltgrass with scattered curly dock, birds-foot trefoil, and spear saltbush, all of these wetlands are characterized by pickleweed. Other species present in the pickleweed wetlands areas include saltgrass, brass buttons, and rabbitsfoot grass. All of these areas were dry during the July 2010 survey. On March 31, 2011, these areas were inundated with between 4 and 10 inches of standing water. Surface soils associated with these wetlands included very dark grayish-brown (10 YR 3/2) sand and sandy clay loams, dark gray (2.5 Y 4/1) sand, and mixed dark gray (2.5 Y 4/1) and dark grayish-brown (2.5 Y 4/2) sand. No hydric indicators were observed in any of the soils, and none of the sample locations had a reaction to alpha alpha-Dipyridyl during the March 2011 survey. Hydric soils were assumed to be present in these areas based on the abundance of FACW and OBL vegetation, observations of seasonal wetland hydrology, and absence of upland plants.

3.3 Adjacent Upland Sample Points

A total of 18 sample points were established in uplands adjacent to the wetland areas (Figure 2). Common plant species in the adjacent uplands included ice plant, rip-gut brome, foxtail fescue, soft chess, Italian thistle, wild oat, and tall fescue. Common wetland species, including pickleweed and saltgrass, were observed in a number of upland areas, but generally the areas have low cover or were intermixed with abundant nonwetland plants (see Section 3.5 for additional discussion on vegetation). No evidence of inundation or saturation in the upper part of the soils was observed in these areas during either the July 2010 or March 2011 field surveys. As with the wetland sample points, surface soils were highly variable from one location to the next and often were similar to soils observed in the wetland areas adjacent to the upland sample point. The variability of the soils is typical for areas where the substrate consists of dredged fill material.

3.4 Nonwetland Constructed Drainage

A concrete-lined drainage channel is present along the southeast side of the landfill area (Figure 2). A large semicircular corrugated metal pipe stand with a 26-inch-diameter culvert passing through the eastern levee wall drains into a concrete-lined channel that runs approximately 1,370 feet to the south. The channel terminates at the southeast corner of the landfill site where it flows into a 36-inch-diameter culvert that appears to discharge into San Francisco Bay. At the time of the survey, there was no evidence of recent flow through the channel, and upland vegetation, including ice plant, rip-gut brome, wild oat, and Italian thistle, all of which are common throughout portions of the channel sediment, had accumulated.

3.5 Survey Conditions and Problem Soils and Vegetation

No significant recent disturbance was observed at IR Site 2, and the overall seasonal conditions were considered to be within the normal range, although the monthly rainfall in March 2011 was higher than average. Soils throughout IR Site 2 consist of dredged fill material and were considered to be problematic. While the *Wetland Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE, 2008) provide useful guidance, the determination of wetland and nonwetland areas was, in many cases, based on best professional judgment. The following sections provide addition discussion of the survey conditions and problems encountered within IR Site 2 during the wetland delineation surveys.

3.5.1 Rainfall and Hydrology

With the exception of the open water area WTR-1 and contiguous wetland area W-11, which are hydrologically connected to the San Francisco Bay through a culvert, the hydrology of the wetlands identified within IR Site 2 appears to be influenced by direct precipitation and localized runoff during the winter and early spring months.

During the July 2010 surveys, surface water was absent from most of the wetlands as a result of normal seasonal conditions. In contrast, surface saturation and/or inundation was observed in all of the wetland areas during the March 2011 survey. The total rainfall during the month of March 2011 was 4.94 inches, compared to a monthly average of 3.56 inches (University of California Statewide Integrated Pest Management Program [UCIPMP], 2011). A total of 0.67 inches of rainfall was recorded in West Oakland the week immediately preceding the March 31, 2011, survey (UCIPMP, 2011). The higher-than-average rainfall in March 2011, as well as a relatively significant amount of precipitation immediately preceding the survey, likely resulted in an increased extent and depth of ponding in some areas. However, the total seasonal rainfall between November 1, 2010, and March 31, 2011, was 17.24 inches—slightly below an average of 19.18 inches for this period (UCIPMP, 2011). Therefore, the overall wet season conditions were considered to be within the range of normal circumstances.

One of the primary purposes of the March 2011 survey was to document the wet season conditions of areas that were identified as potential wetlands during the July 2010 field survey. Taking into consideration both the monthly rainfall conditions and overall seasonal precipitation, the observations of seasonal ponding during the March 2011 survey confirmed the presence of wetland hydrology in areas that were mapped as potential wetlands during the July 2010 dry season field survey.

3.5.2 Problematic Soils

Because soils throughout IR Site 2 originated from dredged fill material and are described as being moderately alkaline (USDA, 1981), soils were considered to be problematic. Common hydric soil indicators are frequently absent in wetlands with coarse textured soils (sand), and/or wetlands that have soils with a high pH (USACE, 2008; NRCS, 2010). Redoximorphic features (and the presence of reduced iron as detected with alpha alpha-Dipyridyl) are also not found in soils where there are low amounts of soluble carbon and iron, or where there are other chemical and/or physical constraints on microbial processes that result in the reduction of iron under saturated soil conditions (Vepraskas, 1999; Richardson and Vepraskas, 2001; Childs, 1981).

While no data were collected on soil salinity, the fact that the soils are derived from dredged material (USDA, 1981), the fact that IR Site-2 is located in an area that was originally part of San Francisco Bay, and the dominant vegetation associated with the wetlands consists of salt tolerant plants, it is likely the soils are at least partly saline. Saline soils that become anaerobic in the upper 12 inches often do not exhibit redoximorphic features even though the soils are anaerobic for long periods of time (Richardson and Vepraskas, 2001).

Hydric soil indicators, such as the presence of a depleted matrix or the presence of reduced iron (a positive reaction to alpha alpha-Dipyridyl), confirm that hydric conditions either have been or are currently present in a given location. However, some hydric soils lack any of the currently identified indicators, and the lack of an indicator does not prevent classification of the soil as hydric (NRCS, 2010). As previously mentioned, areas that were characterized by wetland vegetation, exhibited seasonal wetland hydrology, and had a notable absence of upland plant species were considered to also have hydric soils present (Environmental Laboratory 1987).

3.5.3 Problematic Vegetation

Two relatively common plants observed at IR Site 2 are pickleweed and salt grass. Pickleweed is listed as an OBL, and saltgrass is listed as FACW in the *National List of Plants that Occur in Wetlands* (Reed, 1988). Both of these species are commonly dominant in coastal salt marshes around the San Francisco Bay region and were the most abundant species observed in wetland areas within IR Site 2. Both pickleweed and salt grass were also observed in nonwetland habitats associated with plant species that are intolerant of prolonged inundation and saturation, such as ice plant, rip-gut brome, and coyote. Both pickleweed and saltgrass can spread extensively from wetland areas into adjacent uplands by a long-reaching system of rhizomes. For the purpose of this delineation, areas that were characterized by hydrophytic vegetation intermixed with plants commonly found only in upland areas were not considered to be wetlands.

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4.0 Preliminary Jurisdictional Determination

USACE and USEPA are ultimately responsible for making the determination regarding the limits of waters of the United States subject to regulation under the federal Clean Water Act. The results and conclusions presented in this wetland delineation are intended to assist the USACE with its determination of jurisdictional waters of the United States (including wetlands), and the results and conclusions presented in this report are preliminary, pending verification and subsequent approval by the USACE.

According to the federal Clean Water Act, wetlands that are adjacent to traditional navigable waters are *per se* jurisdictional and therefore do not require a significant nexus, such as a continuous surface water connection (33 CFR 328.3). According to the Clean Water Act, the term adjacent means "bordering, contiguous, or neighboring." Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are "adjacent wetlands" (33 CFR 328.3). The USACE considers wetlands to be bordering, contiguous, or neighboring, and therefore "adjacent" if at least one of the following three criteria is satisfied:

1. There is an unbroken surface or shallow subsurface hydrologic connection between the wetland and jurisdictional waters.
2. The wetlands are physically separated from jurisdictional waters by "man-made dikes or barriers, natural river berms, beach dunes, and the like."
3. Where a wetland's physical proximity to a jurisdictional body of water is reasonably close, that wetland is "neighboring" and thus adjacent.

Proposed guidance issued by the USEPA (2011) states that one test for determining if a wetland is sufficiently proximate to be considered "neighboring" is whether there is a demonstrable ecological interconnection between the wetland and the jurisdictional body of water. For example, if resident aquatic species (e.g., amphibians, aquatic turtles, fish, or ducks) rely on both the wetland and the jurisdictional body of water for all or part of their life cycles (e.g., nesting, rearing, or feeding), that may demonstrate that the wetland is neighboring and thus adjacent" (Federal Register Volume 79, Number 84).

Although only one of the open waters (WTR-1) and associated wetland area (9W-11) identified at IR Site 2 has a direct surface connection to San Francisco Bay, all of the wetland features are located on lands that were created by the historical filling of a portion of the San Francisco Bay, and all are located within approximately 150 to 1,600 feet of the bay. They are likely to be considered adjacent wetlands by the USACE and, therefore, were considered to be potential jurisdictional wetlands.

Additionally, 33 CFR 329 defines navigable waters of the United States as "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce."
A determination of navigation, once made, applies laterally over the entire surface of the body of water and is not extinguished by later actions or events that impede or destroy

navigable capacity. Given the fact that the entire area included within IR Site 2 was historically part of the San Francisco Bay, it is likely that the USCAE would consider all of the wetlands identified in IR Site 2 as potential jurisdictional Waters of the United States.

5.0 Summary and Conclusions

The results of the wetland delineation identified the presence of 9.40 acres of open water, including 4.41 acres of tidal waters, and 11.91 acres of wetlands, including 3.22 acres of tidal wetlands, within the 110-acre IR Site 2 survey area. Additional field surveys conducted in March 2011 confirmed the presence of seasonal wetland hydrology in areas previously identified as wetlands during the July 2010 field surveys. Soils throughout IR Site 2 are derived from dredged fill material and were considered problematic. While hydric soil indicators were not observed in most of the wetland areas, hydric soils were assumed to be present based on abundance of OBL wetland plants, observations of seasonal hydrology, and absence of upland plants per the *1987 Wetland Delineation Manual* (Environmental Laboratory 1987).

Based on USEPA and USACE guidance, as well as on the definition of Waters of the United States in the Federal Clean Water Act, all of the waters and wetlands identified at IR Site 2 were considered adjacent to San Francisco Bay and, therefore, would be jurisdictional under Section 404 of the Clean Water Act. The results and conclusions presented in this report, as well as the jurisdictional determination, are preliminary, pending verification by USACE.

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Figures

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Aerial image source: © Google; additional content by CH2M HILL

0 400 800 1,600 Feet

IR Site 2 Wetland Delineation Study Area

Wetland Delineation, IR Site 2
Alameda Point, Alameda, California

N

FIGURE 1

ES071410053357BAO wetland_study_areas_IRSite2.ai 11-01-10 lho

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VICINITY MAP

LEGEND

- Sample Point
- Culvert
- Storm Drain
- Non-Wetland Drainage Ditch
- Site 2 Boundary (123.54 Acres)
- Open Water
- Seasonal Wetland
- Tidal Wetland

Wetland Delineation:
Russell Huddleston and Holly Barbare,
July 2010 and March 2011

Source:
i-cubed Nationwide Prime 1m or better resolution imagery for the contiguous United States. I-cubed Nationwide Prime is a seamless, color mosaic of various commercial and government imagery sources, including Aerials Express 0.3 to 0.6m resolution imagery for metropolitan areas.

0 150 300
Feet

Waters and Wetlands

Wetland Delineation, IR Site 2
Alameda Point, Alameda, California

N

Figure
2

\\ZINFANDEL\PROJ\NAVYCLEAN\383512\GIS_FILES\MAPFILES\2011\WETLANDS\WETLANDS_SITE2_11X17_APRIL2011.MXD CARCHER 4/27/2011 12:08:15

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Appendix A
Soil Maps

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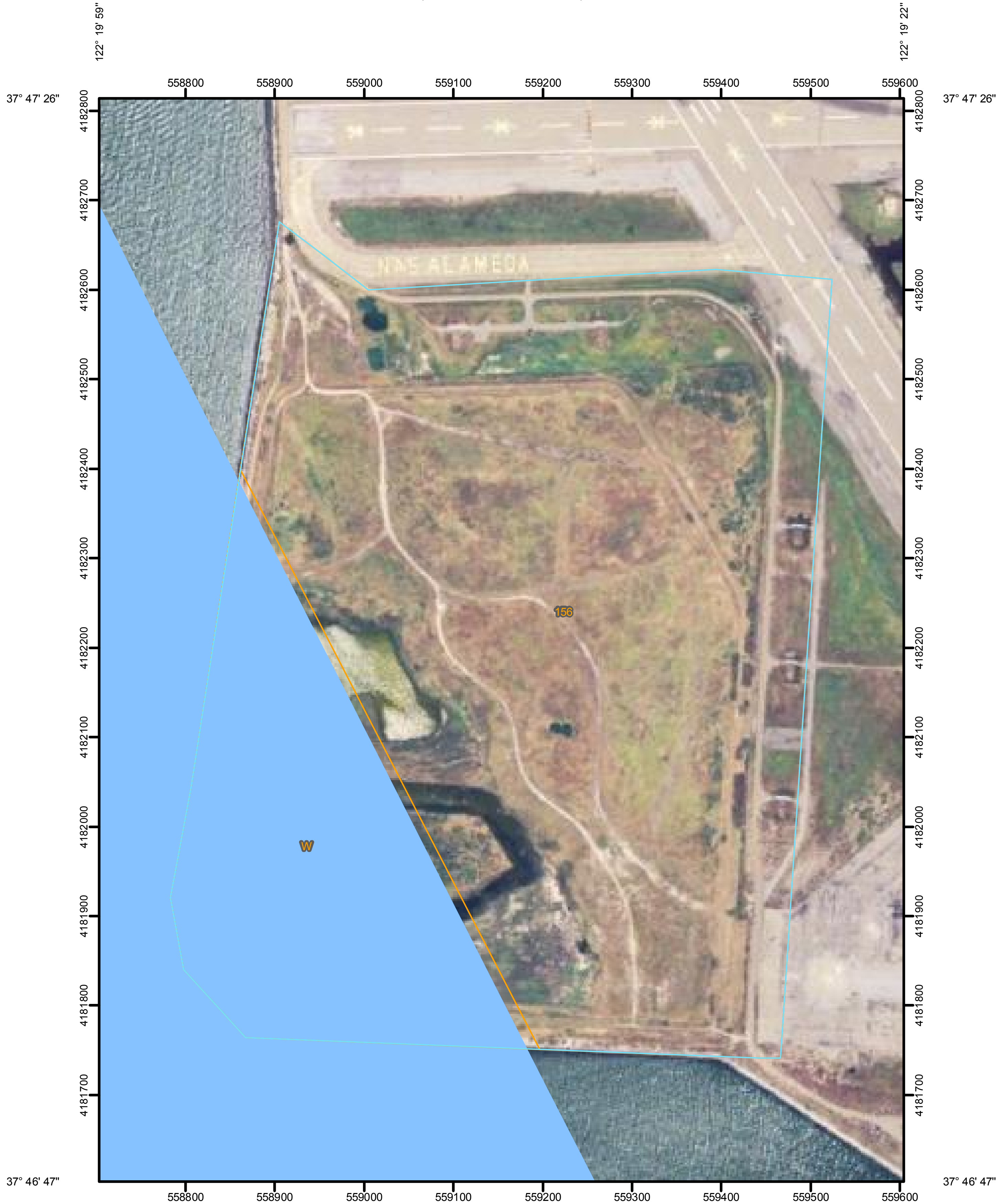

Map Scale: 1:5,780 if printed on A size (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1,200

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,780 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Alameda County, California, Western Part
Survey Area Data: Version 7, Jul 27, 2010

Soil Survey Area: San Mateo County, Eastern Part, and San Francisco County, California
Survey Area Data: Version 7, Jul 27, 2010

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/12/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Alameda County, California, Western Part (CA610)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
156	Xeropsamments, fill	108.3	76.8%
Subtotals for Soil Survey Area		**108.3**	**76.8%**
Totals for Area of Interest		**141.1**	**100.0%**

San Mateo County, Eastern Part, and San Francisco County, California (CA689)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
W	Water	32.8	23.2%
Subtotals for Soil Survey Area		**32.8**	**23.2%**
Totals for Area of Interest		**141.1**	**100.0%**

high shrink-swell potential and low strength affect the construction of roads and streets. Suitable base material is needed.

The water intake rate and permeability are slow; therefore, lawns should be watered slowly to reduce runoff. Shrubs can be drip irrigated to encourage deep rooting. Lawn grasses grow best if 1 pound of elemental nitrogen per 1,000 square feet is applied every 8 weeks, from April through October. Some ornamental plants respond to sulfur and to iron and aluminum chelates. Adding organic matter to the soil can improve the rate of water intake, aeration, and tilth.

Capability classification not assigned.

156—Xeropsamments, fill. This unit consists of sandy material that was dredged from old beach areas. Slopes are less than 2 percent. Elevation ranges from near sea level to 10 feet. The average annual precipitation is 17 inches, and the mean annual temperature is 57 degrees F. The average frost-free season ranges from 300 to 320 days.

Included in mapping, and making up about 10 percent of the map unit, are a few areas that are underlain by strongly alkaline clay at a depth of 36 to 48 inches. Also included, and making up about 5 percent of the map unit, are concave areas that have a water table within a depth of 36 inches and can be ponded in winter.

Typically, Xeropsamments are moderately alkaline sands that extend to a depth of 60 inches. In a few areas they are as much as 5 percent, by volume, shells that are less than one inch in diameter.

These soils are rapidly permeable. The root zone for water-tolerant plants is 60 inches deep; the water table restricts the root zone for water-sensitive plants to a depth of 40 to 60 inches. The available water capacity is 3 to 4 inches. Runoff is slow, and the hazard of erosion is slight. Soil blowing is a serious hazard.

These soils are used mainly for urban and industrial development and as airfields. A few areas are used for small grain. Levees prevent erosion of this fill material.

Frequent and light applications of irrigation water and fertilizer are needed to establish a vegetative cover. Most plants respond to nitrogen and phosphate fertilizer. Iron and aluminum chelates are needed for some ornamental plants.

Capability classification not assigned.

157—Xerorthents-Altamont complex, 30 to 50 percent slopes. This complex consists of soils on foothills adjacent to the bay. The elevation ranges from 200 to 1,500 feet. The average annual precipitation is 16 inches, and the mean annual temperature is 57 degrees F. The average frost-free season ranges from 300 to 320 days. Xerorthents, clayey, make up about 75 percent of this complex; Altamont clay, 20 percent.

Xerorthents consist of soil material that resulted from cutting or filling for urban development; therefore, the soil characteristics are variable. Fill areas consist of heavy clay loam, silty clay, and clay and are as much as 20 percent angular fragments of shale and sandstone. Colors are variable. Reaction is mildly alkaline or moderately alkaline, and these soils are calcareous throughout the profile. Cut areas consist of interbedded shale and fine-grained sandstone. The bedrock dips between 50 and 80 degrees.

Permeability is slow or very slow, depending on the soil texture and on the amount of compaction that takes place during construction.

The Altamont soil is deep and well drained. It formed in the material that weathered from soft, interbedded sedimentary rock and makes up most of the undisturbed areas of this complex. Typically, the surface layer is dark brown, slightly acid to mildly alkaline clay about 28 inches thick. The next layer is finely mixed dark brown and dark yellowish brown, calcareous clay about 9 inches thick. The underlying material extends to a depth of 50 inches. It is yellowish brown, calcareous clay. Below that is highly fractured and weathered fine-grained sandstone and shale.

Permeability is slow. The available water capacity is 5.0 to 9.5 inches. The root zone is 40 to 60 inches deep. Runoff is rapid, and the hazard of erosion is high.

Areas of this complex are used mainly for residential developments that have a density of two to four single family dwellings per acre. Approximately 25 percent of the area is covered by buildings or other urban related structures.

Certain limitations should be overcome before construction is feasible. The shrink-swell potential is high; as a result, foundations can shift and crack. Building pads should be shaped so that water is drained away from the building site, thus keeping the soil beneath the foundation dry and reducing the hazards of differential settlement and shrink-swell. The high shrink-swell potential and low strength affect the construction of roads and streets. Suitable base material is needed. In sloping areas, intercepting drains should be provided to keep moisture from beneath the roads.

Steep banks that result from reshaping these soils for use as building sites are highly erodible. These soils should be seeded to a fast-growing cover as soon as possible to reduce the hazard of erosion. Using straw mulch or jute netting helps to reduce the hazard of erosion during establishment of the grass cover. If runoff from higher areas is a problem, diversions may be needed at the head of these slopes.

The water intake rate and permeability are slow; therefore, lawns should be watered slowly to reduce runoff. Shrubs and trees can be drip irrigated to encourage deep rooting. Lawn grasses grow best if 1 pound of nitrogen per 1,000 square feet is applied every 8 weeks, from April through October. Some ornamental plants respond to sulfur and to iron and aluminum chelates.

Appendix B
Data Sheets

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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-1

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78805 North Long: -122.32917 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Wetland W-1; small depressional area at the north end of IR Site 2 south of taxiway. Mapped as a PEMA in the National Wetlands Inventory. Considered a problem area as the soils are derived from dredged fill material and hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	50	Yes	OBL
2. *Distichlis spicata*	45	Yes	FACW
3. *Polypogon monspeliensis*	2		FACW
4. *Atriplex patula*	<1		FACW
5. *Cotula coronopifolia*	<1		FACW+
6.			
7.			
8.			
Total Cover:	>97%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <3% % Cover of Biotic Crust ~5%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species	50	×1 =	50	
FACW species	48	×2 =	96	
FAC species		×3 =		
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	98	(A)	146	(B)
Prevalence Index = B/A =			1.49	

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0*
- ___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Biotic crust consists of dried algal matting in this location. Other plant species noted in this area included sparse *Lepidium latifolium* (FACW), *Rumex crispus* (FACW-) and *Lotus corniculatus* (FAC).

SOIL

Sampling Point SP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-12	10 YR 4/2	--	--	--	--	--	Sand	No redox.

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: No evidence of hydric soil at this location; no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Area is characterized exclusively by hydrophytic vegetation and appears to support seasonal inundation; therefore hydric soils are presumed to be present in this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- X Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 6

Water Table Present? Yes ___ No ___ Depth (inches): N/A

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): N/A

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 field surveys with scattered dried algal matting observed throughout the topographic basin. The entire area was inundated with approximately 6 inches of standing water on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-2

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78807 North Long: -122.32897 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Grassland habitat at the north end of IR Site 2 south of taxiway adjacent to Wetland W-1. Soils considered problematic as they are derived from dredged fill materials. This area is included in an area mapped as a PEMA by the National Wetlands Inverntoy, but does not appear to support wetland hydrology and is characterized by marginal vegetation consisting largely of facultative species with upland planst also present.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Festuca arundinacea*	90	Yes	FAC
2. *Holcus lanatus*	5		FAC
3. *Polypogon monspeliensis*	1		FACW
4. *Bromus diandrus*	1		NL
5. *Geranium dissectum*	1		NL
6. *Bellardia trixago*	1		NL
7. *Atriplex patula*	<1		FACW
8. *Bromus hordeaceus*	<1		FACU
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <1% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:
OBL species		×1 =
FACW species	1.5	×2 = 3
FAC species	95	×3 = 285
FACU species	.5	×4 = 2
UPL species	3	×5 = 15
Column Totals:	100 (A)	305 (B)

Prevalence Index = B/A = 3.05

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: NL = not included on the *National List of Plant Species that Occur in Wetlands* (Reed,1988); are assumed to be an upland plants.

Meets the dominance test, but fails the prevalence test – suggest that vegetation in this area may not be indicative of seasonal wetland hydrology in this area.

SOIL

Sampling Point SP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	--	--	--	--	--	Sand	Fill Material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** X

Remarks: Fill soils in this location. Dominant vegetation in this area is facultative with scattered non-wetland plants also present. No evidence to suggest hydric conditions are present in this location sufficient to result in the development of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No ______ Depth (inches): >12
Saturation Present? Yes ______ No ______ Depth (inches): >12
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of prolonged seasonal saturation or inundation in this area .

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-3

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78818 North Long: -122.32780 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Wetland W-2; depressional area at the north end of IR Site 2, south of taxiway. Considered a problem area as the soils are derived from dredged fill material and seasonal wetland hydrology. This area is mapped as a PEMA by the National Wetlands Inventory.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Distichlis spicata*	30	Yes	FACW
2. *Melilotus indicus*	20	Yes	FAC
3. *Atriplex patula*	20	Yes	FACW
4. *Lotus corniculatus*	15		FAC
5. *Rumex crispus*	10		FACW-
6. *Salicornia virginica*	5		OBL
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <5% % Cover of Biotic Crust ~5%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	5	×1 =	5
FACW species	60	×2 =	120
FAC species	35	×3 =	105
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	100 (A)		230 (B)

Prevalence Index = B/A = 2.30

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Biotic crust consists of dried algal matting in this location. Notable absence of upland plant species in this area.

SOIL

Sampling Point SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 3/2	>98	7.5 YR 4/6	<2	C	M	SCL	Few concentrations present

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: Few redox concentrations observed, but not a sufficient amount to meet any hydric soil criteria; no reaction to alpha alpha-Dipyridyl was observed at this location during the March 2011 survey. This area is characterized exclusively by hydrophytic vegetation and shows evidence of seasonal ponding and therefore hydric soils are presumed to be present in this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
X Salt Crust (B11)
X Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 6
Water Table Present? Yes ___ No ___ Depth (inches): N/A
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): N/A

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 surveys with scattered dried algal matting observed throughout the low topographic area that was dominated by hydrophytic plant species. This area was inundated on March 31, 2011 with several inches of standing water.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-4

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78839 North Long: -122.32769 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X		
Wetland Hydrology Present?	Yes ____ No X		

Remarks: Grassland habitat at the north end of IR Site 2 south of taxiway adjacent to Wetland W-2. Soils considered problematic as they are derived from dredged fill material. Marginal hydrophytic vegetaion in this area.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Festuca arundinacea*	90	Yes	FAC-
2. *Lotus corniculatus*	2		FAC
3. *Holcus lanatus*	2		FAC
4. *Bromus diandrus*	2		NL
5. *Rumex crispus*	<1		FACW-
6. *Polypogon monspeliensis*	<1		FACW
7.			
8.			
Total Cover:	~97%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	1	×2 =	2
FAC species	94	×3 =	282
FACU species		×4 =	
UPL species	2	×5 =	10
Column Totals:	97 (A)		294 (B)

Prevalence Index = B/A = 3.03

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

____ Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants. Vegetation in this area meets the dominance test, but fails the prevalence test – hydrophytic vegetation in this area may not be indicative of seasonal wetland hydrology.

SOIL

Sampling Point SP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 3/2	>98	7.5 YR 4/6	<2	C	M	SCL	Few redox concentrations

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Few redox concentrations observed in the upper part of the soil, but not sufficient to meet any of the hydric soil criteria. Problem soils in this area as they are derived from dredge fill material. No evidence to suggest that the soils in this area are saturated or inundated long enough to result in reducing conditions in the upper part.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): N/A
Saturation Present? Yes ___ No ___ Depth (inches): N/A
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of prolonged seasonal saturation or inundation was observed in this area at the time of the July 2010 survey or during the March 31, 2011 field survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-5

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78809 North Long: -122.32636 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ___
Hydric Soil Present?	Yes X No ___		
Wetland Hydrology Present?	Yes X No ___		

Remarks: Wetland W-4; small depressional area at the north end of IR Site 2 south of taxiway. Considered a problem area as soils consist of dredged fill material and hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	80	Yes	OBL
2. *Distichlis spicata*	3		FACW
3. *Polypogon monspeliensis*	1		FACW
4. *Atriplex patula*	1		FACW
5. *Hordeum marinum*	1		FAC
6.			
7.			
8.			
Total Cover:	~86%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ~15% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species	80	×1 =	80	
FACW species	5	×2 =	10	
FAC species	1	×3 =	3	
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	86	(A)	93	(B)

Prevalence Index = B/A = 1.08

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Shallow topographic depression characterized by wetland plant species.

SOIL

Sampling Point SP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-8	10 YR 3/2	--	--	--	--	--	Sand	No redox
8-12	10 YR 5/1	--	--	--	--	--	Sand	No Redox

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks: This soil in this area does not meet any of the hydric indictors and no reaction to alpha alpha-Dipyridyl was observed during the March 2011 survey. Area is characterized exclusively by hydrophytic vegetation and supports seasonal wetland hydrology; therefore hydric soil conditions were assumed to be present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
X Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
X Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 10
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? Yes ___ No ___ Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 surveys. Several inches of ponding water as well as aquatic invertebrates (Ostracods) were observed in this location on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-6

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78805 North Long: -122.32637 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Grassland habitat in northeast part of of IR Site 2; adjacent to Wetland w-4. Soils considered problematic as they consist of dredged fill material.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Bromus diandrus*	45	Yes	NL
2. *Carpobrotus edulis*	30	Yes	NL
3. *Vulpia myuros*	20	Yes	FACU*
4. *Geranium dissectum*	5		NL
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species		×1 =		
FACW species		×2 =		
FAC species		×3 =		
FACU species	20	×4 =	80	
UPL species	80	×5 =	400	
Column Totals:	100	(A)	480	(B)
Prevalence Index = B/A =			4.80	

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL = not listed on the *National Lit of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants.

SOIL

Sampling Point SP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-7	10 YR 3/2	100	--	--	--	--	Sand	Dredged fill material
7-12	10 YR 5/1	100	--	--	--	--	Sand	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** X

Remarks: Soil is comprised of dredged fill material. No evidence to suggest hydric conditions are present at this location.
.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No ______ Depth (inches): >12
Saturation Present? Yes ______ No ______ Depth (inches): >12
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-7

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78843 North Long: -122.32619 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks: Wetland W-5; small depressional area in the northeastern part of IR Site 2 south of taxiway. Considered a problem area as the soils are derived from dredged fill material and wetland hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	95	Yes	OBL
2. *Distichlis spicata*	<1		FACW
3. *Hordeum marinum*	<1		FAC
4. *Cotula coronopifolia*	<1		FACW
5.			
6.			
7.			
8.			
Total Cover:	>95%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species	95	×1 =	95	
FACW species	1	×2 =	2	
FAC species	.5	×3 =	1.5	
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	96.5	(A)	98.5	(B)
Prevalence Index = B/A =			1.02	

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0*
- ____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Shallow topographic depression characterized by wetland plants.

SOIL

Sampling Point SP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-5	10 YR 3/2	--	--	--	--	--	Sand	Fill material; No Redox.
5-12	10 YR 5/1	--	--	--	--	--	Sand	Fill Material; No redox.

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: No hydric soil indicators were observed in this location and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Hydric soil assumed present at this location based on abundance of OBL vegetation and observations of seasonal wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- X Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 4

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? Yes ___ No ___ Depth (inches): ___ **Wetland Hydrology Present?** **Yes** X **No** ___
(includes capillary fringe)

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 surveys; shallow topographic depression characterized by hydrophytic plants with notable absence of upland species. Several inches of ponded water and aquatic invertebrates (Ostracods) were observed in this area during the March 31, 2011 field survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-8

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78834 North Long: -122.32616 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X		
Wetland Hydrology Present?	Yes ___	No X		

Remarks: Annual grassland area on the south side of perimeter road in the northeastern corner of IR Site 2 adjacent to Wetland W-5. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Bromus diandrus*	50	Yes	NL
2. *Vulpia myuros*	35	Yes	FACU*
3. *Carduus pycnocephalus*	5		NL
4. *Geranium dissectum*	5		NL
5. *Distichlis spicata*	5		FACW
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	5	×2 =	10
FAC species		×3 =	
FACU species	35	×4 =	140
UPL species	60	×5 =	300
Column Totals:	100 (A)		450 (B)

Prevalence Index = B/A = 4.50

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants. Area is characterized mostly by non-wetland plants with sparse scattered saltgrass also present.

SOIL

Sampling Point SP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-7	10 YR 3/2	100	--	--	--	--	Sand	Dredged fill material
7-12	10 YR 5/1	100	--	--	--	--	Sand	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Soils consist of dredged fill material at this location. No evidence of hydric soil conditions.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No	X	Depth (inches):	
Water Table Present?	Yes ___	No	X	Depth (inches):	>12
Saturation Present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	>12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-9

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78864 North Long: -122.32554 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Wetland W-6; linear drainage swale at the northeast end of IR Site 2 south of taxiway. Considered a problem area as soils are derived from dredged fill material and hydrology appears to be seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	50	Yes	OBL
2. *Distichlis spicata*	~2		FACW
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	~52%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ~50% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species	50	×1 =	50	
FACW species	2	×2 =	4	
FAC species		×3 =		
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	52	(A)	54	(B)

Prevalence Index = B/A = 1.04

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Shallow linear swale feature with *Salicornia* primarily found along the edges, center part of the swale is devoid of vegetation.

SOIL

Sampling Point SP-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	2.5 Y 4/1	100	--	--	--	--	Sand	Soil consists of dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: No indicators of hydric soil observed and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Area is characterized exclusively by hydrophytic vegetation and supports seasonal wetland hydrology; therefore hydric conditions were assumed to be present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
X Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 8
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 surveys - shallow open depressional swale with soil cracks indicative of seasonal inundation were observed within the sale feature on July 27, 2010. Entire swale area was inundated with several inches of water on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-10

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78844 North Long: -122.32543 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Grassland habitat at the north end of IR Site 2 south of taxiway adjacent to Wetland W-6. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	95	Yes	NL
2. *Distichlis spicata*	5		FACW
3. *Geranium dissectum*	<1		NL
4.			
5.			
6.			
7.			
8.			
Total Cover:	>100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:
OBL species		×1 =
FACW species	5	×2 = 10
FAC species		×3 =
FACU species		×4 =
UPL species	95.5	×5 = 477.5
Column Totals:	100.5 (A)	487.5 (B)

Prevalence Index = B/A = 4.75

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants.

SOIL

Sampling Point SP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-12	10 YR 4/2	100	--	--	--	--	SL	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks: No evidence to suggest hydric soil conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): >12
Saturation Present? Yes ___ No X Depth (inches): >12
(includes capillary fringe)

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation observed during July 2010 or March 2011 surveys.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-11

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78821 North Long: -122.32542 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Wetland W-7; small depressional area at the northeastern part of IR Site 2 southwest of taxiway. Considered a problem area as soils are derived from dredged fill material and hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Cotula coronopifolia*	20	Yes	FACW
2. *Salicornia virginica*	20	Yes	OBL
3. *Distichlis spicata*	<1		FACW
4. *Polypogon monspeliensis*	<1		FACW
5.			
6.			
7.			
8.			
Total Cover:	~40%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 60% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	20	×1 =	20
FACW species	21	×2 =	42
FAC species		×3 =	
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	41 (A)		62 (B)

Prevalence Index = B/A = 1.51

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0*
- ____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Shallow open sandy topographic depression with notable change in plant community from the surrounding area which is characterized by *Bromus diandrus* (NL), *Carduus pycnocephalus* (NL), *Bromus hordeaceus* (FACU), *Lotus corniculatus* (FAC), *Bellardia trixago* (NL), *Distichlis spicata* (FACW) and *Hordeum marinum* (FAC).

SOIL

Sampling Point SP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-6	2.5 Y 4/1	50	--	--	--	--	Sand	Mixed fill material
	2.5 Y 4/2	50	--	--	--	--		
6-12	2.5 Y 4/1	50	--	--	--	--	Sand	Mixed sandy dredge material with
	2.5 Y 4/2	45	--	--	--	--	Sand	some clay inclusions
	G1 4/10Y	5	--	--	--	--	Clay	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: Soils derived of mixed dredge fill material. No hydric soil indicators were present and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. This area is characterized exclusively by hydrophytic vegetation and supports seasonal wetland hydrology therefore hydric conditions are assumed to be present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
X Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 4
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 surveys; shallow open sandy topographic depression that is characterized by hydrophytic plants with notable absence of upland species that are present in the adjacent grassland habitat. The entire basin was inundated on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-12

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78809 North Long: -122.325538 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes ____	No X		

Remarks: Grassland habitat in the northeast part of IR Site 2 southwest of taxiway next to Wetland W-7. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	90	Yes	NL
2. *Bromus diandrus*	10		NL
3. *Distichlis spicata*	<5		FACW
4. *Vicia* sp.	<5		NL
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	2.5	×2 =	5
FAC species		×3 =	
FACU species		×4 =	
UPL species	102.5	×5 =	512.5
Column Totals:	105	(A)	517.5 (B)

Prevalence Index = B/A = 4.93

Hydrophytic Vegetation Indicators:

- ____ Dominance Test is >50%
- ____ Prevalence Index is ≤3.0*
- ____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and area assumed to be an upland plants.

SOIL

Sampling Point SP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-12	10 YR 3/2	100	--	--	--	--	Sand	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks: Soil consists of dredged fill materials - no evidence of hydric conditions were observed at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): >12
Saturation Present? Yes ___ No X Depth (inches): >12
(includes capillary fringe)

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation was observed at this location during the July 2010 or March 2011 field surveys.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-13

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78793 North Long: -122.32656 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?** **Yes** X **No**
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	

Remarks: Wetland W-3; towards the northeast area of IR Site 2 on the northeast side of levee surrounding the landfill area. Weakly expressed depressional area. Considered a problem area as soils are derived from dredged fill material and hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Distichlis spicata*	75	Yes	FACW
2. *Rumex crispus*	15		FACW-
3. *Lotus corniculatus*	10		FAC
4. *Atriplex patula*	10		FACW
5. *Xanthium strumarium*	2		FAC+
6. *Cotula coronopifolia*	2		FACW+
7. *Festuca arundinacea*	2		FAC
8. *Polypogon monspeliensis*	<1		FACW
Total Cover:	>116%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species		×1 =		
FACW species	102.5	×2 =	205	
FAC species	14	×3 =	42	
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	116.5	(A)	247	(B)
Prevalence Index = B/A =			2.12	

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0*
- ____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Shallow, weakly expressed topographic depression notable absence of upland species common in the adjacent habitat. Very sparse (<<1%) *Salicornia virginica* (OBL) also present.

SOIL

Sampling Point SP-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 3/2	100	--	--	--	--	SCL	No redox.

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: No redoximorphic features or other hydric soil indicators were observed and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Soils problematic - derived from dredged fill material. Hydric conditions were assumed present in this location based on the abundance of FACW vegetation, general absence of upland plants and observations of seasonal inundation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- X Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 5

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 field survey, shallow weakly expressed topographic depression. Several inches of standing water was present in this area on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-14

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78777 North Long: -122.326282 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X		
Wetland Hydrology Present?	Yes ____ No X		

Remarks: Ruderal grassland habitat at the north end of IR Site 2 located to the northeast of the levee sorounding the landfill area; adjacent to Wetland W-3. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	45	Yes	NL
2. *Bromus diandrus*	45	Yes	NL
3. *Rumex crispus*	10		FACW-
4. *Cirsium vulgare*	<5		FACU
5.			
6.			
7.			
8.			
Total Cover:	>100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	10	×2 =	20
FAC species		×3 =	
FACU species	2.5	×4 =	10
UPL species	90	×5 =	450
Column Totals:	102.5 (A)		480 (B)

Prevalence Index = B/A = 4.68

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%

____ Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants.

SOIL

Sampling Point SP-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 3/2	100	--	--	--	--	SCL	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: Soil consists of dredged fill materials - no evidence of hydric conditions observed at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):		
Water Table Present?	Yes ___	No X	Depth (inches):	>12	
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>12	**Wetland Hydrology Present?** Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-15

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78805 North Long: -122.32917 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes X	No

Is the Sampled Area within a Wetland? **Yes** X **No**

Remarks: Wetland W-8; linear depressional feature along the west side of IR Site 2 located on the west side of the landfill levee, east of the outer perimeter road. Considered a problem area as the soils are derived from dredged fill material and hydrology is seasonal. Drift wood and debris present in this area, but above the normal high tide elevation.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	90	Yes	OBL
2. *Bromus hordeaceus*	<5		FACU
3. *Rumex crispus*	<5		FACW
4.			
5.			
6.			
7.			
8.			
Total Cover:	>97%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	90	×1 =	90
FACW species	5	×2 =	10
FAC species		×3 =	
FACU species	5	×4 =	20
UPL species		×5 =	
Column Totals:	100 (A)		120 (B)
Prevalence Index = B/A =			1.20

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No**

Remarks: Swale feature is filled with pickleweed throughout., scatteded curly dock also present. Soft chess observed only at outer margin of this feature.

SOIL

Sampling Point SP-15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-5	2.5 Y 4/1	100	--	--	--	--	SCL	Dredged fill material
5-12	2.5Y 4/2+	100	--	--	--	--	C	Dense clay material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Dense clay layer

Depth (inches): 5

Hydric Soil Present? **Yes** X **No** ___

Remarks: No hydric indicators were observed in the upper part - dense clay layer appears to result in a perched water table. Faint reaction to alpha alpha-Dipyridyl was observed during the March 2011 survey in the upper 5 inches. Hydric conditions were assumed to be present based on abundance of OBL plants and observations of seasonal saturation in this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: This area was dry in July 2010. Soils at the sample point were saturated to the surface - most of the swale feature to the north of the sample location was inundated with several inches of standing water on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-16

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78587 North Long: -122.33152 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks: Grassland habitat along west side of IR Site 2 west of the levee surrounding the landfill area; adjacent to Wetland W-8. along. Fill soils in this location.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Vulpia myuros*	45	Yes	FACU*
2. *Bromus hordeaceus*	25	Yes	FACU
3. *Medicago polymorpha*	10		NL
4. *Geranium dissectum*	5		NL
5. *Rumex crispus*	5		FACW-
6. *Avena barbata*	5		NL
7. *Vicia* sp.	5		NL
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	5	×2 =	10
FAC species		×3 =	
FACU species	70	×4 =	280
UPL species	25	×5 =	125
Column Totals:	100 (A)		415 (B)

Prevalence Index = B/A = 4.15

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0*
- ___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants.

SOIL

Sampling Point SP-16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-8	10 YR 4/2	100	--	--	--	--	SL	Dredged fill material
8-12	10 YR 4/2	85	--	--	--	--	C	Mixed clay fill material
	2.5 Y 4/1	15	--	--	--	--	C	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: 8

Depth (inches): Clay material

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Soil is comprised of mixed fill - a dense clay layer was encountered at a depth of 8 inches, but there is no depressional topography in this location and nothing to suggest the presence of prolonged hydric conditions.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): >12
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): >12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation occurs in this area.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-17

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78576 North Long: -122.33131 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Wetland W-10; swale-like depressional feature along the western edge of IR Site 2 just east of the landfill levee.. Considered a problem area as the soils are derived from dredged fill material and hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	60	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	60%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 40% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:
OBL species	60	×1 = 60
FACW species		×2 =
FAC species		×3 =
FACU species		×4 =
UPL species		×5 =
Column Totals:	60 (A)	60 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Pickle weed cover within this basin is variable ranging from around 10% in some areas to 100% in other areas. At the time of the March 2011 survey all of the non-vegetated areas were open water.

SOIL

Sampling Point SP-17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-6	2.5 Y 4/1	98	7.5 YR 4/6	2	C	M	SCL	Fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? Yes X **No** ___

Remarks: Soils in this area are derived from fill material andshow evidence of reducing conditions. Unknow if these redox features are due to current hydric conditions; howverer, the abundance of OBL plants in this area as well as observation of seasonal inundation suggest that reducing conditions are likely present in this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 6

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 surveys, but the entire basin was inundated on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-17A

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78639 North Long: -122.33121 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ____
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Wetland W-9; small swale-like depressional area along the western edge of IR Site 2, just east of the landfill levee. Considered a problem area as the soils are derived from dredged fill material and hydrology is seasonal.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	50	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	50%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 50% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:
OBL species	50	×1 = 50
FACW species		×2 =
FAC species		×3 =
FACU species		×4 =
UPL species		×5 =
Column Totals:	50 (A)	50 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: At the time of the March 2011 survey all of the non-vegetated areas were open water.

SOIL

Sampling Point SP-17A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	100	--	--	--	--	SCL	No redox; Fill soils

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: No hydric soil indicators were observed at this location and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Soil at this location was assumed to be hydric based on abundance of OBL plants and observations of seasonal inundation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 11
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The entire basin was inundated on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-18

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78563 North Long: -122.33129 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Upland grassland/ruderal habitat adjacent to Wetland W-10 on the west side of IR-Site 2, just east of the landfill levee. Soils in this area are derived from dredged fill material.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Bromus hordeaceus*	50	Yes	FACU
2. *Carduus pycnocephalus*	20	Yes	NL
3. *Carpobrotus edulis*	20	Yes	NL
4. *Vulpia myuros*	5		FACU*
5. *Bromus diandrus*	<1		NL
6.			
7.			
8.			
Total Cover:	95%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species		×2 =	
FAC species		×3 =	
FACU species	55	×4 =	220
UPL species	40.5	×5 =	162
Column Totals:	95.5	(A)	382 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL – species tht are not included on the *National list of Plant Species that occur in Wetlands* (Reed,1998) and are considered to be UPL.

SOIL

Sampling Point SP-18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-3	10 YR 4/2	100	--	--	--	--	SL	Dredged fill material
3-12	2.5 Y 4/2	90	--	--	--	--		Mixed fill material, some woody
	10 YR 4/6	10	--	--	--	--		debris present

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: Fill soils derived from dredge material; No evidence of reducing soil conditions at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): >12

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): >12

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of seasonal or tidal saturation or inundation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-19

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78570 North Long: -122.33118 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Wetland W-11; wetland areas surrounding the tidal open water area in the western part of IR Site 2. Fill soils present in this area; This area appears to be subject to frequent tidal inundation and saturation due to a culvert connection with the San Francisco Bay.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	95	Yes	OBL
2. *Distichlis spicata*	5		FACW
3. *Atriplex patula*	<1		FACW
4.			
5.			
6.			
7.			
8.			
Total Cover:	>100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	95	×1 =	95
FACW species	5.5	×2 =	11
FAC species		×3 =	
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	100.5 (A)		106 (B)

Prevalence Index = B/A = 1.05

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Area is characterized by dense cover of *Salicornia* with notable absence of upland species found in the adjacent grassland area.

SOIL

Sampling Point SP-19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-9	10 YR 4/2	100	--	--	--	--	SCL	Dredged fill material
9-14	10 YR4/2	95	--	--	--	--	SCL	Mixed fill material
	10 YR 3/4	5	--	--	--	--	SCL	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: No redoximorphic features or other hydric indicators were noted at this location; no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Considered problem soils due to fill material - hydric conditions are assumed present based on abundance of OBL plants, absence on non-wetland plants and observations of inundation at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
X Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 3.5
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Surface soils were moist but not saturated at the time of the July 2010 survey. Fringe wetland area adjacent to open water habitat that is connected to the San Francisco Bay by a culvert to the west. This area was inundated during the March 31, 2011 field survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-20

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78548 North Long: -122.33109 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ____
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Wetland areas adjacent to the tidal open water area on the west side of IR Site 2. Fill soils present in this area; This area appears to be subject to frequent tidal inundation and saturation due to culverted connection with the San Francisco Bay.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	90	Yes	OBL
2. *Distichlis spicata*	5		FACW
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	95%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species	90	×1 =	90	
FACW species	5	×2 =	10	
FAC species		×3 =		
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	95	(A)	100	(B)

Prevalence Index = B/A = 1.05

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
____ Prevalence Index is ≤3.0*
____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Area is characterized by dense cover of *Salicornia* with notable absence of any of the upland species that were observed in the adjacent annual grassland/ruderal habitat.

SOIL

Sampling Point SP-20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	100	--	--	--	--	SCL	No Redox

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: No hydric soil indicators were observed at this location and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Considered problem soils due to fill material - hydric conditions assumed present based on abundance of OBL plants, absence on non-wetland plants and observations of inundation at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
X Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 3.5
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Surface soils were moist but not saturated at the time of the July 2010 survey. Fringe wetland area adjacent to open water habitat that is connected to the San Francisco Bay by a culvert to the west. This area was inundated during the March 31, 2011 field survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-21

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Convex Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78555 North Long: -122.33115 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: Ruderal upland area on the west side of IR Site 2. Just east of the levee around the landfill; adjacent to Wetland W-11. Soils considered problematic as they are derived from dredged fill material.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum			
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	75	Yes	NL
2. *Distichlis spicata*	15		FACW
3. *Bromus hordeaceus*	10		FACU
4. *Avena barbata*	<1		NL
5.			
6.			
7.			
8.			
Total Cover:	>100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	15.5	×2 =	31
FAC species		×3 =	
FACU species	10	×4 =	40
UPL species	75.5	×5 =	377.5
Column Totals:	100.5	(A)	447.5 (B)

Prevalence Index = B/A = 4.45

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%

____ Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: NL = plants that are not inlcued on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are considered to be UPL. Area is characterized by dense cover of *Carpobrotus edulis* with some grasses intermixed.

SOIL

Sampling Point SP-21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	100	--	--	--	--	C	Dredged clay fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay soil throughout upper profile

Depth (inches): ________

Hydric Soil Present? Yes ____ **No** X

Remarks:Soil consisits of dredged fill material. No evidence to suggest reducing conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):		
Water Table Present?	Yes ____	No X	Depth (inches):	>12	
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	>12	**Wetland Hydrology Present? Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of wetland hydrology in this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-22

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78486 North Long: -122.33147 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks: Sample point taken at the base of the levee surrounding the landfill on the west side of IR Site 2, adjacent to Wetland W-11. Soils in this area are dredge fill material.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Avena barbata*	50	Yes	NL
2. *Carduus pycnocephalus*	20	Yes	NL
3. *Helminthotheca echioides* (*Picris echioides*)	1		FAC*
4. *Rumex crispus*	1		FACW-
5.			
6.			
7.			
8.			
Total Cover:	~72%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <30% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	1	×2 =	2
FAC species	1	×3 =	3
FACU species		×4 =	
UPL species	70	×5 =	350
Column Totals:	72 (A)		355 (B)

Prevalence Index = B/A = 4.9

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: Approximately 20% of the cover in this area was comprised of thatch. NL = species are not included on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are considered UPL.

SOIL

Sampling Point SP-22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	100	--	--	--	--	SCL	Dredge fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks: Fill material - No evidence of hydric conditions at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): >12
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): >12

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of seasonal saturation or inundation or tidal flooding observed at this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-23

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78426 North Long: -122.33115 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Wetland W-15; defined depressional area located south of tidal open water and wetland area along the western edge of IR site 2. Fill soils in this area.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	100%	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

	Total % Cover Of:		Multiply By:	
OBL species	100	×1 =	100	
FACW species		×2 =		
FAC species		×3 =		
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	100	(A)	100	(B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0*
- ___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Dense *Salicornia* with notable absence of any upland species; center of the depression is characterized by open water.

SOIL

Sampling Point SP-23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-8	10 YR 4/2	100	--	--	--	--	Sand	No redox.
8-12	10 YR 4/1	100	--	--	--	--	Sand	No redox.

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: No hydric soil indicators were observed at this location and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Hydric conditions assumed to be present at this location based on abundance of OBL vegetation and observations of seasonal wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 11

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Small depressional area with open water noted in the central area in July 2010; open water is surrounded by dense OBL vegetation with notable absence of any upland plants common in the adjacent iupland areas. The entire area was inundated to a depth of 11 inches on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-24

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78420 North Long: -122.33111 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X		
Wetland Hydrology Present?	Yes ____ No X		

Remarks: Upland grassland on the west side of IR Site 2 adjacent to Wetland W-15. Soils considered problematic as they are derived from dredged fill material.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Vulpia myuros*	50	Yes	FACU*
2. *Carduus pycnocephalus*	30	Yes	NL
3. *Geranium dissectum*	10		NL
4.			
5.			
6.			
7.			
8.			
Total Cover:	90%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 10% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species		×2 =	
FAC species		×3 =	
FACU species	50	×4 =	200
UPL species	40	×5 =	200
Column Totals:	90 (A)		400 (B)

Prevalence Index = B/A = 4.4

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%

____ Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: Area is characterized by upland annual grasses and ruderal forbs. NL = plants that are not included on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are considered to be UPL.

SOIL

Sampling Point SP-24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-4	10 YR 4/3	100	--	--	--	--	SCL	Dredged clay fill material
4-12	10 YR 4/2	100	--	--	--	--	C	Clay fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay soils

Depth (inches): 4

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Clay soils present at a depth of 4 inches, but no depressional topography or other evidence to suggest reducing conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)
- ___

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches):	___
Water Table Present?	Yes	___	No	X	Depth (inches):	>12
Saturation Present? (includes capillary fringe)	Yes	___	No	X	Depth (inches):	>12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of wetland hydrology in this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-25

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78348 North Long: -122.33113 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Wetland W-12; Sample point taken area with dense pickleweed along the southern edge of the non-tidal open water area in the southwestern part of IR Site 2. Fill soils in this area; seasonal hydrology.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	80%	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	80%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 20% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	100	×1 =	100
FACW species		×2 =	
FAC species		×3 =	
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0*
- ____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Dense *Salicornia* throughout this area including a narrow fringe around the open water area.

SOIL

Sampling Point SP-25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-16	10 YR 4/2	100	--	--	--	--	SCL	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks: No indicators of hydric conditions observed in this area; no reaction to alpha alpha-Dipyridyl during March 2011 survey. Hydric soil was assumed to be present based on abundance of OBL vegetation and observations of seasonal wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 3

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Shallow surface inundation present in this area during the March 2011 survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-26

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.86333 North Long: -122.33117 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks: Grassland habitat south of non-tidal open water in the southwestern part of IR Site 2 adjacent to Wetland W-12. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	80	Yes	NL
2. *Bromus hordeaceus*	10		FACU
3. *Salicornia virginica*	<5		OBL
4.			
5.			
6.			
7.			
8.			
Total Cover:	>90%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <10% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	5	×1 =	5
FACW species		×2 =	
FAC species		×3 =	
FACU species	10	×4 =	40
UPL species	80	×5 =	400
Column Totals:	95 (A)		445 (B)

Prevalence Index = B/A = 4.68

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants. Mostly iceplant with sparse grasses and scattered pickleweed in this area.

SOIL

Sampling Point SP-26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	100	--	--	--	--	SL	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Fill soils; no evidence to suggest hydric soil conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): >12
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): >12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation at this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-27

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78326 North Long: -122.33122 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Wetland-W-14; sample point taken in low depressional area in the southwest part of IR Site 2, south of the non-tidal open water area. Fill soils in this area; seasonal wetland hydrology.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum			
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	85%	Yes	OBL
2. *Atriplex patula*	5%		FACW
3. *Rumex crispus*	3%		FACW-
4.			
5.			
6.			
7.			
8.			
Total Cover:	93%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <10% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	85	×1 =	85
FACW species	8	×2 =	16
FAC species		×3 =	
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	93 (A)		101 (B)

Prevalence Index = B/A = 1.08

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Well defined topographic depression with dense *Salicornia* and notable absence of upland species common in the adjacent habitat. Some *Distichlis spicata* (FACW) present around the edges of the basin.

SOIL

Sampling Point SP-27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-16	10 YR 4/2	100	--	--	--	--	SCL	Fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks: No evidence of redoximorphic features or other hydric soil indicators were noted in this area; no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Hydric soils assumed present based on abundance of OBL and FACW plants as well as observations of seasonal hydrology in this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- X Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- X Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 15

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 survey, but is a well defined topographic depressional area that is characterized by OBL and FACW vegetation with soil cracks and a notable absence of upland plants. During the March 31, 2011 field survey 15 inches of water was present at this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-28

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78334 North Long: -122.33140 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes ____ No X		

Remarks: Grassland habitat in southwestern part of IR Site 2 adjacent to W-14. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	100	Yes	NL
2. *Bromus hordeaceus*	<5		FACU
3. *Salicornia virginica*	<5		OBL
4.			
5.			
6.			
7.			
8.			
Total Cover:	>100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <1% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species		×2 =	
FAC species		×3 =	
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	(A)		(B)
Prevalence Index = B/A =			

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%
____ Prevalence Index is ≤3.0*
____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: NL = not listed on the *National List of Plant Species that Occur in Wetlands* (Reed,1988) and are assumed to be an upland plants. Dense iceplant throughout this area with scattered grasses and pickleweed also present.

SOIL

Sampling Point SP-28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	43	7.5 YR 4/4	2	C	M	C	Mixed dredged fill material
	2.5 Y 5/2	55						

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks: Soil with low chroma matrix and at least 2 percent redoximorphic concentrations present- this soil meets the criteria for depleted matrix; however, these indicators appear to be the result of the conditions under which the fill material formed and not indicative of current wetland hydrological conditions based on abundance of non-wetland plants and lack of wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): >12

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): >12

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation at this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-29

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78291 North Long: -122.33112 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Wetland W-13; sample point taken in low area in the southwest part of the IR site 2, south of the non-tidal open water area. Fill soils in this area; seasonal wetland hydrology; no apparent tidal connection.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	65%	Yes	OBL
2. *Atriplex patula*	20%	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	85%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 15% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	65	×1 =	65
FACW species	20	×2 =	40
FAC species		×3 =	
FACU species		×4 =	
UPL species		×5 =	
Column Totals:	85 (A)		105 (B)

Prevalence Index = B/A = 1.24

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Well defined topographic depression with dense *Salicornia* and notable absence of upland species common in the adjacent habitat. Central part of this shallow basin is devoid of plants – open scald area in July 2010 - this area was open water in March 2011..

SOIL

Sampling Point SP-29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-9	10 YR 4/2	100	--	--	--	--	SCL	Fill material
9-16	10 YR 4/2	80	--	--	--	--	SCL	Mixed fill material
	10 YR 3/4	20	--	--	--	--	SCL	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type: None Encountered
Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks: No hydric soil indicators were observed at this location; no reaction to alpha alpha-Dipyridyl observed during March 2011 survey. Considered a problem area due to fill material; hydric conditions are assumed to be present at this location based on abundance of OBL and FACW plants and observations of seasonal wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
X Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
X Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 19.5
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry at the time of the July 2010 field survey, but is a well defined topographic depressional area characterized by OBL and FACW vegetation with a notable absence of upland plants, does not appear to be tidal. Extensive inundation was observed in this area on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-30

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78296 North Long: -122.33105 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: Grassland habitat in southwestern part of IR Site 2 adjacent to Wetland W-13. Soils considered problematic as they are derived from dredged fill materials.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	90	Yes	NL
2. *Bromus hordeaceus*	10		FACU
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <1% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:
OBL species		×1 =
FACW species		×2 =
FAC species		×3 =
FACU species	10	×4 = 40
UPL species	90	×5 = 450
Column Totals:	100 (A)	490 (B)

Prevalence Index = B/A = 4.90

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%

____ Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: NL = not included on the *National List of Plant Species that Occur in Wetlands* (Reed,1988) and are assumed to be an upland plants. Dense iceplant throughout this area with scattered grass also present.

SOIL

Sampling Point SP-30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-12	10 YR 4/2	100	--	--	--	--	SCL	Fill soil; no redox

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: No evidence to suggest hydric conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

	Yes		No		Depth (inches):
Surface Water Present?	Yes		No	X	Depth (inches):
Water Table Present?	Yes		No	X	Depth (inches): >12
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches): >12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation at this location..

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-31

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78194 North Long: -122.33045 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: PUSCh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ___
Hydric Soil Present? Yes X No ___		
Wetland Hydrology Present? Yes X No ___		

Remarks: Wetland W-12; sample point taken in area with dense pickleweed along the southwestern edge large wetland area in the southwestern part of IR Site 2. Fill soils in this area; apparent seasonal hydrology.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	100%	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

	Total % Cover Of:		Multiply By:	
OBL species	100	×1 =	100	
FACW species		×2 =		
FAC species		×3 =		
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	100	(A)	100	(B)
Prevalence Index = B/A =			1.0	

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Dense *Salicornia* throughout this area. All of the vegetation was submerged during the March 31, 2011 field survey.

SOIL

Sampling Point SP-31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-8	2.5 Y 5/2	100	--	--	--	--	Sand	Dredged fill material
8-12	10 YR 4/1	100	--	--	--	--	SC	Dredged fill material

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: No evidence of hydric soil at this location; no reaction to alpha alpha-Dipyridyl during March 2011 survey. Hydric conditions assumed present based on abundance of OBL plants and observations of seasonal wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 15

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area was dry during the July 2010 surveys; extensive inundation was observed throughout this area on March 31, 2011. Ostracods were also present in this area during the March 2011 survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-32

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78196 North Long: -122.33050 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Ruderal grassland area in southwestern part of IR Site 32 adjacent to W-12. Soils considered problematic as they are derived from dredged fill material.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Vulpia myuros*	50	Yes	FACU*
2. *Carpobrotus edulis*	20	Yes	NL
3. *Bromus hordeaceus*	10		FACU
4. *Distichlis spicata*	10		FACW
5. *Geranium dissectum*	5		NL
6.			
7.			
8.			
Total Cover:	95%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species		×1 =	
FACW species	10	×2 =	20
FAC species		×3 =	
FACU species	60	×4 =	240
UPL species	25	×5 =	125
Column Totals:	95 (A)		385 (B)

Prevalence Index = B/A = 4.05

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: Area is characterized primarily by upland vegetation with sparse saltgrass present. NL = Plants that are not included on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are condisered to be UPL.

SOIL

Sampling Point SP-32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-4	10 YR 4/2	100	--	--	--	--	SCL	Dredged fill material
4-12	7.5 YR 3/3	20	--	--	--	--	C	Mixed clay fill material
	2.5 Y 4/1	80	--	--	--	--		

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay soils

Depth (inches): 4

Hydric Soil Present? Yes ___ **No** X

Remarks: Clay soil present at a depth of 4 inches but no depressional topography or other evidence to suggest reducing conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): >12
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): >12

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence of wetland hydrology in this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: July 27, 2010

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-33

Investigator(s): Russell Huddleston and Holly Barbare Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78283 North Long: -122.32779 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: PUSCh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Wetland W-12; sample point taken in low area to the southwest of the IR Site 2 landfill, southeast of open water area. Fill soils in this area; seasonal wetland hydrology; no apparent tidal connection.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum			
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	95%	Yes	OBL
2. *Distichlis spicata*	2%		FACW
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	97%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 3% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:
OBL species	100	×1 = 100
FACW species	2	×2 = 4
FAC species		×3 =
FACU species		×4 =
UPL species		×5 =
Column Totals:	100 (A)	104 (B)

Prevalence Index = B/A = 1.04

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Dense *Salicornia* with scattered *Distichlis* throughout this area; several open unvegetated scald areas also present in the vicinity of this sample point; *Distichlis* becomes co-dominant with the *Salicornia* towards to the southeast of this large wetland area. Somne algal matting observed in other aeras in the vicinity of this sample point during the Jul;y 2010 surevey.

SOIL

Sampling Point SP-33

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[a]	Loc[b]	Texture	Remarks
0-12	10 YR 4/2	50	--	--	--	--	C	Soil in this area is mixed fill material
	2.5 Y 6/2	30	--	--	--	--	SiC	
	10 YR 4/6	20	--	--	--	--	SCL	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? Yes X **No** ___

Remarks: Soils in this area are problematic as they are derived from dredge fill material. No hydric soil indicators were observed and there was no reaction to alpha alpha-Dipyridyl during the March 2011 survey. Hydric conditions are assumed to be present based on abundance of OBL and FACW plants as well as observations of wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- X Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 9

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Large wetland area characterized by OBL and FACW plant species – algal matting observed t in some areas during the July 2010 survey. No surface water or saturation noted at the time of the July 2010 survey, but this area was inundated with 9 inches of ponded water on March 31, 2011 and extensive inundation was noted throughout the entire wetland area. Aquatic invertebrates (Ostracods) were also present in this area during the March 2011 survey.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-34

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 15-25%

Subregion (LRR): C-14 Lat: 37.78276 North Long: -122.32744 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X		
Wetland Hydrology Present?	Yes ____ No X		

Remarks: Ruderal Grassland habitat along the eastern edge of W-12 along the the sloped edge of the landfill area in the southern part of IR Site 2. Soils considered problematic as they are derived from dredged fill materials located at the edge of the landfill.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Carpobrotus edulis*	90	Yes	NL
2. *Bromus diandrus*	5		NL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	90%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 5% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	0%	(A/B)

Prevalence Index Worksheet:

	Total % Cover Of:	Multiply By:	
OBL species		×1 =	
FACW species		×2 =	
FAC species		×3 =	
FACU species		×4 =	
UPL species	95	×5 =	475
Column Totals:	95	(A)	(B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

____ Dominance Test is >50%

____ Prevalence Index is ≤3.0*

____ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: NL = not lincluded on the *National List of Plant Species that Occur in Wetlands* (Reed,1988) and are assumed to be an upland plants. Mostly iceplant with sparse grass.

SOIL

Sampling Point SP-34

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[a]	Loc[b]		
0-4	10 YR 4/3	100	--	--	--	--	SC	Dredged fill material
4-12	10 YR 4/2	80	--	--	--	--	C	Mixed fill material
	10 YR 4/6	10	--	--	--	--	SCL	
	2.5 Y 6/2	10	--	--	--	--	SiC	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: None Encountered

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Sample point taken on slope area. Soils in this area are comprised of mixed dredge fill material; no evidence to suggest hydric soil conditions are present at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

	Yes		No		Depth (inches):
Surface Water Present?	Yes		No	X	
Water Table Present?	Yes		No	X	>12
Saturation Present? (includes capillary fringe)	Yes		No	X	>12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation at this location.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-35

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78421 North Long: -122.32872 West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Wetland W-11; sample point taken in area with dense pickleweed to the southeast of the tidally influenced open water area on the west side of IR Site 2. Fill soils in this area.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Salicornia virginica*	90%	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	90%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 10% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover Of:			Multiply By:	
OBL species	90	×1 =	90	
FACW species		×2 =		
FAC species		×3 =		
FACU species		×4 =		
UPL species		×5 =		
Column Totals:	90	(A)	90	(B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: Dense *Salicornia* throughout this area- notable absence of non-wetland plant species.

SOIL

Sampling Point SP-35

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
1-12	2.5 Y 4/2	60	7.5 YR 4/6	>2	C	M	C	Soil in this area in mixed clay fill with
	2.5 Y 5/2	<38					C	some redoximorphic features

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay soils throughout upper part

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:Fill soil at this location meets the criteria for a depleted matrix; Although soils in this area consist of dredged fill material and are the same in the adjacne tnon-wetalnd area. Hydric conditions are assumed to be present in this area based on the abundance of OBL wetland vegetation as well as observations of seasonal inundation and lack of non-wetland plants.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- X Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	1.5
Water Table Present?	Yes ___	No ___	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Perimeter wetland area around tidal open water area characterized by OBL plant species – algal matting present in some areas during the July 2010 field survey. This area was inundated with 1.5 inches of ponded water on March 31, 2011.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Alameda Point IR Site 2 City/County: Alameda County Date: March 31, 2011

Applicant/Owner: U.S. Navy State: CA Sampling Point: SP-36

Investigator(s): Russell Huddleston Section, Township, Range: 05 02S 04W (Mt. Diablo Meridian)

Landform (hillslope, terrace, etc.): Fill Terrace Local relief (concave, convex, none): None Slope (%): 0-1

Subregion (LRR): C-14 Lat: 37.78420 North Long: -122.32864West Datum: WGS84

Soil Map Unit Name: Xeropsaments, Fill NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Grassland habitat adjacent to tidal open water and fringe wetland (W-11)on the west side of IR Site 2. Fill soils in this area.

VEGETATION

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. N/A			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Vulpia myuros*	40	Yes	FACU*
2. *Bromus hordeaceus*	35	Yes	FACU
3. *Carpobrotus edulis*	10		NL
4. *Carduus pycnocephalus*	10		NL
5. *Salicornia virginica*	5		OBL
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1. N/A			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0% % Cover of Biotic Crust 0%

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index Worksheet:

Total % Cover Of:		Multiply By:	
OBL species	5	×1 =	5
FACW species		×2 =	
FAC species		×3 =	
FACU species	75	×4 =	300
UPL species	20	×5 =	100
Column Totals:	100 (A)		405 (B)

Prevalence Index = B/A = 4.05

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0*

___ Morphological Adaptations* (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation* (Explain)

* Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: NL = not included on the *National List of Plant Species that Occur in Wetlands* (Reed, 1988) and are assumed to be an upland plants. Area is characterized by non-wetland plants with low cover of pickleweed also present.

SOIL

Sampling Point SP-36

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[a]	Loc[b]	Texture	Remarks
0-5	2.5 Y 4/2	60	--	--	--	--	C	Mixed dredged fill material
	2.5 Y 4/2	40	--	--	--	--	C	
5-12	2.5 Y 4/2	60	7.5 YR 4/6	>2	C	M	C	Mixed dredged fill material
	2.5 Y 4/2	40					C	

[a] Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [b] Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[c]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[c] Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay soils throughout the upper part

Depth (inches): ______

Hydric Soil Present? Yes X **No** ___

Remarks: Soil is comprised of mixed dredged fill material. Soil meets the criteria for a depleted matrix, but there is depressional topography, predominantly non-wetlands plants and no evidence to suggest this reflects in situ reducing conditions.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (two or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): >12

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): >12

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No evidence to suggest seasonal saturation or inundation was noted in this area.

Appendix C
Representative Photographs

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Tidal Open Water (WTR-1) looking east from perimeter levee; July 2010

Non-tidal open water (WTR-2) looking east from perimeter levee; July 2010

Non-tidal open water (WTR-2) looking south; July 2010

Non-tidal open water (WTR-2) looking west; March 2011

Wetland W-1 looking east; July 2010

Wetland W-1 looking northwest; March 2011

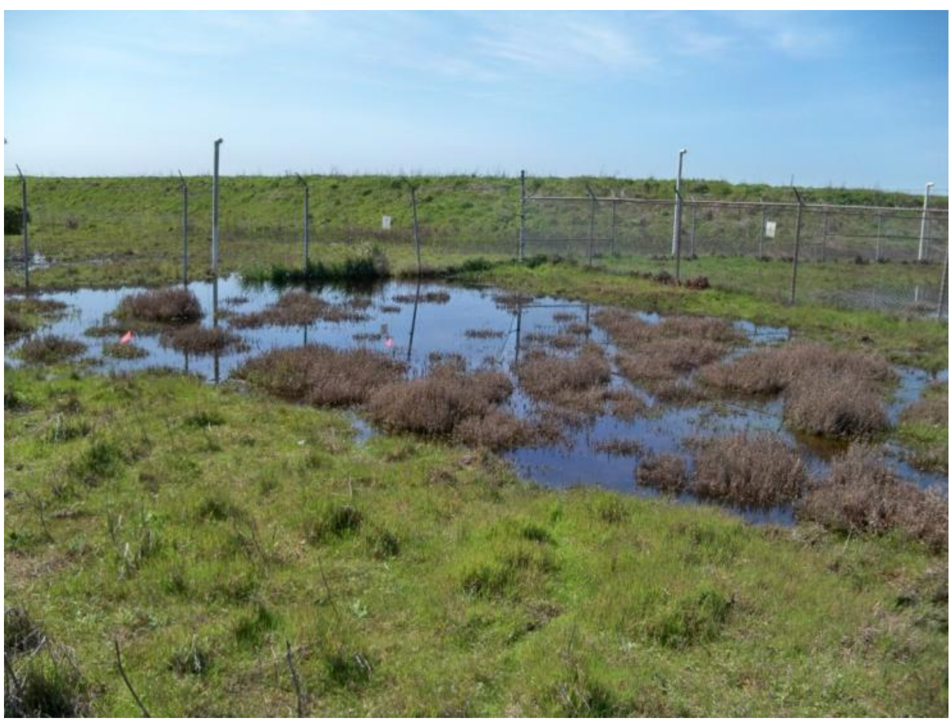
Wetland W-2 looking east; July 2010

Wetland W-2 looking northeast; March 2011

Wetland W-3 looking northeast; July 2010

Wetland W-3 looking northwest; March 2011

Wetland W-4 looking north; July 2010



Wetland W-4 looking southwest; March 2011

Wetland W-5 looking northeast; July 2010

Wetland W-5 looking west-southwest; March 2011

Wetland W-6 looking southeast; July 2010

Wetland W-6 looking southeast; March 2011

Wetland W-7 looking northeast; July 2010

Wetland W-7 looking northeast; March 2011

Wetland W-8 looking south; July 2011

Wetland W-9 looking north; March 2011

Wetland W-10 looking south; July 2010

Wetland W-10 looking south; March 2011

Wetland W-11, south side of WTR-1, looking west; July 2010

Wetland W-11, southwest side of WTR-1, looking west; March 2011

Wetland W-12, from southeast corner, looking west; July 2010

Wetland W-12, from northwest from levee road; March 2011

Wetland W-13 looking west; July 2010

Concrete-lined drainage channel filled with ice plant, looking south

Appendix D
List of Plant Species Observed

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Table D-1. List of Plant Species Observed IR-Site 2

Scientific Name[1]	Common Name	Wetland Indicator[2]	Growth Habit
Acacia melanoxylon	Black-wood acacia	NL	Tree
Atriplex patula	spear saltbush	FACW	Annual Herb
Avena barbata	Wild oat	NL	Annual Grass
Baccharis pilularis	Coyote bush	NL	Shrub
Bellardia trixago	Mediterranean lineseed	NL	Annual Herb
Bromus diandrus	Rip-gut brome	NL	Annual Grass
Carduus pycnocephalus	Italian thistle	NL	Annual Herb
Carpobrotus edulis	Ice-plant	NL	Shrub
Centaurea solstitialis	Yellow star-thistle	NL	Annual Herb
Centromadia fitchii	Fitch's tarweed	NL	Annual Herb
Cirsium vulgare	Bull thistle	FACU	Biennial Herb
Cortaderia jubata	Pampas grass	NL	Perennial Grass
Cotula coronopifolia	Brass buttons	FACW+	Perennial Herb
Distichlis spicata	saltgrass	FACW	Perennial Grass
Festuca arundinacea	Tall fescue	FAC-	Perennial Grass
Foeniculum vulgare	Fennel	FACU	Perennial Herb
Geranium dissectum	Cut-leaf geranium	NL	Annual Herb
Helminthotheca echioides	Bristly ox-tongue	FAC*	Annual Herb
Hirschfeldia incana	Field mustard	NL	Annual Herb
Holcus lanatus	Velvet grass	FAC	Perennial Grass
Hordeum marinum	Mediterranean barley	FAC	Annual Grass
Lepidium latifolium	Perennial pepperweed	FACW	Perennial Herb
Lotus corniculatus	Birds-foot trefoil	FAC	Perennial Herb
Madia gracilis	Slender tarweed	NL	Annual Herb
Medicago polymorpha	Burclover	NL	Annual Herb
Melilotus indicus	Yellow sweetclover	FAC	Annual Herb
Polypogon monspeliensis	rabbitsfoot grass	FACW+	Annual Grass
Raphanus sativus	Wild radish	NL	Annual Herb
Rumex crispus	Curly dock	FACW-	Perennial Herb
Salicornia virginica	Pickleweed	OBL	Perennial Herb
Salix lasiolepis	Arroyo willow	FACW	Tree
Vicia sp.	Vetch	NL	Annual Herb

Table D-1. List of Plant Species Observed IR-Site 2

Scientific Name[1]	Common Name	Wetland Indicator[2]	Growth Habit
Vulpia myuros	Rat-tail-fescue	FACU*	Annual Grass
Xanthium strumarium	Cocklebur	FAC+	Annual Herb

Notes:

This list only includes plant species observed at wetland and upland sample point locations during the July 27, 2010 and March 31, 2011 field surveys as well as common upland plant species mentioned in the text. It is not intended to be a comprehensive plant list for the 110-acre IR Site 2.

[1] All taxonomic names are based on the *Jepson Manual* (Hickman 1993) or the most current taxonomic nomenclature per the *Jepson on-line Interchange for California Floristics* (University of California, 2011).

[2] Plant Indicator status is based on the *National List of Plants that Occur in Wetlands: Region 0.* (Reed, 1988)

NL - Not listed

FACU - Facultative Upland; Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).

FAC - Facultative; Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).

FACW - Facultative Wetland; Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.

OBL - Obligate ; Occurs almost always (estimated probability 99%) under natural conditions in wetlands>

* Indicates a tentative indicator status assignment
\+ Indicates a frequency toward the higher end of the category (more frequently found in wetlands)
\- Indicates a frequency toward the lower end of the category (less frequently found in wetlands)

Appendix E
National Wetland Inventory Maps

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U.S. Fish and Wildlife Service

National Wetlands Inventory

Printed July 26, 2010

Jul 26, 2010

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deetwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

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Appendix F
Partial View of the USGS West Oakland 7.5 Minute Topographic Quadrangle

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OAKLAND
NAVAL SUPPLY CENTER
OAKLAND MIDDLE HARBOR
BAR CHANNEL
Beacon
CABLE AREA
Beacon
OAKLAND ALAMEDA CORP CORP BDY BDY
BM 11
BM 16
8TH
BM 9
BM 8
GROVE ST
OAKLAND INNER HARBOR
BM 11
Beacon
Beacon
BM 6
BM 11
Beacon
BM 14
ALAMEDA
NAVAL AIR STATION
BM 6
BM 8
ATLANTIC
NAVAL SUPPLY CENTER
BM 10
Beacons
Beacon
BREAKWATER
BREAKWATER
Beacons
B A Y
ALAMEDA CO
SAN FRANCISCO CITY AND

APPENDIX B

SITE PHOTOS

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Photo 1. Open water area: North Pond (Source: KCH 2011)


Photo 2. Open water, transitional mudflat, and pickleweed fringe: South Pond

Photo 3. Seasonal wetland to be filled: northeast corner of project area

Photo 4. Reference seasonal wetland: south side of project area

Photo 5. Upland: southwest corner of project area

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ATTACHMENT 8

STORMWATER POLLUTION PREVENTION PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 8

FINAL

STORMWATER POLLUTION PREVENTION PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, California 92101-8536

CERTIFICATION

This SWPPP was developed by a Qualified SWPPP Developer (QSD):

Company: Tetra Tech EC, 1230 Columbia St, Suite 750, San Diego, CA 92101

QSD Name: Mark Kyllo, QSD, CPESC, PE

"Tetra Tech EC certifies that this Stormwater Pollution Prevention Plan and all attachments were prepared by a qualified SWPPP Developer (QSD) to meet the requirements of the various agencies having jurisdiction over the project and the California Construction General Permit Order No. 2009-00090DWQ."

Mark Kyllo
Signature

4/24/13
Date

Mark Kyllo, QSD (# 20508)
Name

Principal Engineer
Title

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TABLES

ATTACHMENTS
(on CD only)

APPENDICES
(on CD only)

ABBREVIATIONS AND ACRONYMS

BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DDx	sum of 4,4′-DDD, 4,4′-DDE, and 4,4′-DDT
DON	Department of the Navy
IR	Installation Restoration
NAL	numeric action level
NOI	Notice of Intent
PCB	polychlorinated biphenyl
QSD	Qualified SWPPP Developer
QSP	Qualified SWPPP Practitioner
RAWP	Remedial Action Work Plan
REAP	Rain Event Action Plan
SWPPP	Stormwater Pollution Prevention Plan
TtEC	Tetra Tech EC, Inc.

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1.0 STORMWATER PROGRAM INFORMATION

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared to support the Tetra Tech EC, Inc. (TtEC) remedial action at Installation Restoration (IR) Site 2 at Alameda Point, Alameda, California. TtEC has been contracted by the Department of the Navy (DON) to develop and implement the remedial action for IR Site 2 for the Base Realignment and Closure Program Management Office West under Naval Facilities Engineering Command Southwest Contract No. N62473-10-D-0809. The DON is directing the remedial action in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan.

This SWPPP has been prepared for the DON to comply with the substantive requirements of the National Pollutant Discharge Elimination System program, specifically the General Construction Activity Stormwater Permit program as set forth by the California Regional Water Quality Control Board General Permit No. CAS000002, "Water Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities." This permit is hereafter referred to as the "General Permit" and is included as Appendix A.

Effective July 1, 2010, the General Permit requirements under Water Quality Order 99-08-DWQ were superseded by new legislation under Water Quality Order 2009-0009-DWQ. These new, more stringent permit requirements of Water Quality Order 2009-0009-DWQ will be enforced over the course of this removal action. The Best Management Practices (BMPs) and monitoring requirements identified in this SWPPP will meet the requirements under Water Quality Order 2009-0009-DWQ.

Management and monitoring requirements under the new permit are based on a risk level assessment. The remedial action at IR Site 2 was determined to be Risk Level 2. The basis for this determination is explained in Section 4.1. Appendix B provides the stormwater management requirements for Risk Level 2 sites.

SWPPPs and a Notice of Intent (NOI) are generally required for regulated sites, including site disturbance over 1 acre. However, an NOI is not required because ground disturbance associated with the remedial action at IR Site 2 will be performed as part of an on-site response action defined by CERCLA.

1.1 CONTACT INFORMATION

Table 1-1 lists the Qualified SWPPP Developer (QSD) and the primary Qualified SWPPP Practitioner (QSP) for implementation of this SWPPP. Table 1-2 provides a list of subcontractors who will be directed, if required, by the QSP.

1.2 INSPECTION, SAMPLING, AND NONCOMPLIANCE DOCUMENTATION

Before, during, and after storm events as discussed in Section 4.3, stormwater pollution prevention measures and BMPs will be inspected. The inspections will be documented on a form included in Appendix C; completed inspection forms will be inserted at the end of Appendix C of IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office, where they will be retained for the duration of the removal actions. Effluent will also be sampled during qualified rain events as discussed in Sections 4.5. The effluent sampling will be documented on a form included in Appendix D; completed effluent sampling forms will be inserted at the end of Appendix D of IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office. If applicable during this removal action, the Noncompliance Documentation Form included in Appendix C of this SWPPP can be used to document any instances of noncompliance with the General Permit or with this plan. Completed Noncompliance Documentation Forms will be inserted at the end of Appendix C of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.

2.0 PROJECT INFORMATION

2.1 PROJECT INFORMATION

The location and general site features of IR Site 2 are described in Section 2.0 of the Remedial Action Work Plan (RAWP), to which this SWPPP is attached. The activities to implement the remedial action are included in Section 5.0 of the RAWP. The site location is shown in Figure 1-1 of the RAWP. The Site Plan and Grading Plan are included as Attachments 1 and 2, respectively.

2.1.1 Existing Site Topography and Stormwater Flows

Inside the bermed area, IR Site 2 topography gently slopes overall from the north and east toward the south and west, in the direction of San Francisco Bay. The topography of the landfill is graded to promote surface drainage and consists predominantly of upland habitat. Visual observations of the site do not suggest the presence of significant erosion channels or areas that retain standing water following precipitation.

The upland area is covered predominantly with grasses, shrubs, trees, and roads that traverse the landfill. Miscellaneous landfill waste and debris have become exposed through the landfill cover over the course of time or may not have been properly covered during historical closure activities. The wetlands are covered by salt-tolerant wetland plant species and pockets of grasses, shrubs, and small trees. There is an existing weir structure that connects to the existing drainage channel through the berm at the eastern side of the landfill. This weir will be removed during the remedial action.

2.1.2 Construction Schedule

The schedule for the remedial action to be performed at IR Site is included as Figure 1-3 of the RAWP. Any updates to schedule will be provided during the project quality control meetings during construction activities.

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3.0 POLLUTANT SOURCES AND BEST MANAGEMENT PRACTICES

This section identifies the materials and activities that may contaminate stormwater (Section 3.1) and discusses implementation of BMPs for stormwater, where applicable, during and after construction (Sections 3.2 through 3.6). Fact sheets for BMPs that may be used at the site are in Appendix F.

3.1 INVENTORY OF MATERIALS AND ACTIVITIES THAT MAY CONTAMINATE STORMWATER

The BMPs for construction activities that may pollute stormwater focus on the following potential pollutant sources:

- Contaminated fine-grained soil (silt) from the excavation that can be suspended in stormwater runoff
- Contamination of stormwater with radionuclides, metals, or other chemicals of concern
- Trackout of soil and sediment from trucks leaving the sites
- Hazardous materials, including spills of fuel, oil, and lubricant
- Wind erosion of stockpiles of soil built during construction
- Solid waste (asphalt, concrete, metal, etc.) from grading activities

3.2 BMPs TO BE IMPLEMENTED FOR CONSTRUCTION ACTIVITIES

Good housekeeping and maintenance practices are key factors in reducing potential off-site migration of pollution. These practices shall include elimination of brush, litter, or other items, including solid waste that may clog drainage pathways or enter the stormwater flow within the grading areas. The achievement of good housekeeping and maintenance also requires employee participation and requires specific training and control systems. The following BMPs that will be implemented are essential to maintaining control of potential pollution sources.

Stormwater control structures will be inspected weekly and at least once each 24-hour period during extended storm events (a storm that lasts longer than 24 hours). Any authorized or unauthorized non-stormwater discharges, if observed, will be documented on the site inspection and monitoring forms in Appendix C. Instructions for completing the forms are provided in Section 4.3.

3.2.1 Spill Prevention and Control

The remedial action at IR Site 2 will be conducted in accordance with the RAWP, Radiological Work Plan (Attachment 2 to the RAWP), Radiation Protection Plan (Attachment 3 to the RAWP), Environmental Protection Plan (Attachment 6 to the RAWP), the Dust Control and Air Monitoring Plan (Attachment 9 to the RAWP), and the project-specific Accident Prevention Plan/Site Safety and Health Plan. These documents will be maintained on-site and outline the specific steps to be followed if a spill or release occurs. If changes or revisions to these documents are made, the most recent version will supersede the previous iteration.

3.2.2 Management of Solid Waste

All construction waste shall be disposed of in dumpsters, roll-off bins, or other similarly approved containers in designated areas located throughout the site. Specific procedures to handle all types of waste expected are included in the Radiological Work Plan, Environmental Protection Plan, and Waste Management Plan (included as Attachments 2, 6, and 10 to the RAWP, respectively).

3.2.3 Management of Contaminated Soil

Radiologically contaminated soil will be placed directly in lined and covered bins. Stockpiled soil will be treated with a soil tackifier to provide dust control and prevent runoff.

3.2.4 Trackout of Material

Based on the requirements of working at a radiological materials area, trackout of loose materials will be controlled by use of a vehicle and equipment decontamination pad for tire cleaning at the access point to the project site from the paved road to prevent trackout of mud or loose soils onto roadways.

Any visible trackout onto a paved road where vehicles exit the work site will be removed by sweeping immediately.

3.2.5 Vehicle and Heavy Equipment Fueling

3.2.5.1 Diesel Fuel

During construction, diesel fuel will be delivered and pumped directly into various pieces of equipment. Fueling will occur in designated areas on the pavement within the radiological control area, which will be located away from drainage courses to prevent run-on of stormwater and runoff of spills (see Figure 5-1 of the main RAWP). If a spill occurs as equipment is fueled, the spill will be immediately contained with an earthen berm constructed of import fill material and an excavation retention trap will be provided. The individual noting the spill will be responsible for contacting the Site Superintendent, who will notify the DON, who in turn is responsible for notifying the regulatory agencies, as necessary, and managing cleanup and removal of contaminated soils in accordance with regulations.

3.2.5.2 Fuels for Passenger Vehicles and Trucks and Vehicle-Related Lubricants

Passenger vehicles and trucks fueled on-site will occur in designated areas located away from drainage courses to prevent the run-on of stormwater and the runoffs of spills. If a spill occurs as equipment is fueled, the spill will be immediately contained with an earthen berm constructed of import cover material and an excavation retention trap will be provided. The individual noting the spill will be responsible for contacting the Site Superintendent, who will notify the DON, who in turn is responsible for notifying the regulatory agencies, as necessary, and managing cleanup and removal of contaminated soils in accordance with regulations.

3.2.6 Equipment and Vehicle Maintenance

3.2.6.1 Heavy Equipment and Vehicle-Related Lubricants

All heavy equipment and vehicles will be inspected prior to use on-site and at the beginning of each workday for oil, lubricant, and hydraulic leaks. Leaking equipment will be repaired or removed from service, and small leaks will be cleaned up immediately. Excessive greasing of components will be avoided, and accumulated grease will be wiped off and contaminated rags properly disposed of off-site. All oil and lubricant supplies will be securely stored in drums or bins to prevent an uncontrolled discharge of spilled materials.

Heavy equipment oil changes and maintenance may be performed on-site. If a spill associated with heavy equipment/vehicles (e.g., diesel, gasoline, hydraulic fluid, or lubricant leak) occurs, containment will be provided, the Site Superintendent will be notified, the spill area will be absorbed or excavated, and the material will be containerized and stored in accordance with the Waste Management Plan (Attachment 10 to the RAWP) until proper off-site disposal.

3.2.6.2 Passenger Vehicles and Trucks

Passenger vehicles and trucks will be inspected daily for possible leaks, but any service will be performed off-site at commercial facilities.

3.2.7 Employee and Subcontractor Training

Primary work policies will be centered on requiring extensive training for employees and any subcontractor working on-site. Each employee is required to be current with appropriate federal hazardous waste training requirements and other training programs, as defined in the Site Safety and Health Plan prepared for the project. Each subcontractor will be required to attend daily safety meetings at the worksite, and each work phase is reviewed during project orientation meetings. During the meetings, potential problems, including weather conditions and stormwater control, will be discussed and the response actions that will be implemented if a particular spill or pollution situation occurs will be reviewed.

3.3 BMPs TO BE IMPLEMENTED FOR EROSION AND SEDIMENT CONTROL

BMPs for erosion and sediment control will be implemented, as necessary, during construction activities. Erosion and sediment control structures will be inspected weekly and at least once each 24-hour period during extended storm events (a storm that lasts longer than 24 hours). Any authorized or unauthorized non-stormwater discharges, if observed, will be documented on the site inspection and monitoring forms in Appendix C. Instructions for completing the forms are provided in Section 4.3. The following sections identify BMPs that will or may be implemented to prevent erosion of sediment. The BMPs are shown on the Sediment and Erosion Control Plan (Attachment 3).

3.3.1 Construction Sequence and Scheduling

Grading activities will be sequenced to minimize the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

3.3.2 Dust Controls

Dust control will be implemented in accordance with the Dust Control and Air Monitoring Plan (Attachment 9) but will generally include wetting active haul routes every 2 hours (or more frequent based on weather conditions), limiting vehicle speeds to under 15 miles per hour, wetting soil prior to excavation, trackout control (as discussed in Section 3.2.4), and stockpile management (as discussed in Sections 3.2.3 and 3.3.4).

3.3.3 Sodding or Other Groundcover

The site will be graded to match the grade specified in the Grading Plan (Attachment 2). After the grading activities are complete, the entire site will be hydroseeded as shown on the Sediment and Erosion Control Plan (Attachment 3).

3.3.4 Soil Stockpile Areas

During grading, soils may be stockpiled in areas adjacent to that activity. The soil will be stockpiled in a generally uncompacted condition at the angle of repose; thus it is subject to erosion. In addressing stockpiling, BMPs may include diversion of drainage from the stockpiles, installation of silt fencing/straw bale filter barriers on the downgradient toe of stockpile slope, and dust control. A soil tackifier will also be applied, as needed, to the stockpiles to prevent erosion. Plastic sheeting will not be used on any stockpile due to health and safety concerns.

3.3.5 Temporary Swales or Berms

Swales and berms may need to be cut to divert and control stormwater runoff during excavation. They can be used to divert sheet flow over slopes, prevent run-on into open excavations or active construction zones, and control erosion along with transport of sediment.

3.3.6 Silt Fence and Sandbags

Silt fencing may be used as a temporary sediment trapping and filtering device downgradient of all disturbed areas where sheet flow might occur. Alternatively, straw bale filter barriers, described in Section 3.3.7, may be used to perform the same function. Silt fences will be installed on a level contour receiving no more than 1 acre of runoff per 100 linear feet or 0.5 cubic foot per second of concentrated flow draining to any point along the silt fence.

Sandbags will be used as a drainage diversion and for sediment trapping and stormwater velocity and erosion control. The sandbags will be installed on level contours up to 1 acre and in areas of concentrated flows and drainage courses.

Silt fences and sandbags will be used at the following locations at the site:

- Silt fencing or sandbags around and along the downgradient toe of all soil stockpiles
- Silt fencing or sandbags below active construction areas
- Silt fencing along the downgradient toe of any work performed on the shoreline or adjacent steeply sloping bank
- Sandbags in concentrated drainage flow course and in areas downgradient of active work areas, as needed
- Sandbags as a diversion berm to stormwater run-on upgradient of active work areas and excavations

3.3.7 Straw Bale Filter Barrier

Straw bale filter barriers consist of a series of secured, anchored straw bales or wattles placed to intercept and filter sediment-laden runoff from small areas of disturbed soil. Straw bale filter barriers may be used on-site in place of silt fencing and sandbags around stockpile areas and downgradient of any active areas where excess sediment or soil may be expected. Straw bales may be required along the shoreline if the silt fencing does not provide adequate sediment filtration as determined by the field engineer.

3.4 OFF-SITE RUN-ON TO THE CONSTRUCTION SITE

Run-on to IR Site 2 is currently prevented by the presence of a perimeter earthen berm. The earthen berm is approximately 10 to 15 feet high. During site grading activities, the berm will be removed along the north and east sides of the landfill and a new drainage channel will be constructed along the north side. The existing drainage channel along the eastern side will be utilized for drainage along the eastern side of the landfill. Two existing storm drain manholes located along the eastern side of the landfill will also be converted to drain inlets and ultimately drain to San Francisco Bay through Outfall U (Attachment 1).

3.5 NON-STORMWATER MANAGEMENT

Inspections to identify any non-stormwater discharges will be performed quarterly. Any authorized or unauthorized non-stormwater discharges, if observed, will be documented on the site inspection and monitoring forms in Appendix C. Instructions for completing the forms are provided in Section 4.3.

3.5.1 Spill Prevention and Control

The BMPs for spill prevention and control include the following controls:

- Train employees and subcontractors in proper spill response procedures.
- Stop the source of a spill immediately, if it is safe to do so.
- If safe to do so, contain and clean up spills immediately and notify TtEC's Site Superintendent immediately.
- Spills of hazardous materials that cannot be cleaned up or that have resulted in a release should be immediately reported to TtEC's Site Superintendent, who will immediately notify the DON, who in turn will be responsible for notifying the regulatory agencies, as necessary, and managing cleanup.

3.6 POST-CONSTRUCTION BMPs

Final graded slopes for the landfill cover are presented in Attachment 2. The grading and drainage plans will be designed to maintain sheet flow of stormwater over the site to minimize ponding of water and infiltration.

Upon completion of the remedial action, drainage swales will be established throughout the affected sites to direct flow to previously constructed swale systems, still active drainage systems, and existing outfalls.

Once soil stockpiles have been removed, stockpile areas will be swept clean. No permanent post-construction BMPs will be required.

4.0 MONITORING PROGRAM

Monitoring requirements are assessed based on a calculated risk level. Section 4.1 describes how the stormwater monitoring requirements were determined for the various TtEC work areas at IR Site 2. The pollutant source assessment of the historical, current, and proposed site activities is presented in Section 4.2. Site inspections and the monitoring program for the project are discussed in Sections 4.3, 4.4, 4.5 and 4.6.

4.1 SEDIMENT RISK LEVEL DETERMINATION

Sediment risk determination was performed using the procedure outlined in Appendix 1 of the 2009-0009-DWQ permit. The procedure to calculate the sediment risk determination factor involves two steps: 1) evaluating the project sediment risk and 2) evaluating the receiving water risk. Risk level is then determined using the table in the Risk Determination Worksheet provided in Appendix 1 of the permit.

Sediment risk was evaluated for the IR Site 2 project. The watershed erosion estimate for the anticipated duration of the project was calculated to be 1.99 tons/acre (based on fieldwork completion in November 2013). Details of the evaluation are presented in Appendix G.

Since the watershed erosion estimate was below 15 tons/acre, the IR Site 2 work area was assigned a low Site Sediment Risk Factor. If TtEC conducts work outside the IR Site 2 work area, additional risk evaluations will be required. If the duration of the fieldwork extends beyond the above completion dates, the QSD will reevaluate the sediment risk to ensure the work area(s) still maintain a low Site Sediment Risk Factor. If it is determined that the Site Sediment Risk Factor changes, revisions to this SWPPP will be required. Any updated or new risk calculations will be kept on-site with the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.

Receiving water risk was determined to be high because the receiving water body adjacent to IR Site 2 (i.e., San Francisco Bay) was listed as having beneficial uses of fish spawning, fish migration, and cold freshwater habitat.

Based on this risk evaluation, stormwater monitoring and management requirements fall into the Risk Level 2 category and will be based on the Risk Level 2 requirements. Stormwater management and monitoring requirements for Risk Level 2 sites can be found in Attachment D of the General Permit, a copy of which is provided in Appendix B.

4.2 POLLUTANT SOURCE ASSESSMENT

In accordance with the Risk Level 2 requirements included in Attachment D of the General Permit, a pollutant source assessment was conducted to identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in stormwater and non-stormwater discharges. The following is a general description of the construction activities to be performed during the remedial action and the stormwater management control systems to be implemented. These controls will also minimize the risk of discharging pollutants that are not visually detectable to the waters of San Francisco Bay. If there is a breach, malfunction, leakage, or spill from a BMP that could result in the discharge of pollutants, the monitoring procedures detailed in Section 4.6 will be implemented.

Mobilization activities will include site preparation, moving equipment and materials to the site, establishing a laydown area, installing security fencing and stormwater runoff controls, and protection or proper abandonment of utilities within the grading footprint.

Prior to beginning the grading activities, sandbag or straw bale berms will be installed downgradient and upgradient of any areas where the runoff may lead to open storm drains or the San Francisco Bay, as well as to prevent stormwater run-on from areas outside the grading limits. Any storm drains located within 50 feet of grading limits and not a part of the remedial action will be surrounded with wattles, and the storm drain will be covered with filter fabric.

Open storm drain lines left in place during the remedial action will be plugged to prevent water from entering or exiting the lines and to eliminate the release of any contamination that may be present in the lines.

To protect areas along the waterfront, silt fencing may be used if no asphalt is present. Sandbags and/or straw bale berms will be used in asphalt areas, where silt fencing is not possible. If needed, sandbags will be placed in drainage control swales and at drainage control discharge points or areas with high probability of erosion. Stormwater coming into contact with the disturbed areas will be collected to prevent any uncontrolled discharge.

To stabilize and minimize wind dispersion of particulate matter from stockpiled soil, soil tackifier will be utilized.

To prevent chemical pollutants from entering the environment, hazardous materials will be stored in a central area at least 50 feet from surface waters. Containers will be stored properly when not in use and will be placed in the appropriate storage cabinet or secondary containment structure to reduce the risks of fire and releases. In addition, refueling operations for construction equipment will be conducted at least 50 feet from surface water bodies. Vehicle/equipment refueling operations will be supervised and appropriate spill control equipment will be available on-site in the event of a release. Proximal storm sewer inlets will also be covered during refueling or hazardous material transfer operations.

4.3 SITE INSPECTIONS

In addition to the weekly inspections mentioned previously, all stormwater pollution prevention measures and BMPs will also be inspected in accordance with the Risk Level 2 monitoring requirement presented in Appendix B. All stormwater pollution prevention measures and BMPs will be inspected 48 hours before (prediction of) and following (measurement of) each qualifying rain event, defined as 0.5 inch or more of precipitation with a 48 hour or greater period between rain events. This inspection will allow for evaluation of the BMPs to prevent the release of potential pollutants. The TtEC work areas at IR Site 2 and BMPs will be inspected during construction by trained personnel, and the appropriate forms will be filled out. These visual inspection field forms are provided in Appendix C. Completed forms will be inserted at the end of Appendix C of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office. The following instructions apply to the forms that will be used to document these inspections:

- Use the visual inspection field form for inspecting the BMPs described in Section 3.0 before, during, and after wet weather events.
- Include in the weather information the best estimate of when (time) the storm event began, the duration of the event, the time elapsed since the last storm, and the approximate amount of rainfall.
- List observations of all BMPs: temporary erosion controls, temporary sediment controls, wind erosion controls, non-stormwater controls, and waste management and materials pollution controls.
- Evaluate BMPs for adequacy and proper implementation and whether additional BMPs are required in accordance with the terms of the General Permit.
- Inspect one-time discharges of non-stormwater when such discharges occur.
- Describe any inadequate BMPs.
- Note the corrective actions required, including any changes to the SWPPP and implementation dates.
- Visual observations (inspections) shall be conducted during normal business hours. Inspections will not be performed during dangerous weather conditions such as flooding and electrical storms. Inspections not performed as a result of weather conditions or outside of scheduled site business hours will be documented on the inspection form.

4.4 RAIN EVENT ACTION PLAN

A Rain Event Action Plan (REAP) will be prepared 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50 percent or greater probability of producing precipitation in the project area. The REAP will be prepared by the QSP. The REAP will include a printed copy of the precipitation forecast information from the National Weather Service Forecast (e.g., by entering the zip code of the project location at http://www.srh.noaa.gov/forecast). The REAP form is provided in Appendix E. Completed REAP forms will be inserted at the end of Appendix E of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.

4.5 WATER QUALITY SAMPLING AND ANALYSIS

Effluent sampling will be performed during each qualifying rain event (i.e., at least 0.5 inch of rain or more within a 48-hour or greater period). Prior to collecting samples for measurement, the hand-held field meter will be calibrated in accordance with manufacturer's instructions, and the calibration information will be recorded on the effluent sampling field form provided in Appendix D. A sample will then be collected at each location where storm water is discharged off-site. A minimum of three samples will be collected per day during each qualifying rain event. An 8-ounce glass jar or equivalent will be used to collect a sample at each location. The jar will be filled with water at least ¾ full. The samples will then be measured for pH and turbidity using the calibrated hand-held field meter by inserting the meter probe into the water container. The readings will be recorded on the same effluent sampling field form that the calibration information was recorded on. The numeric action level (NAL) for pH is lower than 6.5 pH units or greater than 8.5 pH units, and the NAL for turbidity is greater than 250 nephelometric turbidity units. Section I.15 of Attachment D in Appendix B describes actions to take in the event a measurement exceeds these NALs. Completed effluent sampling field forms will be inserted at the end of Appendix D of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.

4.6 MONITORING FOR POLLUTANTS NOT VISUALLY DETECTABLE IN STORMWATER

Water samples will be collected and analyzed should visual monitoring indicate that there has been a breach, malfunction, leakage, or spill from a BMP that could result in the discharge of pollutants. If a point discharge were to occur as a result of a breach of a BMP along the border during construction activities, the monitoring point would be designated as the point closest to where the breach occurred, if water is present at the time of observation. The shoreline is another susceptible location. Should a BMP near the shoreline fail, the monitoring and sampling location would be nearest to the point where the BMP failed. The water samples will be analyzed for the radionuclides of concern (cobalt-60, radium-226, strontium-90, cesium-137, thorium-232, uranium-238, uranium dioxide, and depleted uranium) and the contaminants of concern listed in the ROD (DON 2010), which include cadmium, chromium, lead, molybdenum, total DDx (represented by the sum of the 4,4′-isomers of dichlorodiphenyltrichloroethane [DDT], dichlorodiphenyldichloroethane [DDD], and dichlorodiphenyldichloroethene [DDE]), polychlorinated biphenyls (PCBs), zinc, and benzo(a)pyrene.

This stormwater monitoring program will be amended if conditions at the TtEC work areas at IR Site 2 or the scope of the remedial action changes. Any such amendments will be documented using the Amendment Summary Form that is provided as Appendix H of this SWPPP, and any completed forms will be inserted at the end Appendix H of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.

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5.0 RECORDS

No later than August 25 of each year, TtEC will provide the DON the information specified in Section XVI, Annual Reporting Requirements, of the General Permit for inclusion in their Annual Report.

Records of all monitoring information and copies of all reports required by the General Permit will be retained in the project files for a period of at least 3 years from the date generated or date submitted, whichever is last.

Copies of the monitoring information and reports will be placed in the San Diego project files on a monthly basis.

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6.0 TRAINING AND CERTIFICATION REQUIREMENTS

To ensure that water quality is being protected, the General Permit requires that all SWPPPs be written, amended, and certified by a QSD. The General Permit also requires that all BMPs required by the General Permit are implemented by a QSP. The QSP is responsible for non-stormwater and stormwater visual observations/inspections, and sampling and analysis, if required. Table 6-1 outlines the required certifications and training for both the QSD and QSP. The QSD and QSPs for the removal actions are provided in Table 1-1. Certificates documenting the formal and informal training received for the primary project team members listed in Table 1-1 are provided in Appendix I. Additionally, certificates for alternate QSPs have also been included in Appendix I.

As IR Site 2 is in a Risk Level 2 category, the QSP may delegate the inspection, maintenance, repair, and sampling activities to an employee trained to perform these tasks appropriately, but shall ensure adequate deployment. Copies of training documentation for others delegated to perform the QSP tasks will be inserted into Appendix I of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.

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7.0 REFERENCES

DON (Department of the Navy). 2010. Final Record of Decision, IR Site 2, Former Naval Air Station, Alameda, California. August.

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TABLES

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TABLE 1-1

SWPPP CONTACT INFORMATION

Qualified SWPPP Developer (QSD)		
Mark Kyllo, PE	Qualified SWPPP Developer (#20508)	(619) 471-3569
Qualified SWPPP Practitioner (QSP)		
Vincent Richards, PG	Qualified SWPPP Practitioner (#22540)	(949) 283-0589

Abbreviations and Acronyms:
SWPPP – Stormwater Pollution Prevention Plan

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TABLE 1-2

SUBCONTRACTOR LIST

Company Name	Address	Services
Radiological Survey and Remedial Services, LLC	Field Office 200 Fisher Avenue San Francisco, CA 94214 (415) 216-2752 Main Office 100 Washington Street, Suite 200 Reno, NV 89503 (415) 297-2927	Radiological Screening
Tracer Environmental Sciences & Technologies, Inc.	970 Los Vallecitos Blvd., Ste. 100 San Marcos, CA 92069 (760) 744-9611	Air Sampling
Sterling Environmental Corporation	10203 E. Street Oakland, CA 94603 (510) 638-2800	Asbestos Abatement
Golden Bay Construction	3826 Depot Road Hayward, CA 94545 (510) 783-2960	Asphalt Paving
Bryan A Stirrat and Associates (TtEC company)	1360 Valley Vista Drive Diamond Bar, CA 91765 (909) 860-7777	Site Surveying
Smith-Emery	1940 Oakdale Avenue San Francisco, CA 94124 (415) 642-7326	Geotechnical Testing and On-Site Compaction Testing

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TABLE 6-1

QSD/QSP REQUIRED QUALIFICATIONS AND CERTIFICATIONS[a]

Certification/ Title	Registered By	QSD[b]/QSP
Professional Civil Engineer	California	Both
Professional Geologist or Engineering Geologist	California	Both
Landscape Architect	California	Both
Professional Hydrologist	American Institute of Hydrology	Both
Certified Professional in Erosion and Sediment Control™	Enviro Cert International, Inc.	Both
Certified Inspector of Sediment and Erosion Control™	Certified Inspector of Sediment and Erosion Control, Inc.	QSP
Certified Erosion, Sediment and Stormwater Inspector™	Enviro Cert International, Inc.	QSP
Certified Professional in Stormwater Quality™	Enviro Cert International, Inc.	Both
Registered professional in erosion and sediment control	National Institute for Certification in Engineering Technologies	Both

Notes:

[a] Effective 2 years from September 2, 2009, the QSD shall have attended a State Water Board-sponsored or approved QSD training course. Effective 2 years from September 2, 2009, the QSP shall have attended a State Water Board-sponsored or approved QSP training course.

[b] Effective 2 years from September 2, 2009, a QSP shall be either a QSD or have the certifications listed above.

Abbreviations and Acronyms:

QSD – Qualified SWPPP Developer: a person with one of the above registrations or certifications

QSP – Qualified SWPPP Practitioner: a person responsible for non-stormwater and stormwater visual observations, sampling, and analysis

SWPPP – Stormwater Pollution Prevention Plan

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ATTACHMENT 1

SITE PLAN
(on CD only)

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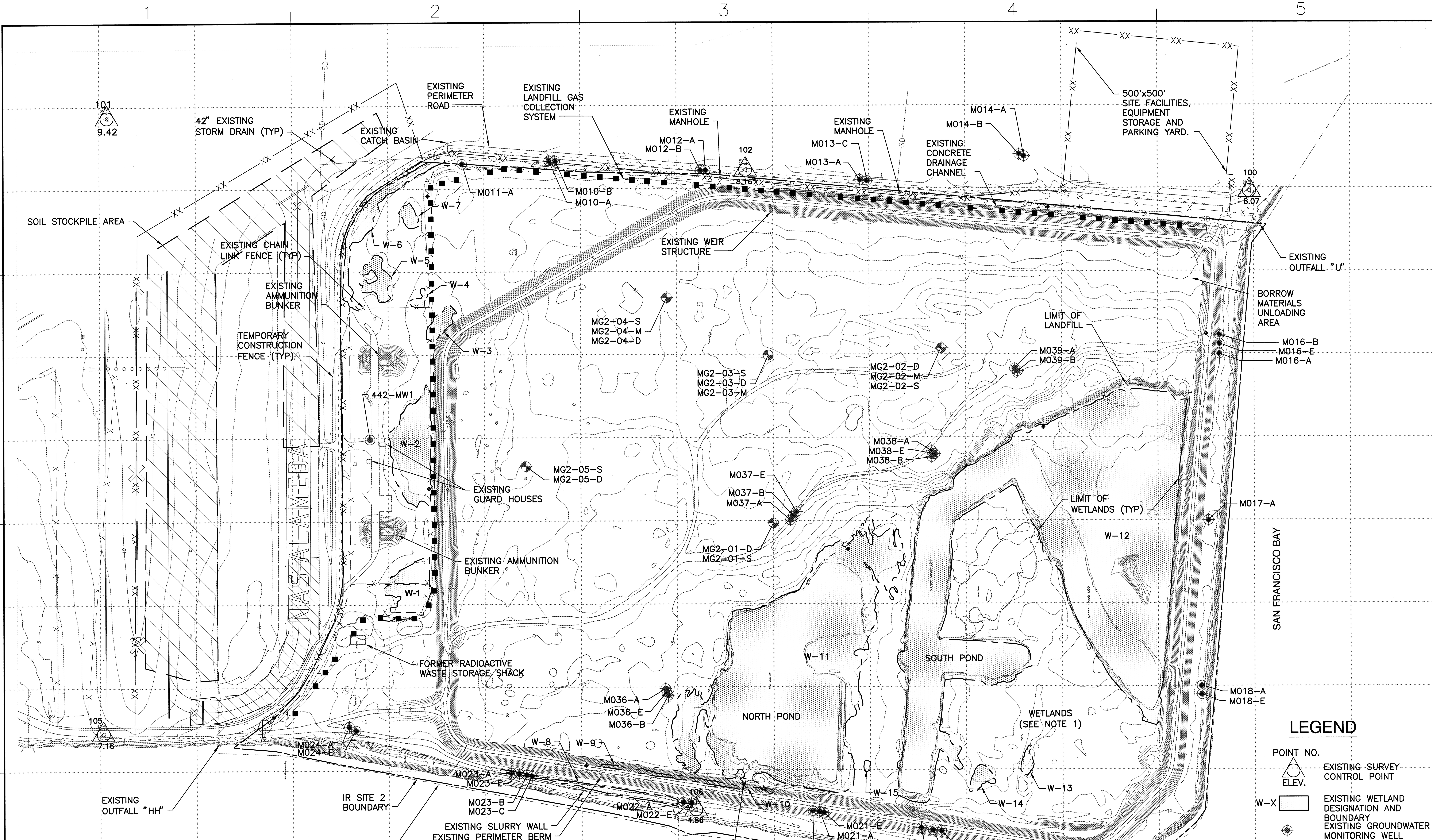

BASIS OF SURVEY:

THIS MAP WAS PREPARED USING COMPUTER ASSISTED, PHOTOGRAMMETRIC METHODS BY HJW GEOSPATIAL, INC. IN OAKLAND, CALIFORNIA. CONTROL SURVEY PERFORMED BY KISTER, SAVIO & REI, RICHMOND, CA. IN AREAS OF DENSE VEGETATION, ACCURACY OF CONTOURS MAY DEVIATE FROM ACCEPTED ACCURACY STANDARDS.

SURVEY CONTROL IS BASED ON THE MONUMENT DESIGNATED "MAIN/ATL" AS DESCRIBED BY THE NATIONAL GEODETIC SURVEY. THE MONUMENT IS LOCATED AT THE NORTHWEST CORNER OF MAIN STREET AND ATLANTIC AVENUE.

COORDINATES ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM ZONE III NORTH AMERICAN DATUM OF 1927. THE NAD27 VALUE FOR "MAIN/ATL" WAS DERIVED FROM THE NADCON CONVERSION OF THE PUBLISHED NAD83 COORDINATES. THE COMPUTED NAD27 COORDINATES ARE:
NORTH 471,068.97'
EAST 1,482,604.56'
ELEVATIONS ARE BASED THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. THE PUBLISHED ELEVATION OF "MIN/ATL" = 6.69' NGVD29.

COORDINATES AND ELEVATIONS WERE OBTAINED USING RTK GPS TECHNIQUES AND CONVENTIONAL GROUND CONTROL SURVEY METHODS.

SITE PLAN
SCALE: 1"=150'

PLAN NORTH

GRAPHIC SCALE
150 75 0 150 300
(IN FEET)

NOTE:

1. WETLANDS BOUNDARIES BASED ON JULY 2010 WETLANDS SURVEY BY KCH.

EXISTING SURVEY CONTROL POINTS

POINT NO.	NORTHING	EASTING	ELEVATION
100	471603.78	1472920.58	8.07
101	475136.51	1473153.00	9.42
102	473162.17	1472987.48	8.16
105	475151.12	1471252.25	7.16
106	473320.10	1471014.48	4.86
107	472039.32	1470837.94	8.65

LEGEND

POINT NO. / ELEV. — EXISTING SURVEY CONTROL POINT
W-X — EXISTING WETLAND DESIGNATION AND BOUNDARY
EXISTING GROUNDWATER MONITORING WELL
EXISTING SOIL GAS MONITORING WELL
EXISTING GAS VENTS
LIMIT OF REFUSE
IR SITE 2 BOUNDARY
SD — STORM DRAIN
X — EXISTING FENCE
XX — TEMPORARY CONSTRUCTION /SECURITY FENCE
PROPOSED STOCKPILE AREA

SYM | DESCRIPTION | DATE | APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAL... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L. DRW V.Y./A.N.P.
REVIEWED BY G.E.S.
PM/DM C.H.M.
CHIEF ENG C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SITE PLAN

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO NO. –
STA. PROJ. NO. –
WORK ORDER NO. –
CONSTR. CONTR. NO. –
NAVFAC DRAWING NO.
SHEET 3 OF 24
C-1
DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\10-0014SITE.dwg LAYOUT NAME: 22X34 LAYOUT PLOTTED: Tuesday, February 19, 2013 - 2:07pm

ATTACHMENT 2

GRADING PLAN
(on CD only)

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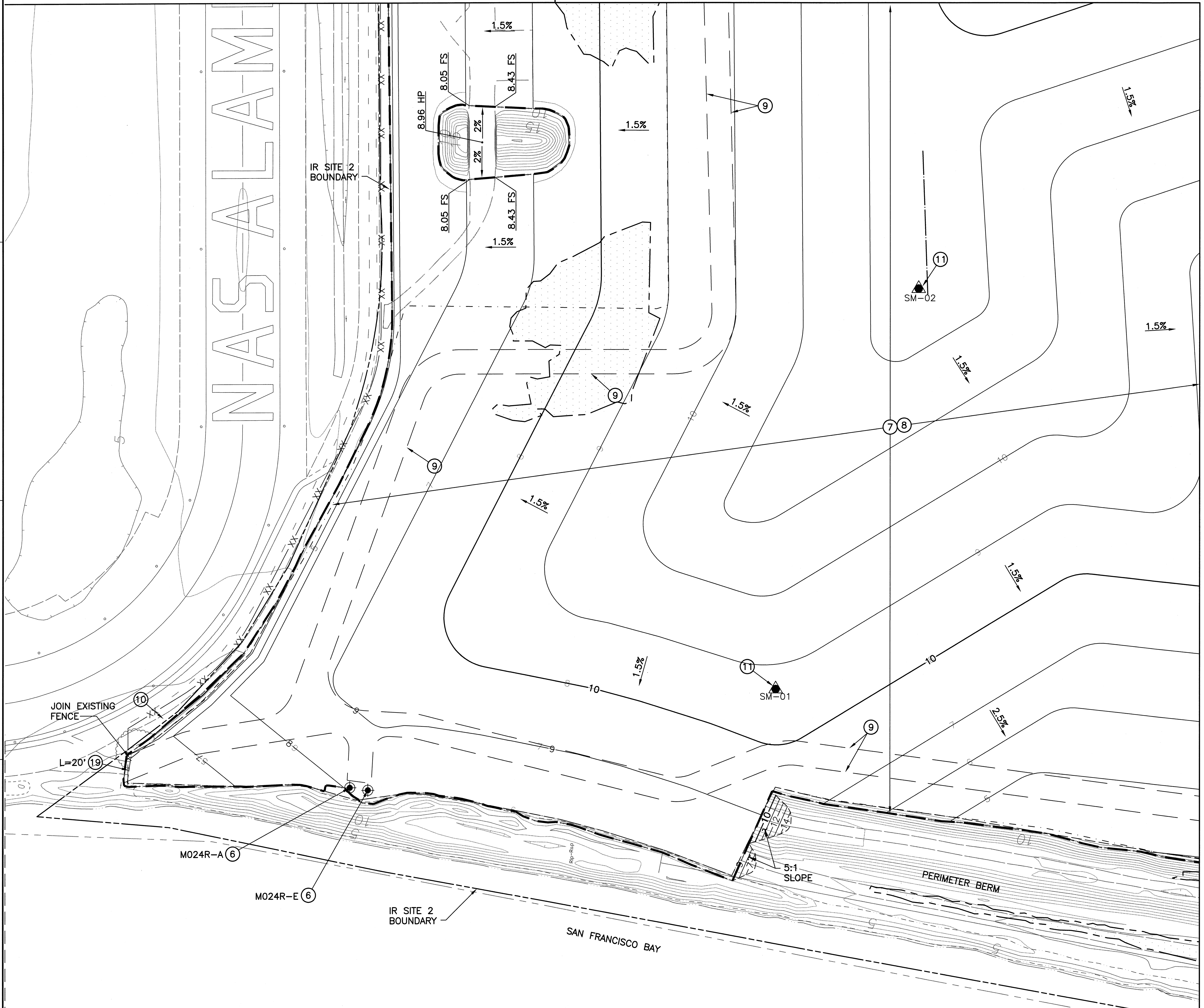
MATCHLINE - SEE SHEET C-13

MATCHLINE - SEE SHEET C-12



CONSTRUCTION NOTES

(6) PROTECT IN PLACE
(7) EXCAVATE OR FILL TO CONTOURS SHOWN
(8) CONSTRUCT FINAL COVER PER 1/D-1
(9) CONSTRUCT ACCESS ROAD PER 5/D-4
(11) INSTALL SETTLEMENT MONUMENT PER 3/D-1
(19) CONSTRUCT CHAIN LINK GATE PER 1/D-6

LEGEND

- WETLAND PRESERVE
- XX TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- NEW GROUNDWATER MONITORING WELL
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W-X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 150 100

(IN FEET)

NAVFAC

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REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SALE CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-NORTHWEST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 11 OF 24	

C-9

DRAWFORM REVISION: OCTOBER 2011

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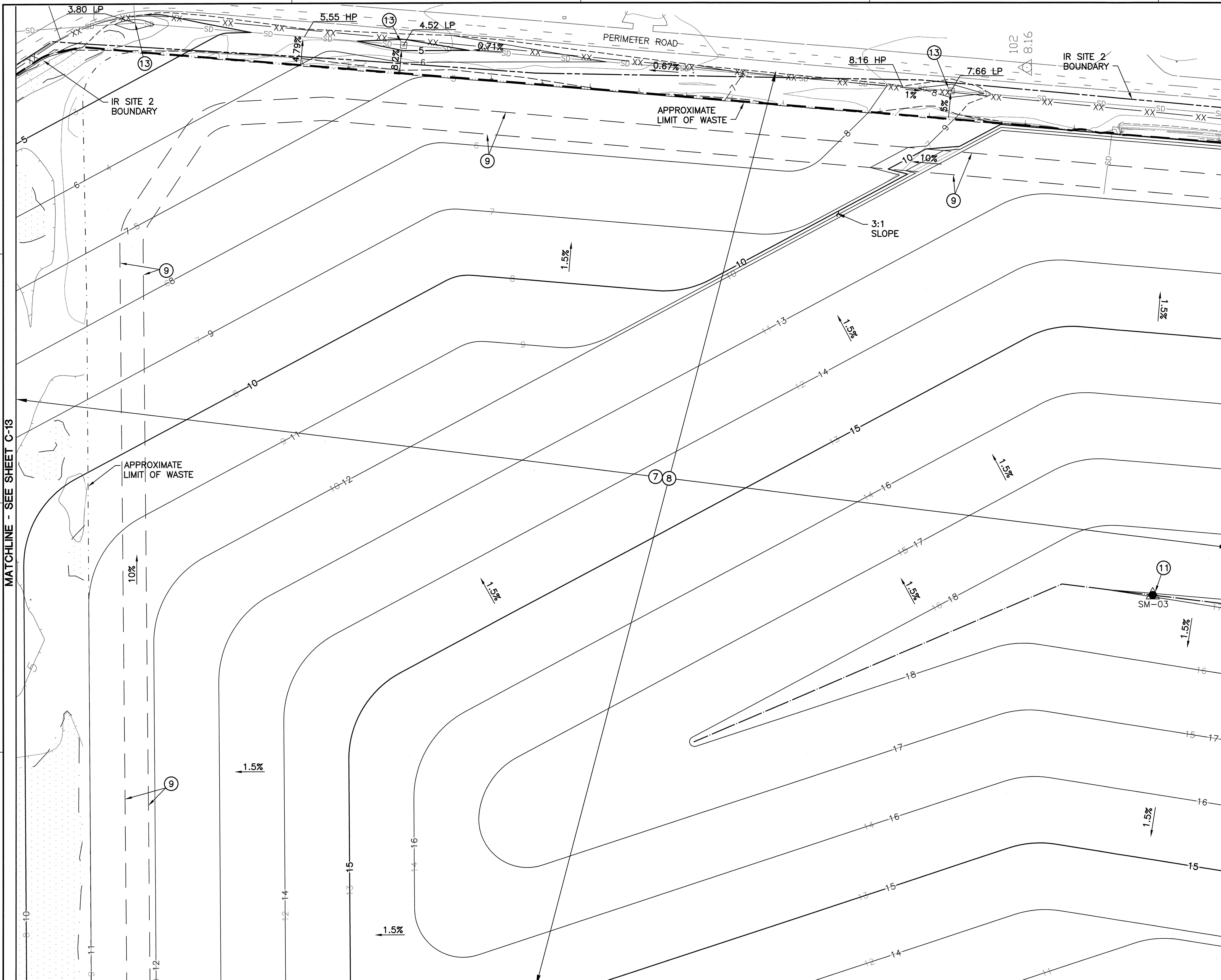

CONSTRUCTION NOTES

7. EXCAVATE OR FILL TO CONTOURS SHOWN
8. CONSTRUCT FINAL COVER PER 1/D-1
9. CONSTRUCT ACCESS ROAD PER 5/D-4
11. INSTALL SETTLEMENT MONUMENT PER 3/D-1
13. CONVERT EXISTING MANHOLE TO DRAINAGE INLET PER 1/D-3

LEGEND

	WETLAND PRESERVE
XX	TEMPORARY CONSTRUCTION/ SECURITY FENCE
	APPROXIMATE LIMIT OF WASTE
	IR SITE 2 BOUNDARY
	TOP/GB OR TOE OF SLOPE
	COVER SYSTEM LIMITS
829	EXISTING CONTOUR
829	PROPOSED CONTOUR
	CENTERLINE OF ROADWAY
	ROCK SEAWALL
	LIMIT OF EXISTING RIP RAP
SD	EXISTING STORM DRAIN
	RIDGE
	CAB
℄	CENTERLINE
HP	HIGH POINT
LP	LOW POINT
(201.5)	EXISTING ELEVATION
	SETTLEMENT MONUMENT
1	SURVEY CONTROL POINT
	WATER VALVE
Ø	DIAMETER
	NEW LANDFILL GAS MONITORING PROBE
POINT NO. / ELEV.	EXISTING SURVEY CONTROL POINT
W-X	EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

NAVFAC

TETRA TECH, INC.
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(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAUL CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.		
REVIEWED BY	G.E.S.		
PM/DM	C.H.M.		
CHIEF ENG	C.H.M.		

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-NORTHEAST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 12 OF 24	

C-10

DRAWFORM REVISION: OCTOBER 2011

SYM | DESCRIPTION | DATE | APPR

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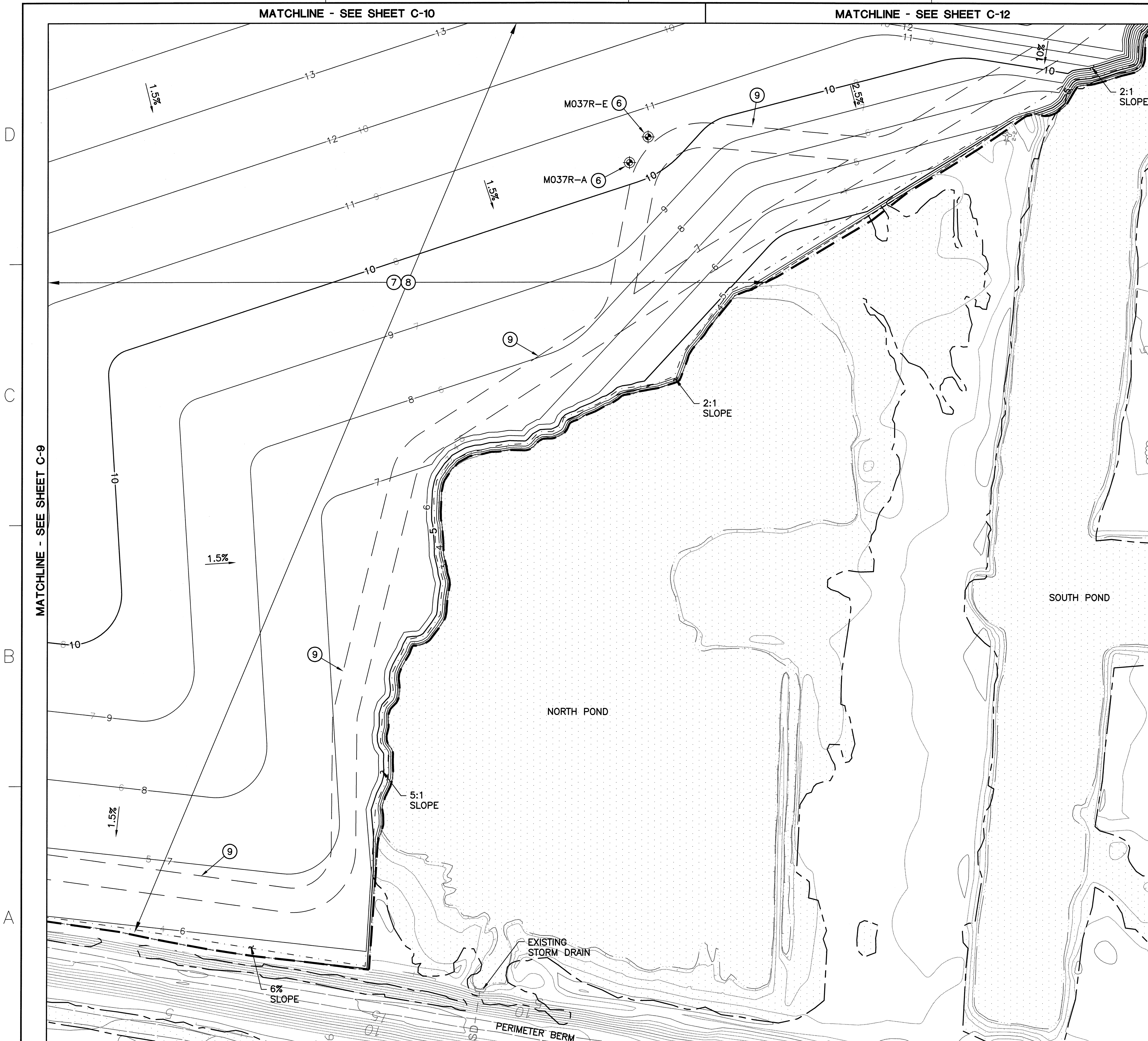


CONSTRUCTION NOTES

(6) PROTECT IN PLACE
(7) EXCAVATE OR FILL TO CONTOURS SHOWN
(8) CONSTRUCT FINAL COVER PER 1/D-1
(9) CONSTRUCT ACCESS ROAD PER 5/D-4
(10) INSTALL LANDFILL GAS MONITORING PROBE PER 1/D-2

LEGEND

- WETLAND PRESERVE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- 1 SURVEY CONTROL POINT
- ⊗ WATER VALVE
- ø DIAMETER
- NEW LANDFILL GAS MONITORING PROBE
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W-X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER G. EDWIN SALT CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

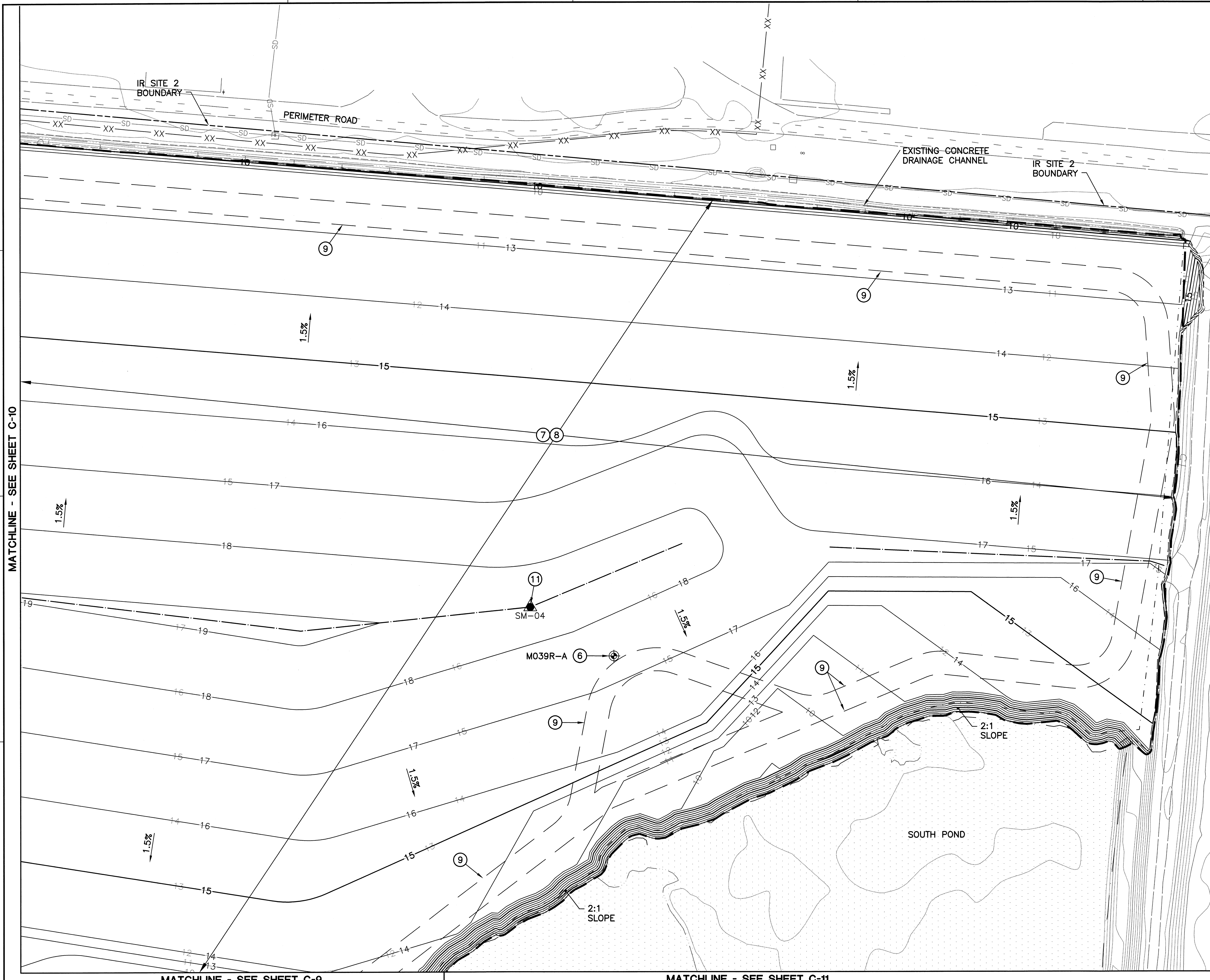
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-SOUTHWEST

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 13	OF 24

C-11

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0048GRF.dwg LAYOUT NAME: C-11 FINAL GRADING AND COVER PLAN-SOUTHWEST PLOTTED: Tuesday, February 19, 2013 - 2:08pm



CONSTRUCTION NOTES

6. PROTECT IN PLACE
7. EXCAVATE OR FILL TO CONTOURS SHOWN
8. CONSTRUCT FINAL COVER PER 1/D-1
9. CONSTRUCT ACCESS ROAD PER 5/D-4
10. INSTALL LANDFILL GAS MONITORING PROBE PER 1/D-2
11. INSTALL SETTLEMENT MONUMENT PER 3/D-1

LEGEND

- WETLAND PRESERVE
- XX — TEMPORARY CONSTRUCTION FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 — EXISTING CONTOUR
- 829 — PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD — EXISTING STORM DRAIN
- RIDGE
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- 1 SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- NEW LANDFILL GAS MONITORING PROBE
- POINT NO. / ELEV. — EXISTING SURVEY CONTROL POINT
- W-X — EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SAUL... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
ALAMEDA, CA

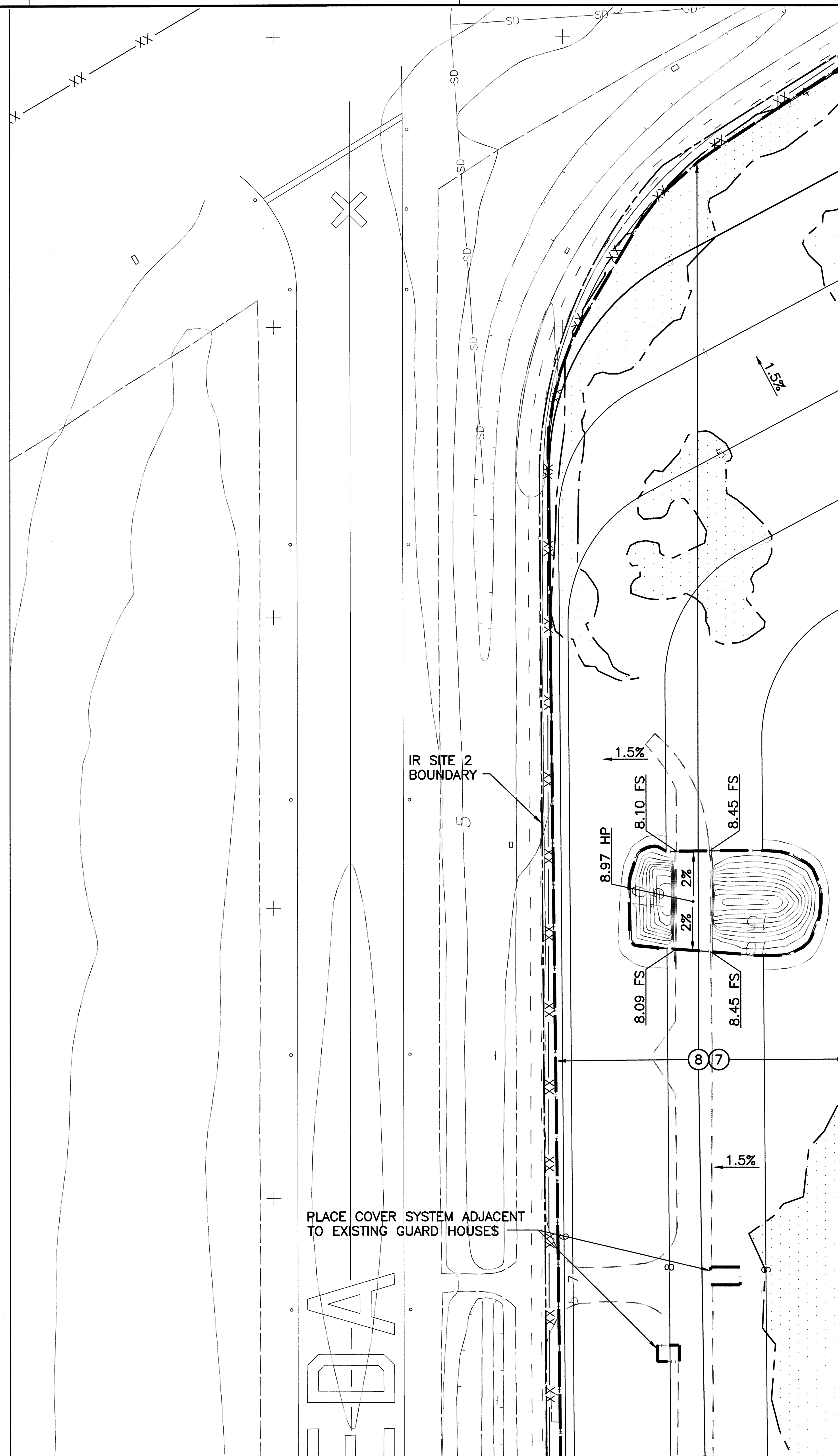
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-SOUTHEAST

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 14 OF 24	

C-12

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\R2-PLAN SET\PLAN SET\12-00530RF.dwg LAYOUT NAME: C-12 FINAL GRADING AND COVER PLAN-SOUTHEAST PLOTTED: Tuesday, February 19, 2013 - 2:08pm



MATCHLINE - SEE SHEET C-9

CONSTRUCTION NOTES

7 EXCAVATE OR FILL TO CONTOURS SHOWN

8 CONSTRUCT FINAL COVER PER 1/D-1

LEGEND

- WETLAND PRESERVE
- XX TEMPORARY CONSTRUCTION/ SECURITY FENCE
- APPROXIMATE LIMIT OF WASTE
- IR SITE 2 BOUNDARY
- TOP/GB OR TOE OF SLOPE
- COVER SYSTEM LIMITS
- 829 EXISTING CONTOUR
- 829 PROPOSED CONTOUR
- CENTERLINE OF ROADWAY
- ROCK SEAWALL
- LIMIT OF EXISTING RIP RAP
- SD EXISTING STORM DRAIN
- CAB
- ℄ CENTERLINE
- (201.5) EXISTING ELEVATION
- SETTLEMENT MONUMENT
- 1 SURVEY CONTROL POINT
- WATER VALVE
- Ø DIAMETER
- NEW GROUNDWATER MONITORING WELL
- POINT NO. / ELEV. EXISTING SURVEY CONTROL POINT
- W-X EXISTING WETLAND DESIGNATION AND BOUNDARY

PLAN NORTH

GRAPHIC SCALE

50 25 0 50 100

(IN FEET)

SYM	DESCRIPTION	DATE	APPR

NAVFAC

TETRA TECH, INC.
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(909) 860-7777

REGISTERED PROFESSIONAL ENGINEER GREG EDWIN SA... CIVIL STATE OF CALIFORNIA

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT INSTALLATION RESTORATION SITE 2
FINAL GRADING AND COVER PLAN-BUNKER

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	–
STA. PROJ. NO.	–
WORK ORDER NO.	–
CONSTR. CONTR. NO.	–
NAVFAC DRAWING NO.	
SHEET 15 OF 24	

C-13

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\12-0078GRF.dwg LAYOUT NAME: C-13 FINAL GRADING AND COVER PLAN-BUNKER PLOTTED: Tuesday, February 19, 2013 - 2:09pm

ATTACHMENT 3

SEDIMENT AND EROSION CONTROL PLAN
(on CD only)

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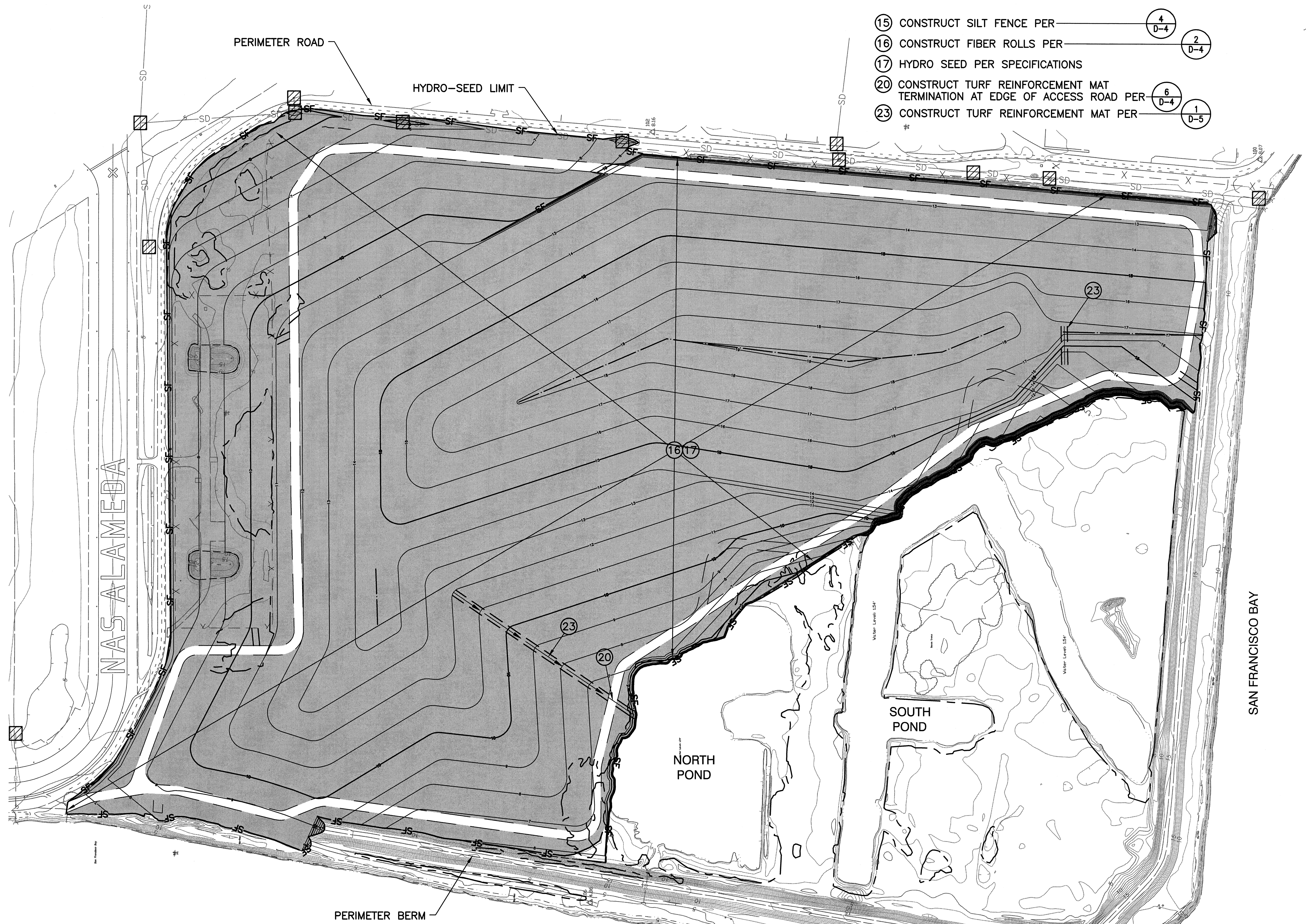
EROSION CONTROL NOTES

1. CONTRACTOR SHALL COMPLY WITH PROVISIONS AND BEST MANAGEMENT PRACTICES INCLUDED IN THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED BY THE CONTRACTOR.
2. BEST MANAGEMENT PRACTICES (BMP) REFERENCE NUMBERS REFER TO CALIFORNIA STORMWATER BMP HANDBOOK—CONSTRUCTION BY THE CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA), DATED NOVEMBER, 2009.
3. ALL EROSION CONTROLS WILL BE INSTALLED AS NECESSARY PRIOR TO THE BEGINNING OF WORK AND BE MAINTAINED THROUGHOUT CONSTRUCTION IN ACCORDANCE WITH THE SWPPP.
4. CONTROL OFF SITE RUN-ON BY DIVERTING STORMWATER FLOWS AWAY FROM SITE TO EXISTING STORM DRAIN SEWERS AND DRAINAGE CHANNELS.
5. CONTROL SITE RUN-OFF FROM ACTIVE AREA USING FIBER ROLLS AND GRAVEL BAG BERMS AT DOWN GRADIENT AREAS.
6. ONLY ESSENTIAL VEHICLES SHOULD ENTER SOIL EXCAVATION AND FILL AREAS.
7. VEHICLES WILL ENTER AND LEAVE SITE ONLY THROUGH DESIGNATED LOCATIONS.
8. VEHICLES WILL BE INSPECTED FOR SOIL ON TIRES AT THE VEHICLE INSPECTION AREA. SOIL WILL BE BRUSHED CLEAN TO PREVENT TRACKING ONTO PUBLIC ROADS. RADIATION CONTROLS IN EFFECT, SEE RPP ATTACHMENTS 2 AND 3.
9. TRASH CONTAINERS WILL BE PROVIDED ON SITE, ALL TRASH WILL BE PLACED INTO APPROPRIATE WASTE CONTAINERS. THE SITE WILL BE KEPT CLEAR OF TRASH AND DEBRIS.

CONSTRUCTION NOTES

15 CONSTRUCT SILT FENCE PER 4/D-4
16 CONSTRUCT FIBER ROLLS PER 2/D-4
17 HYDRO SEED PER SPECIFICATIONS
20 CONSTRUCT TURF REINFORCEMENT MAT TERMINATION AT EDGE OF ACCESS ROAD PER 6/D-4
23 CONSTRUCT TURF REINFORCEMENT MAT PER 1/D-5



LEGEND:

HYDRO-SEED WITH TACKIFIER, SEED MIX PER SPECIFICATIONS

FILTER FABRIC AND GRAVEL BAG BERM INLET PROTECTION PER SE-10

—SF— SILT FENCE PER SE-1

PLAN NORTH

GRAPHIC SCALE

150 75 0 150 300

(IN FEET)

TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777

DES G.E.S./D.L.L.	DRW V.Y./A.N.P.
REVIEWED BY	G.E.S.
PM/DM	C.H.M.
CHIEF ENG	C.H.M.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
ALAMEDA, CA

ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SEDIMENT AND EROSION CONTROL PLAN

CODE ID. NO. 80091	SIZE D
SCALE: AS SHOWN	
MAXIMO NO.	—
STA. PROJ. NO.	—
WORK ORDER NO.	—
CONSTR. CONTR. NO.	—
NAVFAC DRAWING NO.	
SHEET 16 OF 24	

C-14

DRAWFORM REVISION: OCTOBER 2011

REVDATE: FILE NAME: G:\dwg\ALAMEDA IR2\IR2-PLAN SET\PLAN SET\18-0015EC.dwg LAYOUT NAME: C-14 SEDIMENT AND EROSION CONTROL PLAN PLOTTED: Tuesday, February 19, 2013 - 2:09pm

APPENDIX A

GENERAL PERMIT
(not including attachments or appendices)
(on CD only)

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Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

Division of Water Quality
1001 I Street • Sacramento, California 95814 • (916) 341-5455
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100
Fax (916) 341-5463 • http://www.waterboards.ca.gov

Arnold Schwarzenegger
Governor

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO. **CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF APPENDICES

STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002

WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.

2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.

5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.

6. Pursuant to 40 C.F.R. § 131.12 and State Water Board Resolution No. 68-16,[1] which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.

7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.

8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.

9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

[1] Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.

11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.

12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.

13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.

14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.

15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.

16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.

17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.

21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[2]

23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

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[2] Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.

28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

29. Construction activity covered by an individual NPDES Permit for storm water discharges.

30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 (“R” in the Revised Universal Soil Loss Equation).

31. Landfill construction activity that is subject to the Industrial General Permit.

32. Construction activity that discharges to Combined Sewer Systems.

33. Conveyances that discharge storm water runoff combined with municipal sewage.

34. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.

37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and No. 2003-0007-DWQ. For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)[3]. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.

42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

43. This General Permit prohibits the discharge of any debris[4] from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.

45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

[3] BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

[4] Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.

47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.

48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.

49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.

50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS[5]) can prevent or reduce the release of fine particles from construction sites.

[5] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, "The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities," dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel's suggestions into this General Permit, which includes both numeric action levels (NALs) and NELs for pH and turbidity, and special numeric limits for ATS discharges.

Numeric Effluent Limitations

53. Discharges of storm water from construction activities may become contaminated from alkaline construction materials resulting in high pH (greater than pH 7). Alkaline construction materials include, but are not limited to, hydrated lime, concrete, mortar, cement kiln dust (CKD), Portland cement treated base (CTB), fly ash, recycled concrete, and masonry work. This General Permit includes an NEL for pH (6.0-9.0) that applies only at sites that exhibit a "high risk of high pH discharge." A "high risk of high pH discharge" can occur during the complete utilities phase, the complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharges.

54. For Risk Level 3 discharges, this General Permit establishes technology-based, numeric effluent limitations (NELs) for turbidity of 500 NTU. Exceedances of the turbidity NEL constitutes a violation of this General Permit.

55. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based NELs for Risk Level 3 dischargers.

Determining Compliance with Numeric Limitations

56. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. The NALs in this General Permit for pH and turbidity are not directly enforceable and do not constitute NELs.

57. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is required to provide an NAL Exceedance Report when requested by a Regional Water Board.

58. If run-on is caused by a forest fire or any other natural disaster, then NELs do not apply.

59. Exceedances of the NELs are a violation of this Permit. This General Permit requires dischargers with NEL exceedances to implement additional monitoring, BMPs, and revise their SWPPPs accordingly. Dischargers are required to notify the State and Regional Water Boards of the violation through the State Water Boards SMARTs system, and provide an NEL Violation Report sharing additional information concerning the NEL exceedance.

I. Receiving Water Limitations

60. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

61. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

62. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.

63. For all Risk Level 3 and Risk Level 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.

64. Risk Level 3 sites in violation of the Numeric Effluent Limitations contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring.

65. For Risk Level 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.

66. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.

67. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.

68. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.

69. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

70. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially

cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.

71. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.

72. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.

73. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.

74. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

75. This General Permit includes performance standards for post-construction that are consistent with State Water Board Resolution No. 2005-0006, "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and 2008-0030, “Requiring Sustainable Water Resources Management.“ The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This “runoff reduction” approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

76. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

77. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.

78. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

79. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)[6]:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. The utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.

3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

B. Obtaining Permit Coverage Traditional Construction Sites

[6] These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.

2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

3. PRDs shall consist of:

   a. Notice of Intent (NOI)
   b. Risk Assessment (Section VIII)
   c. Site Map
   d. Storm Water Pollution Prevention Plan (Section XIV)
   e. Annual Fee
   f. Signed Certification Statement

   Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

   Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.

   a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.

   b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated. Existing dischargers shall electronically file their PRDs no later than

July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.

6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOT prior to July 1, 2010, are not required to obtain coverage under this General Permit.

7. Small Construction Rainfall Erosivity Waiver

   EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

   Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

   If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.

2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:

   a. A revised NOI indicating the new project size;

   b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.

   c. SWPPP revisions, as appropriate; and

   d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.

   e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved “Final Stabilization” as defined in Section II.D.

4. When an LRP owns property with active General Permit coverage, and the LRP sells the property, or a parcel thereof, to another person, that person shall become an LRP with respect to whatever parcel was sold. The existing LRP shall inform the new LRP of the General Permit’s requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP’s approved signatory, must submit PRDs in accordance with this General Permit’s requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:

   a. For purposes of “final stabilization,” the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;

   b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;

   c. Final stabilization has been reached;

   d. Construction materials and wastes have been disposed of properly;

   e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;

   f. Post-construction storm water management measures have been installed and a long-term maintenance plan[7] has been established; and

[7] For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.

2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.

3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:

   a. “70% final cover method,” no computational proof required

      OR:

   b. “RUSLE or RUSLE2 method,” computational proof required

      OR:

   c. “Custom method”, the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the “final stabilization” requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

A. Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

B. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.

C. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:

1. The discharge does not cause or contribute to a violation of any water quality standard;

2. The discharge does not violate any other provision of this General Permit;

3. The discharge is not prohibited by the applicable Basin Plan;

4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.

5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

6. The discharge is monitored and meets the applicable NALs and NELs; and

7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

D. Debris resulting from construction activities are prohibited from being discharged from construction sites.

E. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.

2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger’s premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notice of Terminations (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS.

    a. The LRP's Approved Signatory must be one of the following:

        i. For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

        ii. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;

        iii. For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA);

        iv. For the military: Any military officer who has been designated.

        v. For a public university: An authorized university official

b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.

2. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass[8] is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;[9]

[8] The intentional diversion of waste streams from any portion of a treatment facility

[9] Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;

3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or

4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset[10] in an action brought for noncompliance shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

    a. An upset occurred and that the discharger can identify the cause(s) of the upset

    b. The treatment facility was being properly operated by the time of the upset

    c. The discharger submitted notice of the upset as required; and

    d. The discharger complied with any remedial measures required

2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.

3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

[10] An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[11] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

[11] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

V. EFFLUENT STANDARDS

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

B. Numeric Effluent Limitations (NELs)

Table 1- Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU	N/A
		Risk Level 3			250 NTU	500 NTU

1. Numeric Effluent Limitations (NELs):

   a. **Storm Event, Daily Average pH Limits –** For Risk Level 3 dischargers, the pH of storm water and non-storm water discharges shall be within the ranges specified in Table 1 during any site phase where there is a "high risk of pH discharge."[12]

b. **Storm Event Daily Average Turbidity Limit –** For Risk Level 3 dischargers, the turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.

2. If daily average sampling results are outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file monitoring results in violation within 5 business days of obtaining the results.

3. **Compliance Storm Event**:

   Discharges of storm water from Risk Level 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for Risk Level 3 discharges is the 5 year, 24 hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

   Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

C. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

[12] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.

3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

    a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

    AND/OR:

    b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

VI. RECEIVING WATER LIMITATIONS

A. The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

B. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

C. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

D. Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

   a. A California registered professional civil engineer;

   b. A California registered professional geologist or engineering geologist;

   c. A California registered landscape architect;

   d. A professional hydrologist registered through the American Institute of Hydrology;

   e. A Certified Professional in Erosion and Sediment Control (CPESC) ™ registered through Enviro Cert International, Inc.;

   f. A Certified Professional in Storm Water Quality (CPSWQ) ™ registered through Enviro Cert International, Inc.; or

   g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET);

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or

   b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.

5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,[13] the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

[13] Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres http://cain.ice.ucdavis.edu/calwater/calwfaq.html, http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175 .

XIII. POST-CONSTRUCTION STANDARDS

A. All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.

1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.

2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.

3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85^{th} percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.

4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream[14] or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

[14] A first order stream is defined as a stream with no tributaries.

B. All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

A. The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;

2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;

3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;

4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and

5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.

B. To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.

C. The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

A. In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.

B. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

C. Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

D. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

E. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

A. All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.

B. The discharger shall certify each Annual Report in accordance with the Special Provisions.

C. The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.

D. The discharger shall include storm water monitoring information in the Annual Report consisting of:

1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;

2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

3. a summary of all corrective actions taken during the compliance year;

4. identification of any compliance activities or corrective actions that were not implemented;

5. a summary of all violations of the General Permit;

6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;

7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and

8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.

E. The discharger shall provide training information in the Annual Report consisting of:

1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and

3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

APPENDIX B

RISK LEVEL 2 STORMWATER MANAGEMENT REQUIREMENTS (on CD only)

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ATTACHMENT D
RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain all fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.

2. Risk Level 2 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

	to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or

design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall

ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase
   b. Trades active on the construction site during each construction phase
   c. Trade contractor information
   d. Suggested actions for each project phase

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

f. Trades active on site during Inactive Construction
g. Trade contractor information
h. Suggested actions for inactive construction sites

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 2 – Water Quality Sampling and Analysis**

a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

Storm Water Effluent Monitoring Requirements

d. Risk Level 2 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. **Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent[4] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. **Risk Level 2 – Visual Observation and Sample Collection Exemptions**

a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk

[4] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 2 – Storm Water Sample Collection and Handling Instructions**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[5]

8. **Risk Level 2 – Monitoring Methods**

a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:

i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample

[5] Additional information regarding SWAMP's QAPrP and QAMP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.
QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml.

collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 2 – Analytical Methods**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. **Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements**

   a. Visual Monitoring Requirements:

      i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

      ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

      iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

   b. Effluent Sampling Locations:

      i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

      ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

      iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. **Risk Level 2 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[6]

h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 2 – Watershed Monitoring Option**

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program

[6] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 2 – Particle Size Analysis for Project Risk Justification**

Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 2 – Records**

Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

f. Rain gauge readings from site inspections;

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 2 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit").

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1 NTU		250 NTU
		For ATS discharges	1 NTU		N/A

APPENDIX C

VISUAL INSPECTION FIELD FORM
(on CD only)

Photocopies of the completed visual inspection field forms will be appended to the field copy of the SWPPP that will be maintained on-site. Original copies of the completed forms will be kept in the TtEC filing system.

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Risk Level 1, 2, 3
Visual Inspection Field Form

Date and Time of Inspection:	Report Date:

Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater

Site Information

Construction Site Name:	
Construction stage and completed activities:	Approximate area of exposed site:

Weather and Observations

Date Rain Predicted to Occur:	Predicted % chance of rain:

Estimate storm beginning: ________ (date and time)	Estimate storm duration: ________ (hours)	Estimate time since last storm: ________ (days or hours)	Rain gauge reading: ________ (inches)

Observations: If yes, identify location

Odors	Yes ☐	No ☐	
Floating material	Yes ☐	No ☐	
Suspended material	Yes ☐	No ☐	
Sheen	Yes ☐	No ☐	
Discolorations	Yes ☐	No ☐	
Turbidity	Yes ☐	No ☐	

Site Inspections

Outfalls or BMPs Evaluated	**Deficiencies Noted**
(add additional sheets or attached detailed BMP Inspection Checklists)	

Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:

Corrective Actions Identified (note if SWPPP/REAP change is needed)

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

NONCOMPLIANCE DOCUMENTATION FORM

Noncompliance Event Description: ____

____

____

____

____

Noncompliance Event Date: ____

Initial Assessment of Impact of Noncompliance Event:____________________________

____

____

____

____

Actions Necessary to Achieve Compliance and Time Schedule

Action	**Completion Date**

Approval

Name ____

Signature ____

Title ____

Date ____

APPENDIX D

EFFLUENT SAMPLING FIELD FORM
(on CD only)

Photocopies of the completed effluent sampling field forms will be appended to the field copy of the SWPPP that will be maintained on-site. Original copies of the completed forms will be kept in the TtEC filing system.

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Risk Level 2
Effluent Sampling Field Form

Construction Site Name:	Date:	Time Start:
Sampler:		

Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant

Field Meter Calibration

pH Meter ID No./Desc.:	Turbidity Meter ID No./Desc.:
Calibration Date/Time:	Calibration Date/Time:

Field pH and Turbidity Measurements

Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected

Discharge Location Description	Sample Type	Time

Additional Sampling Notes:

Time End:

APPENDIX E

RAIN EVENT ACTION PLAN FORM
(on CD only)

Photocopies of the completed REAP forms will be appended to the field copy of the SWPPP that will be maintained on-site. Original copies of the completed REAP forms will be kept in the TtEC filing system.

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Appendix C
Rain Event Action Plan Template

Rain Event Action Plan (REAP)

Date:		**WDID Number:**	
Date Rain Predicted to Occur:		**Predicted % chance of rain:**	

Site Information:

Site Name, City and Zip Code　　Project Risk Level: ☐ Risk Level 2　☐ Risk Level 3

Site Stormwater Manager Information:

Name, Company, Emergency Phone Number (24/7)

Erosion and Sediment Control Contractor – Labor Force contracted for the site:

Name, Company, Emergency Phone Number (24/7)

Stormwater Sampling Agent:

Name, Company, Emergency Phone Number (24/7)

Current Phase of Construction

Check ALL the boxes below that apply to your site.

❑ Grading and Land Development	❑ Vertical Construction	❑ Inactive Site
❑ Streets and Utilities	❑ Final Landscaping and Site Stabilization	❑ Other:

Activities Associated with Current Phase(s)

Check ALL the boxes below that apply to your site (some apply to all Phases).

Grading and Land Development:

❑ Demolition	❑ Vegetation Removal	❑ Vegetation Salvage-Harvest
❑ Rough Grade	❑ Finish Grade	❑ Blasting
❑ Soil Amendment(s):	❑ Excavation (_____ ft)	❑ Soils Testing
❑ Rock Crushing	❑ Erosion and Sediment Control	❑ Surveying
❑ Equip. Maintenance/Fueling	❑ Material Delivery and Storage	❑ Other:

Streets and Utilities:

❑ Finish Grade	❑ Utility Install: water-sewer-gas	❑ Paving Operations
❑ Equip. Maintenance/Fueling	❑ Storm Drain Installation	❑ Material Delivery & Storage
❑ Curb and Gutter/Concrete Pour	❑ Masonry	❑ Other:

Vertical Construction:

❑ Framing	❑ Carpentry	❑ Concrete/Forms/Foundation
❑ Masonry	❑ Electrical	❑ Painting
❑ Drywall/Interior Walls	❑ Plumbing	❑ Stucco
❑ Equip. Maintenance/Fueling	❑ HVAC	❑ Tile
❑ Exterior Siding	❑ Insulation	❑ Landscaping & Irrigation
❑ Flooring	❑ Roofing	❑ Other:

Final Landscaping & Site Stabilization:

❑ Stabilization	❑ Vegetation Establishment	❑ E&S Control BMP Removal
❑ Finish Grade	❑ Storage Yard/ Material Removal	❑ Landscape Installation
❑ Painting and Touch-Up	❑ Irrigation System Testing	❑ Other:
❑ Drainage Inlet Stencils	❑ Inlet Filtration	❑ Perm. Water Quality Ponds
❑ Other:	❑ Other:	❑ Other:

Inactive Construction Site:

❑ E & S Control Device Installation	❑ Routine Site Inspection	❑ Trash Removal
❑ E & S Control Device Maintenance	❑ Street Sweeping	❑ Other:

Rain Event Action Plan (REAP)

Date:		**WDID Number:**	

Trades Active on Site during Current Phase(s)

Check ALL the boxes below that apply to your site

❑ Storm Drain Improvement	❑ Grading Contractor	❑ Surveyor- Soil Technician
❑ Street Improvements	❑ Water Pipe Installation	❑ Sanitary Station Provider
❑ Material Delivery	❑ Sewer Pipe Installation	❑ Electrical
❑ Trenching	❑ Gas Pipe Installation	❑ Carpentry
❑ Concrete Pouring	❑ Electrical Installation	❑ Plumbing
❑ Foundation	❑ Communication Installation	❑ Masonry
❑ Demolition	❑ Erosion and Sediment Control	❑ Water, Sewer, Electric Utilities
❑ Material Delivery	❑ Equipment Fueling/Maintenance	❑ Rock Products
❑ Tile Work- Flooring	❑ Utilities, e.g., Sewer, Electric	❑ Painters
❑ Drywall	❑ Roofers	❑ Carpenters
❑ HVAC installers	❑ Stucco	❑ Pest Control: e.g., termite prevention
❑ Exterior Siding	❑ Masons	❑ Water Feature Installation
❑ Insulation	❑ Landscapers	❑ Utility Line Testers
❑ Fireproofing	❑ Riggers	❑ Irrigation System Installation
❑ Steel Systems	❑ Utility Line Testers	❑ Other:

Trade Contractor Information Provided

Check ALL the boxes below that apply to your site.

❑ Educational Material Handout	❑ Tailgate Meetings	❑ Training Workshop
❑ Contractual Language	❑ Fines and Penalties	❑ Signage
❑ Other:	❑ Other:	❑ Other:

Continued on next page.

Rain Event Action Plan (REAP)

Date of REAP		**WDID Number:**	
Date Rain Predicted to Occur:		**Predicted % chance of rain:**	

Predicted Rain Event Triggered Actions

Below is a list of suggested actions and items to review for this project. Each active Trade should check all material storage areas, stockpiles, waste management areas, vehicle and equipment storage and maintenance, areas of active soil disturbance, and areas of active work to ensure the proper implementation of BMPs. Project-wide BMPs should be checked and cross-referenced to the BMP progress map.

Trade or Activity	Suggested action(s) to perform / item(s) to review prior to rain event
❑ Information & Scheduling	❑ Inform trade supervisors of predicted rain ❑ Check scheduled activities and reschedule as needed ❑ Alert erosion/sediment control provider ❑ Alert sample collection contractor (if applicable) ❑ Schedule staff for extended rain inspections (including weekends & holidays) ❑ Check Erosion and Sediment Control (ESC) material stock ❑ Review BMP progress map ❑ Other:________________________________ ❑ _________________________________ ❑ _________________________________
❑ Material storage areas	❑ Material under cover or in sheds (ex: treated woods and metals) ❑ Perimeter control around stockpiles ❑ Other:________________________________ ❑ _________________________________ ❑ _____________________________
❑ Waste management areas	❑ Dumpsters closed ❑ Drain holes plugged ❑ Recycling bins covered ❑ Sanitary stations bermed and protected from tipping ❑ Other:________________________________ ❑ _________________________________ ❑ _________________________________
❑ Trade operations	❑ Exterior operations shut down for event (e.g., no concrete pours or paving) ❑ Soil treatments (e.g.,: fertilizer) ceased within 24 hours of event ❑ Materials and equipment (ex: tools) properly stored and covered ❑ Waste and debris disposed in covered dumpsters or removed from site ❑ Trenches and excavations protected ❑ Perimeter controls around disturbed areas ❑ Fueling and repair areas covered and bermed ❑ Other:________________________________ ❑ _________________________________ ❑ _____________________________
❑ Site ESC BMPs	❑ Adequate capacity in sediment basins and traps ❑ Site perimeter controls in place ❑ Catch basin and drop inlet protection in place and cleaned ❑ Temporary erosion controls deployed ❑ Temporary perimeter controls deployed around disturbed areas and stockpiles ❑ Roads swept; site ingress and egress points stabilized ❑ Other:________________________________ ❑ _________________________________ ❑ _____________________________
❑ Concrete rinse out area	❑ Adequate capacity for rain ❑ Wash-out bins covered ❑ Other:________________________________ ❑ _________________________________ ❑ _____________________________
❑ Spill and drips	❑ All incident spills and drips, including paint, stucco, fuel, and oil cleaned ❑ Drip pans emptied ❑ Other:________________________________ ❑ _________________________________ ❑ _____________________________

Continued on next page.

❑ Other / Discussion / Diagrams	❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________

Attach a printout of the weather forecast from the NOAA website to the REAP.

I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

____Date: ______________________

Qualified SWPPP Practitioner (Use ink please)

APPENDIX F

BMP FACT SHEETS
(on CD only)

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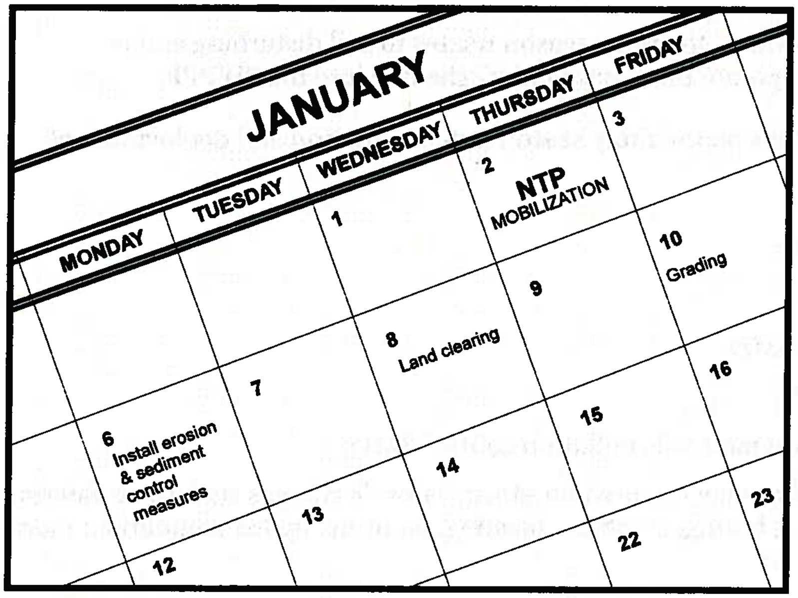

Categories		
EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.

- Plan the project and develop a schedule showing each phase

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of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

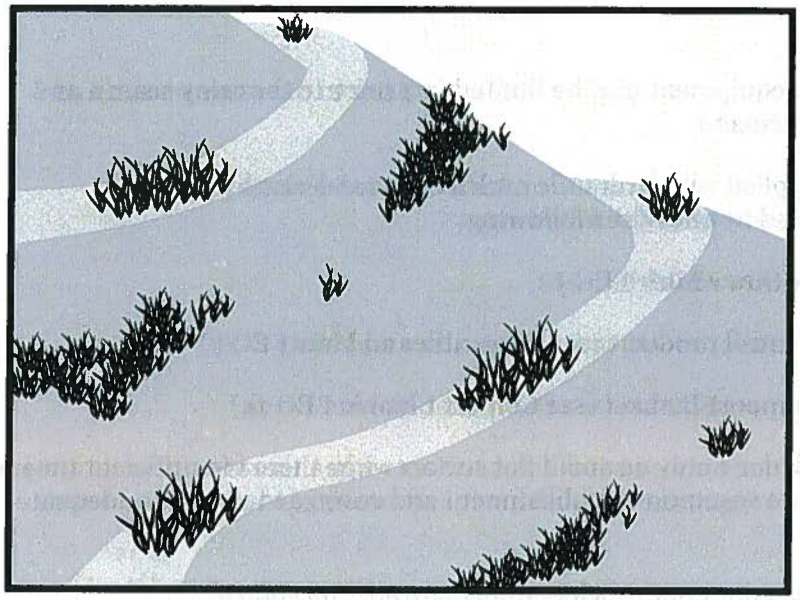
Inspection and Maintenance

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

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Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.
- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

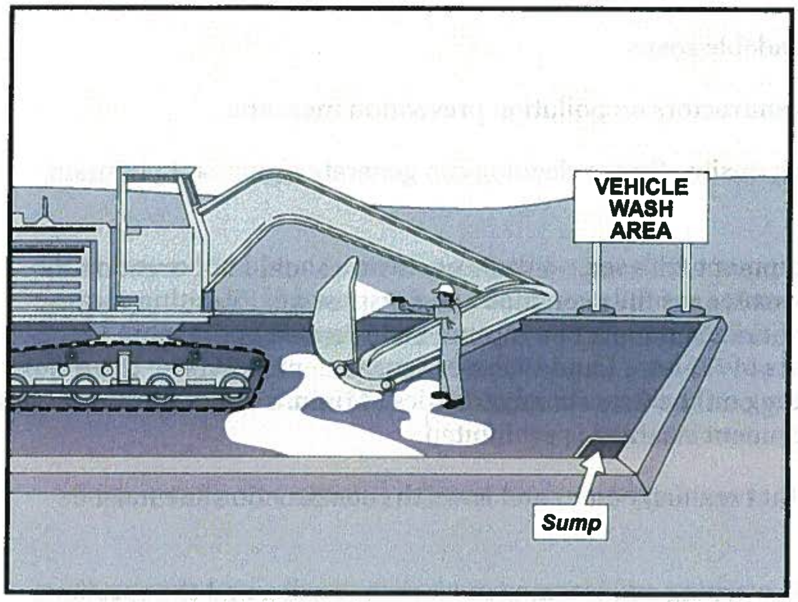
References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Vehicle and Equipment Cleaning NS-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

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- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspection and maintenance is minimal, although some berm repair may be necessary.

- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

- Inspect sump regularly and remove liquids and sediment as needed.

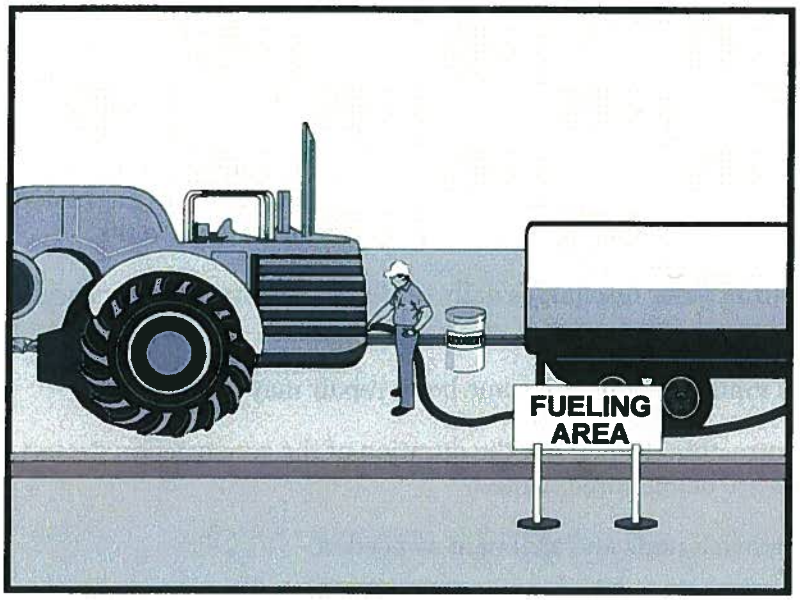
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks. 90% Fill
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

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Vehicle and Equipment Fueling

Categories

Targeted Constituents

Suitable Applications

Limitations

Implementation

be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

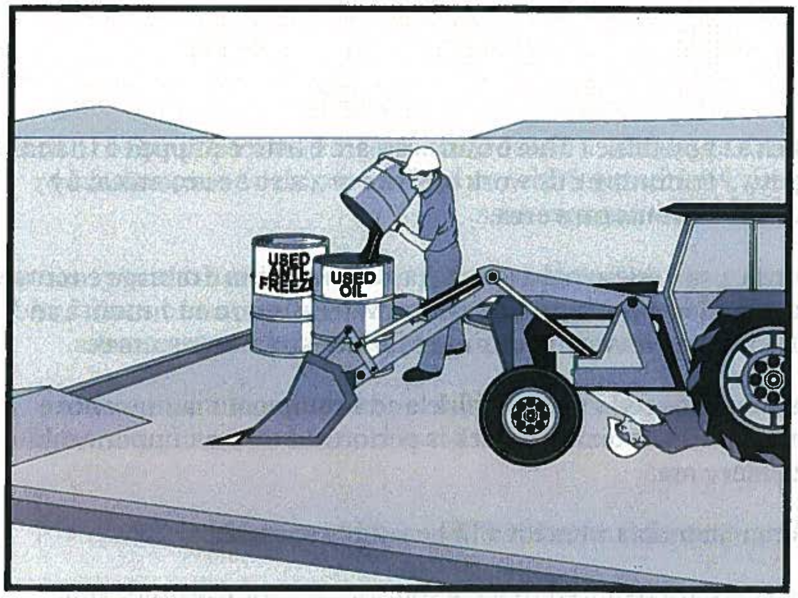
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

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Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

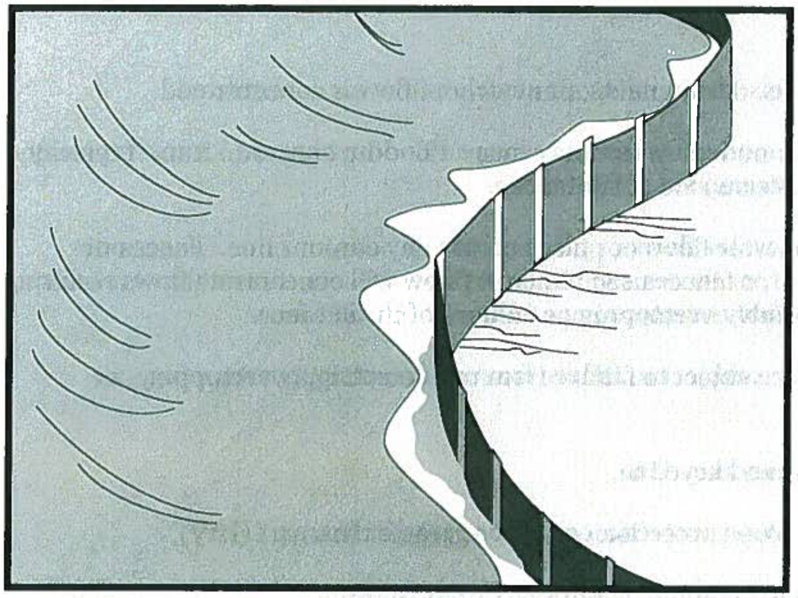
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
  - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
  - Minimal soil disturbance.
  - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
  - Uniform installation.
  - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

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Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

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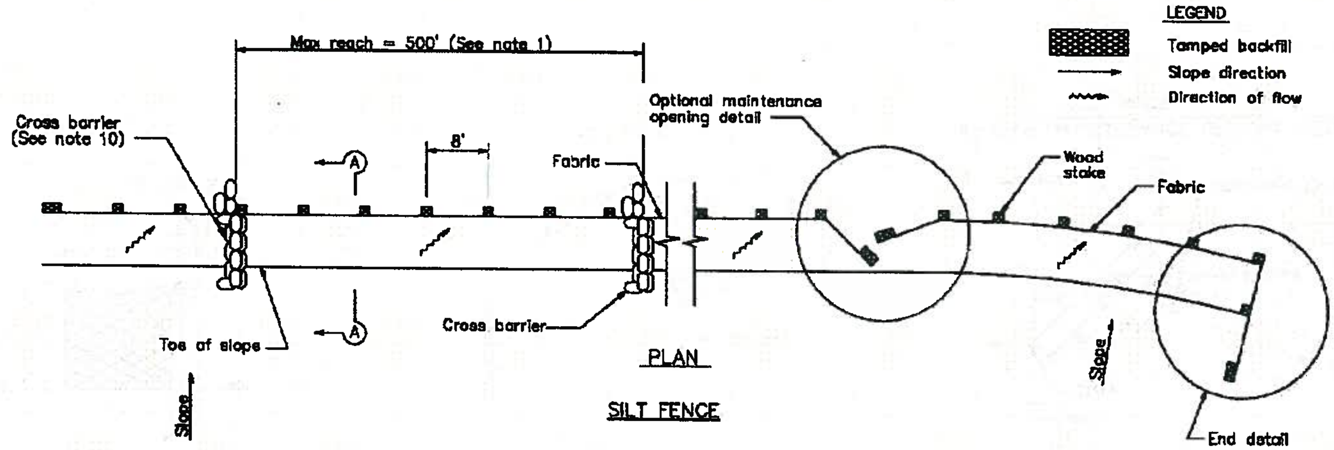
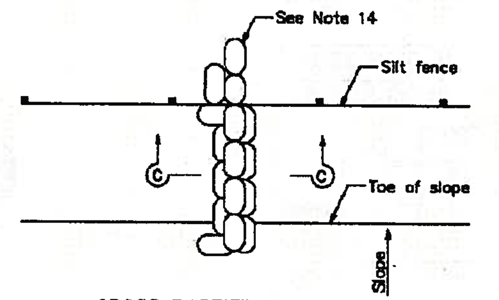
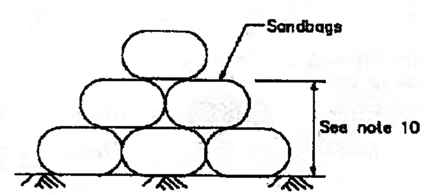


PLAN

SILT FENCE



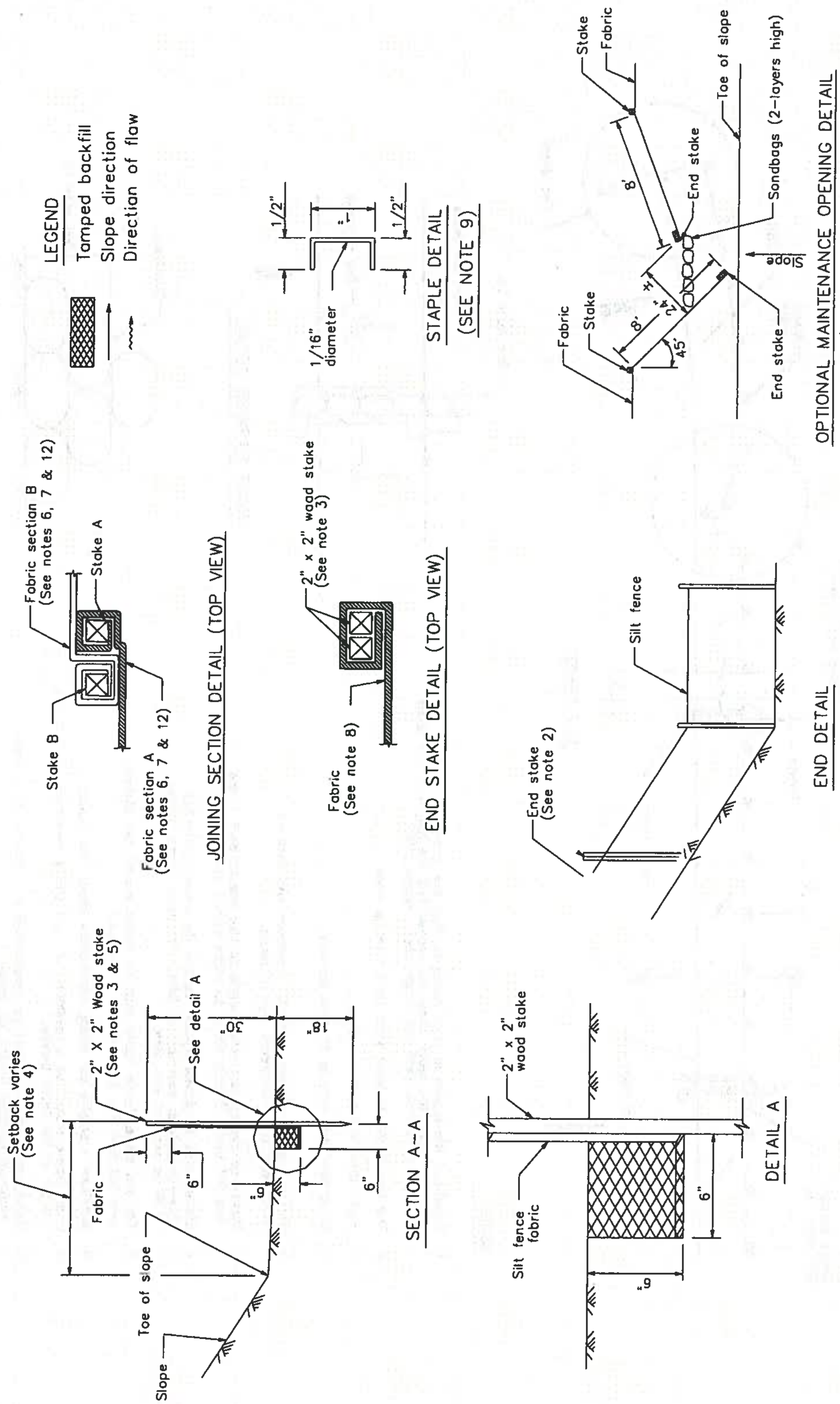
CROSS BARRIER DETAIL

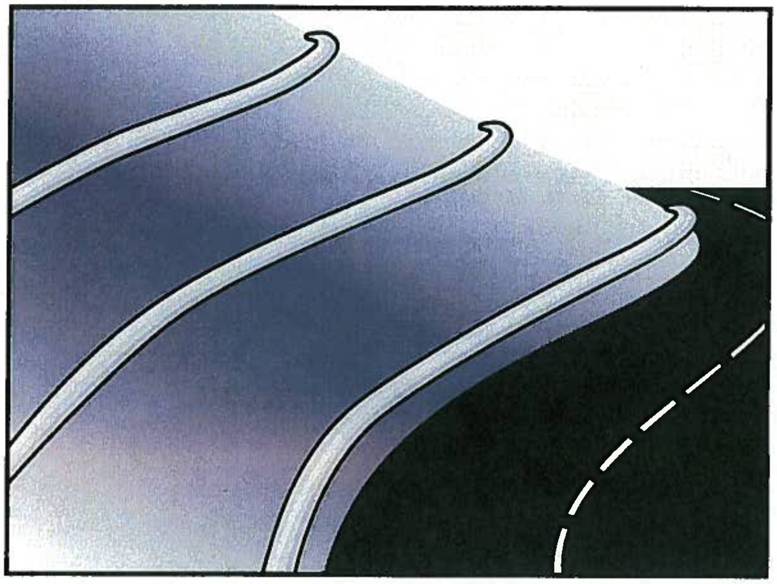


SECTION C–C

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.


LEGEND
Tamped backfill
Slope direction
Direction of flow
Setback varies (See note 4)
2" X 2" Wood stake (See notes 3 & 5)
Fabric
See detail A
Toe of slope
Slope
30"
18"
6"
6"
6"
SECTION A–A
Silt fence fabric
2" x 2" wood stake
6"
6"
DETAIL A
Stake B
Fabric section B (See notes 6, 7 & 12)
Stake A
Fabric section A (See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
Fabric (See note 8)
2" x 2" wood stake (See note 3)
END STAKE DETAIL (TOP VIEW)
End stake (See note 2)
Silt fence
END DETAIL
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
End stake
Toe of slope
Sandbags (2–layers high)
Slope
End stake
8'
8'
4'
2'
45°
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

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- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.

- Start building trenches and installing rolls from the bottom of the slope and work up.

- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.

- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.

- Stake fiber rolls into the trench.

  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.

  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.

- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.

- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Repair or replace split, torn, unraveling, or slumping fiber rolls.

- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

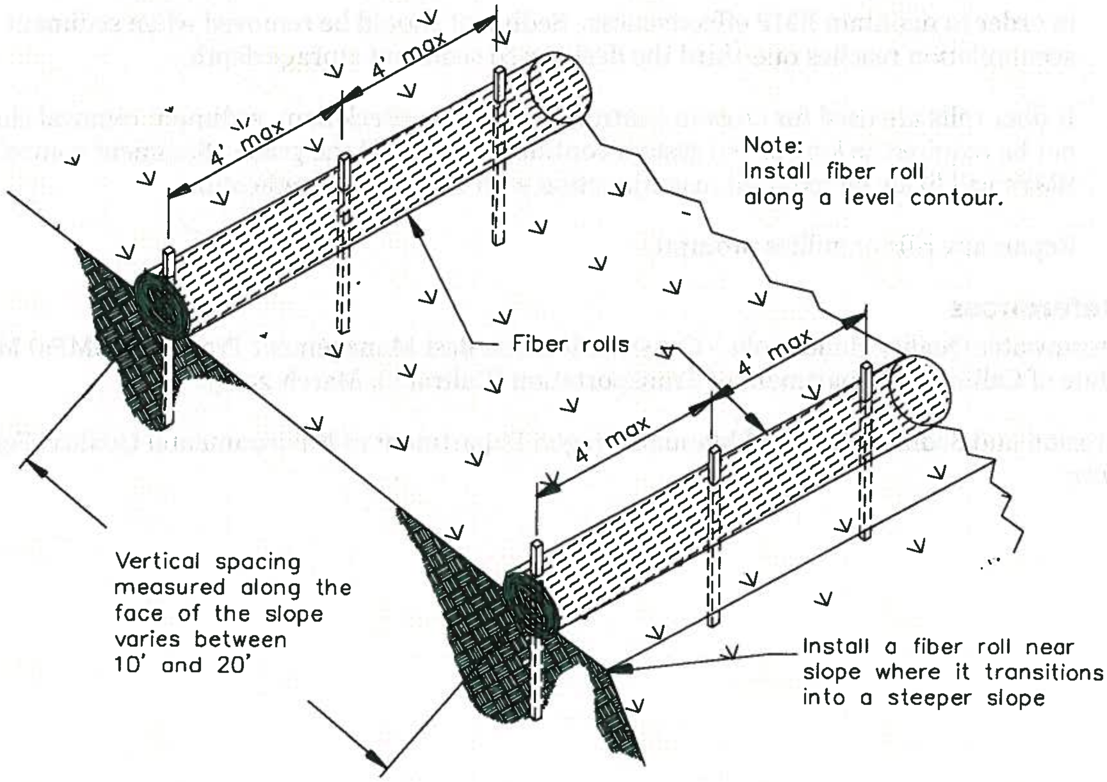
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

- Repair any rills or gullies promptly.

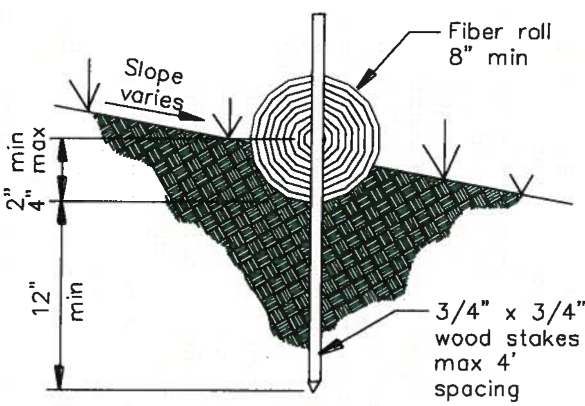
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



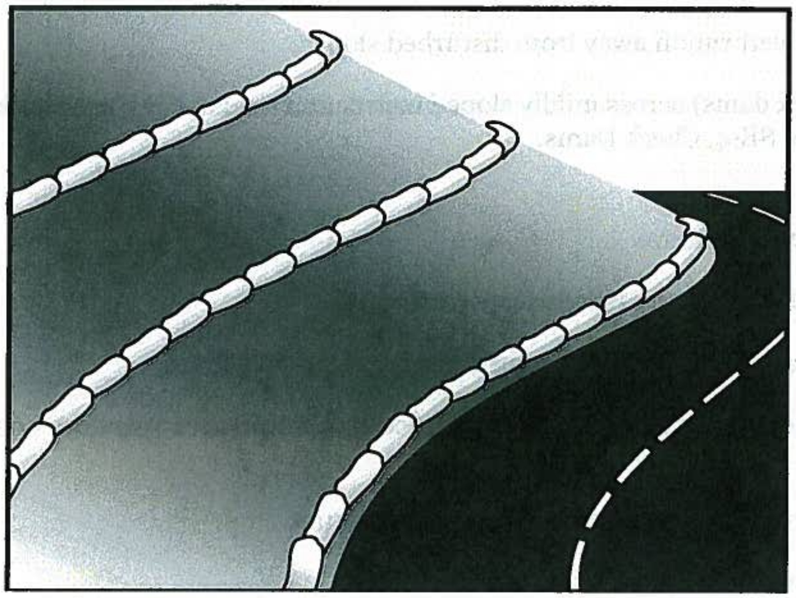
TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm

SE-6



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WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

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- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs
Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

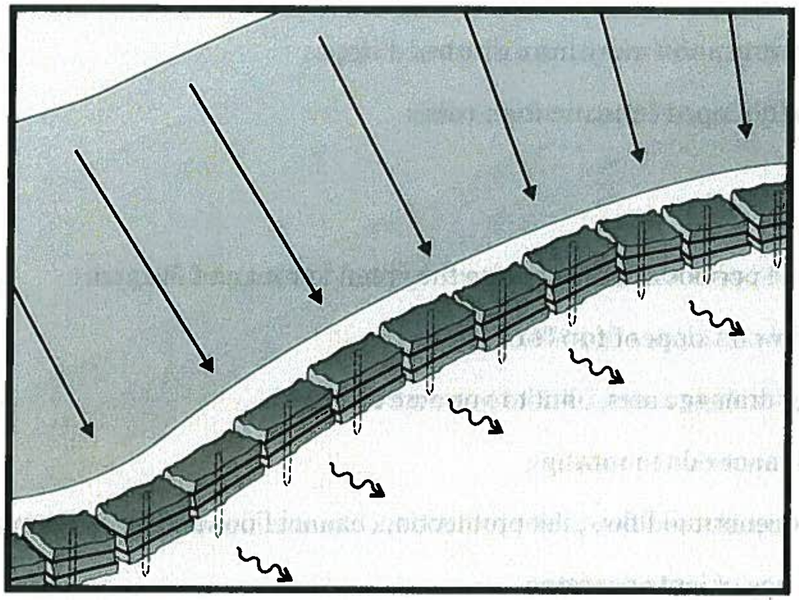
References
Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Straw Bale Barrier



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-12 Temporary Silt Dike
SE-14 Biofilter Bags

Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet-flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

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- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

Inspection and Maintenance

Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.

- Replace or repair damaged bales as needed.

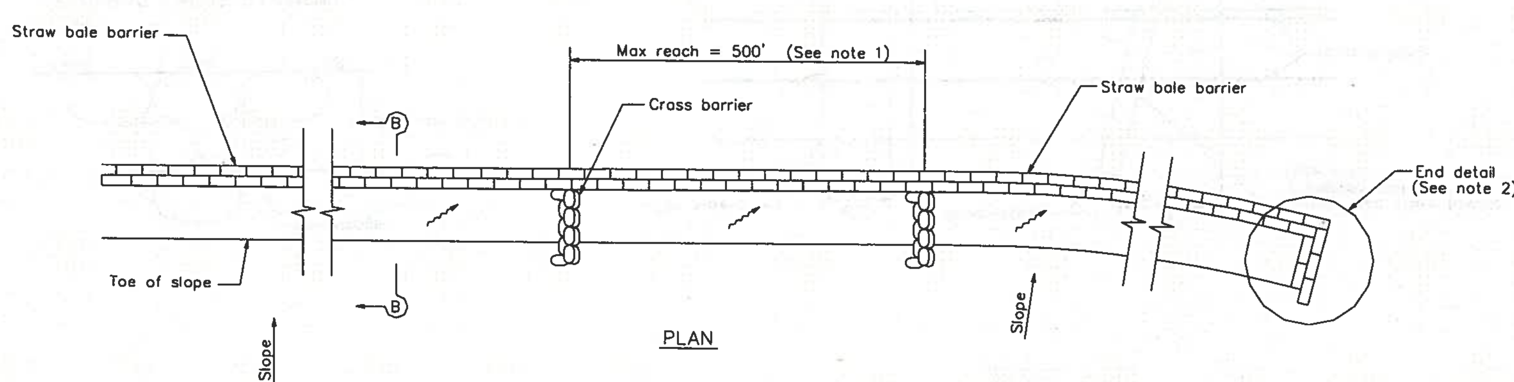
- Repair washouts or other damages as needed.

- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



PLAN

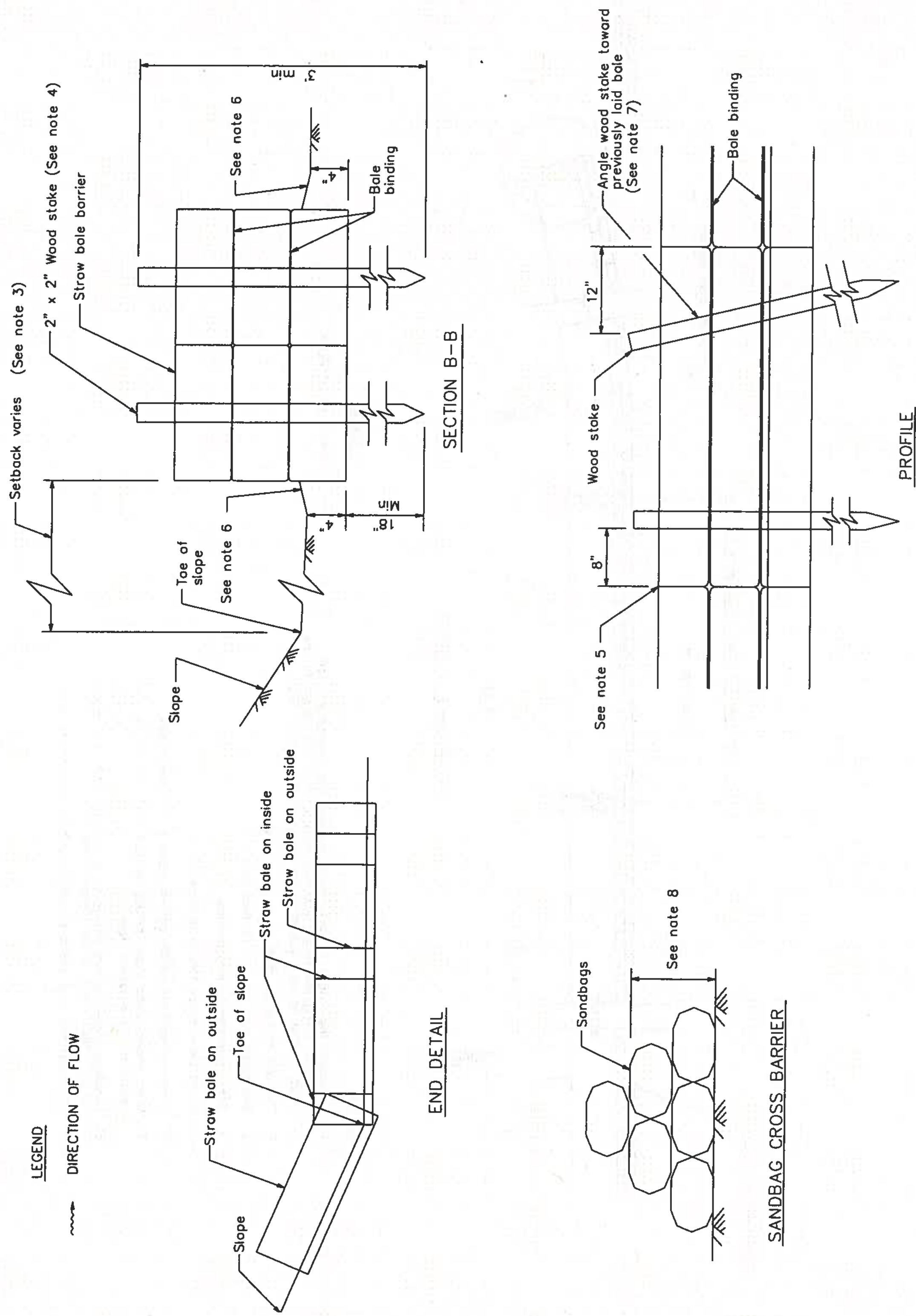
STRAW BALE BARRIER

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

LEGEND

〰 DIRECTION OF FLOW



Setback varies (See note 3)
2" x 2" Wood stake (See note 4)
Straw bale barrier
See note 6
3' min
Bale binding
4"
18" Min
4"
Toe of slope
See note 6
Slope
SECTION B-B
Angle wood stake toward previously laid bale (See note 7)
Bale binding
12"
Wood stake
8"
See note 5
PROFILE
LEGEND
DIRECTION OF FLOW
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
See note 8
Sandbags
SANDBAG CROSS BARRIER

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	x	x	x	x	x			x
Disturbed Areas Subject to Traffic			x	x	x	x		x
Material Stockpiles		x	x	x			x	x
Demolition			x			x	x	
Clearing/ Excavation			x	x				x
Truck Traffic on Unpaved Roads			x	x	x	x	x	
Tracking					x	x		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

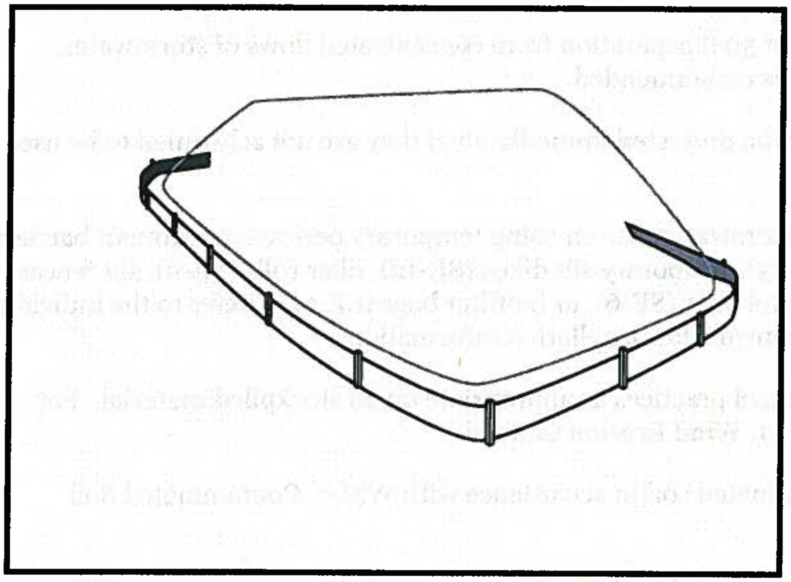
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stockpile Management WM-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of plastic materials should be avoided when feasible and photodegradable plastics should not be used.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.

- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.

- Protect all stockpiles from stormwater run-on using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.

- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.

- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.

- Place bagged materials on pallets and under cover.

- Ensure that stockpile coverings are installed securely to protect from wind and rain.

- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Cover and project soil stockpiles with soil stabilization measures and a temporary perimeter sediment barrier at all times.

- Consider temporary vegetation for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Provide covers and protect these stockpiles with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cover cold mix stockpiles and place them on plastic sheeting (or comparable material) and surround the stockpiles with a berm all times.

Stockpiles of fly ash, stucco, hydrated lime

- Cover stockpiles of materials that may raise the pH of runoff (i.e., basic materials) with plastic and surround the stockpiles with a berm at all times.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)

- Cover treated wood with plastic sheeting (or comparable material) and surround with a berm at all times.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

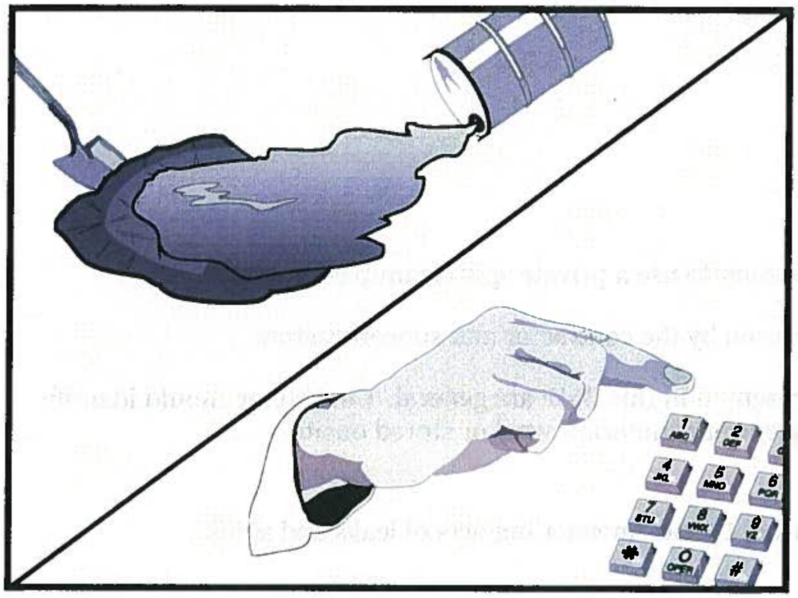
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories

EC	Erosion Control	
SE	Sediment Control	
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WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.

- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.

- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.

- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.

- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.

- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.

- Use absorbent materials on small spills rather than hosing down or burying the spill.

- Absorbent materials should be promptly removed and disposed of properly.

- Follow the practice below for a minor spill:

  - Contain the spread of the spill.

  - Recover spilled materials.

  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

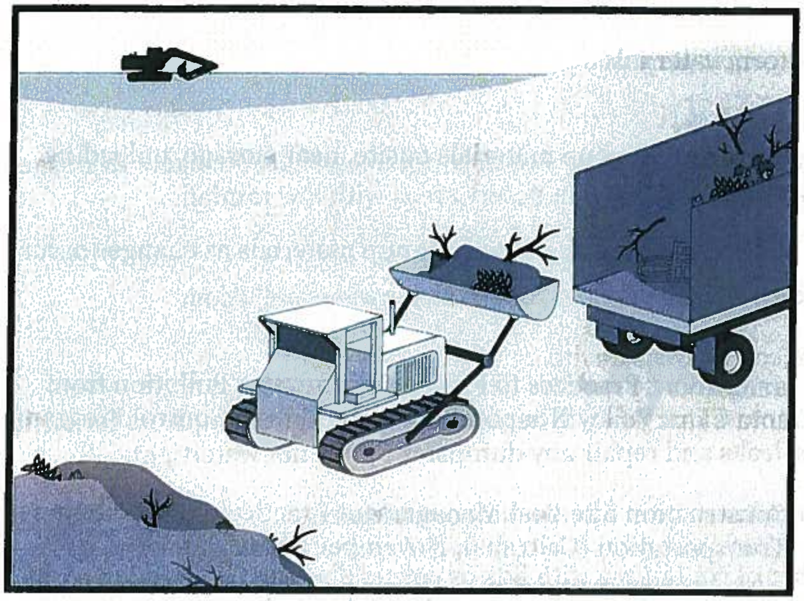
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

CALIFORNIA STORMWATER QUALITY ASSOCIATION

plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur

- Inspect construction waste area regularly.

- Arrange for regular waste collection.

References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Contaminated Soil Management WM-7

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

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plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

APPENDIX G

SEDIMENT RISK LEVEL CALCULATIONS
(on CD only)

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The following pages detail the soil erosion calculations to determine the risk level for IR Site 2 Landfill. A summary of the results are as follows.

Soil Loss: 1.99 tons/acre
Site Sediment Risk Factor of < 15 tons/acre = **Low**

Receiving Water Risk Factor = **High**

Combined Risk = **Level 2**

This risk analysis determines the requirements for ensuring compliance with the California Division of Water Quality National Pollutant Discharge Elimination System (NPDES) General Permit Order No. 2009-0009-DWQ, NPDES No. CAS000002. The total soil loss is based on the Soil Loss Equation from Order No. 2009-0009-DWQ Appendix 1 by the California Division of Water Quality. The equation takes into account the worst soil condition and no established vegetation to be conservative.

Soil Loss Equation (Calculation of Soil Loss from Runoff)

From: Order No. 2009-0009-DWQ Appendix 1 (Division of Water Quality)

A = R*K*(LS)

Where:
A = watershed erosion estimate (tons/acre)
R = rainfall erosivity factor
K = soil erodibility factor
LS = length-slope factor

R from Rainfall Erosivity Factor Calculator (USEPA 2009)

At IR Site 2 Landfill, Alameda, CA (see Sheet 4)

R= 16.56

LS from Order No. 2009-0009-DWQ Appendix 1 (Division of Water Quality)

We used a sheet flow length of 400 feet and a slope of 3.0% to be conservative. See Sheet 5 for determination of the length-slope factor.

Slope	Length	**LS Factor**
$S_1 = 3.0\%$	$L_1 = 400ft$	**0.80**

K from RUSLE K factor Map, Order No. 2009-0009-DWQ Appendix 1 (Division of Water Quality)

The RUSLE K factor map was used to obtain the K value (see Sheet 6).

K= 0.15

Determine Soil Loss

Watershed Erosion Estimate (=R x K x LS) in tons/acre	6.75
Site Sediment Risk Factor	**Low**
Low Sediment Risk: < 15 tons/acre	
Medium Sediment Risk: >=15 and <75 tons/acre	
High Sediment Risk: >= 75 tons/acre	

Determine Receiving Water Risk

The receiving water risk is high since IR Site 2 Landfill does discharge to a location listed with beneficial uses of fish spawning, fish migration, and cold freshwater habitat (see Sheet 7).

Receiving Water (RW) Risk Factor Worksheet		
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment**? (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment?**: http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp	**yes**	**High**

Risk Level

Combined Risk Level Matrix				
		Sediment Risk		
		Low	Medium	High
Receiving Water Risk	Low	Level 1	Level 2	Level 2
	High	Level 2	Level 2	Level 3

REFERENCES

California Division of Water Quality, 2009. "Order No. 2009-0009-DWQ." September 2.

U.S. Environmental Protection Agency (USEPA), 2009. National Pollutant Discharge Elimination System (NPDES). Rainfall Erosivity Factor Calculator for Small Construction Sites.

TETRA TECH EC, INC.

BY Mark Kyllo DATE 11.1.2011 SHEET 4 OF 7

CHKD. BY ____ DATE ____ OFS NO. 106-40440009 DEPT. NO. ____

CLIENT US Navy

PROJECT IR Site 2 Landfill, Alameda, CA

SUBJECT Risk Level Calculation for SWPPP

U.S. ENVIRONMENTAL PROTECTION AGENCY

National Pollutant Discharge Elimination System (NPDES)

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Rainfall Erosivity Factor Calculator for Small Construction Sites

Facility Information

Facility Name: IR Site 2 Landfill
Start Date: 06/01/2012
End Date: 01/01/2013
Address: 1040 W. Tower Ave., Alameda, California 94501
Latitude: 37.7831648
Longitutde: -122.3030301

Erosivity Index Calculator Results

AN EROSIVITY INDEX VALUE OF 16.56 HAS BEEN DETERMINED FOR THE CONSTRUCTION PERIOD OF **06/01/2012 - 01/01/2013.**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site and period of construction. **You do not qualify for a waiver from NPDES permitting requirements.**

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Last updated on August 07, 2009 3:37 PM
URL:http://cfpub.epa.gov/npdes/stormwater/LEW/erosivity_index_result.cfm

	Average Watershed Slope (%)							
Sheet Flow Length (ft)	**0.2**	**0.5**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

IR Site 2 Landfill

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BY Mark Kyllo DATE 11.1.2011 SHEET 6 OF 7

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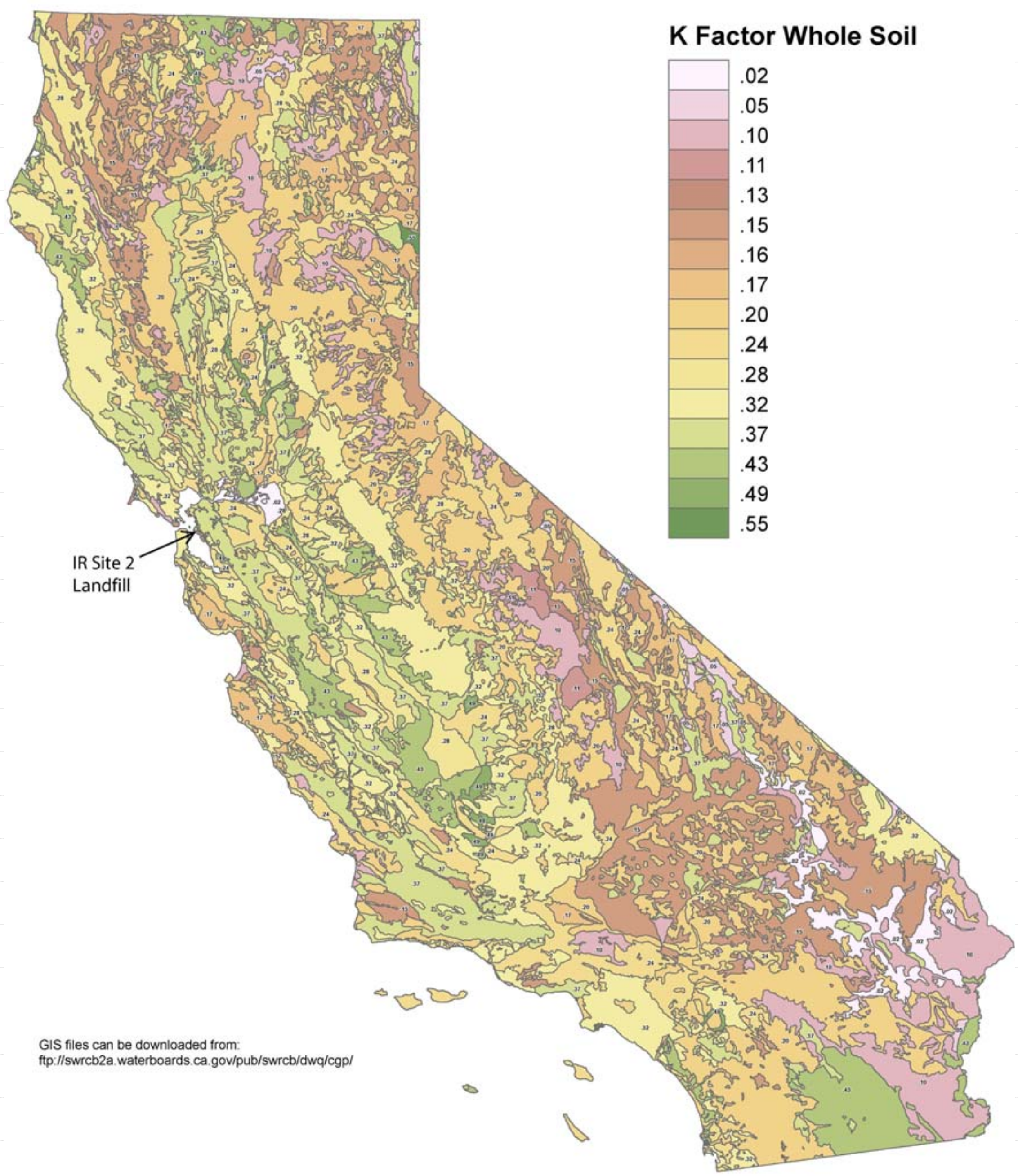
CLIENT US Navy

PROJECT IR Site 2 Landfill, Alameda, CA

SUBJECT Risk Level Calculation for SWPPP

RUSLE K Values



Data Source: *Natural Resources Conservation Service, U.S. Dept. of Agriculture and State Water Resources Control Board*

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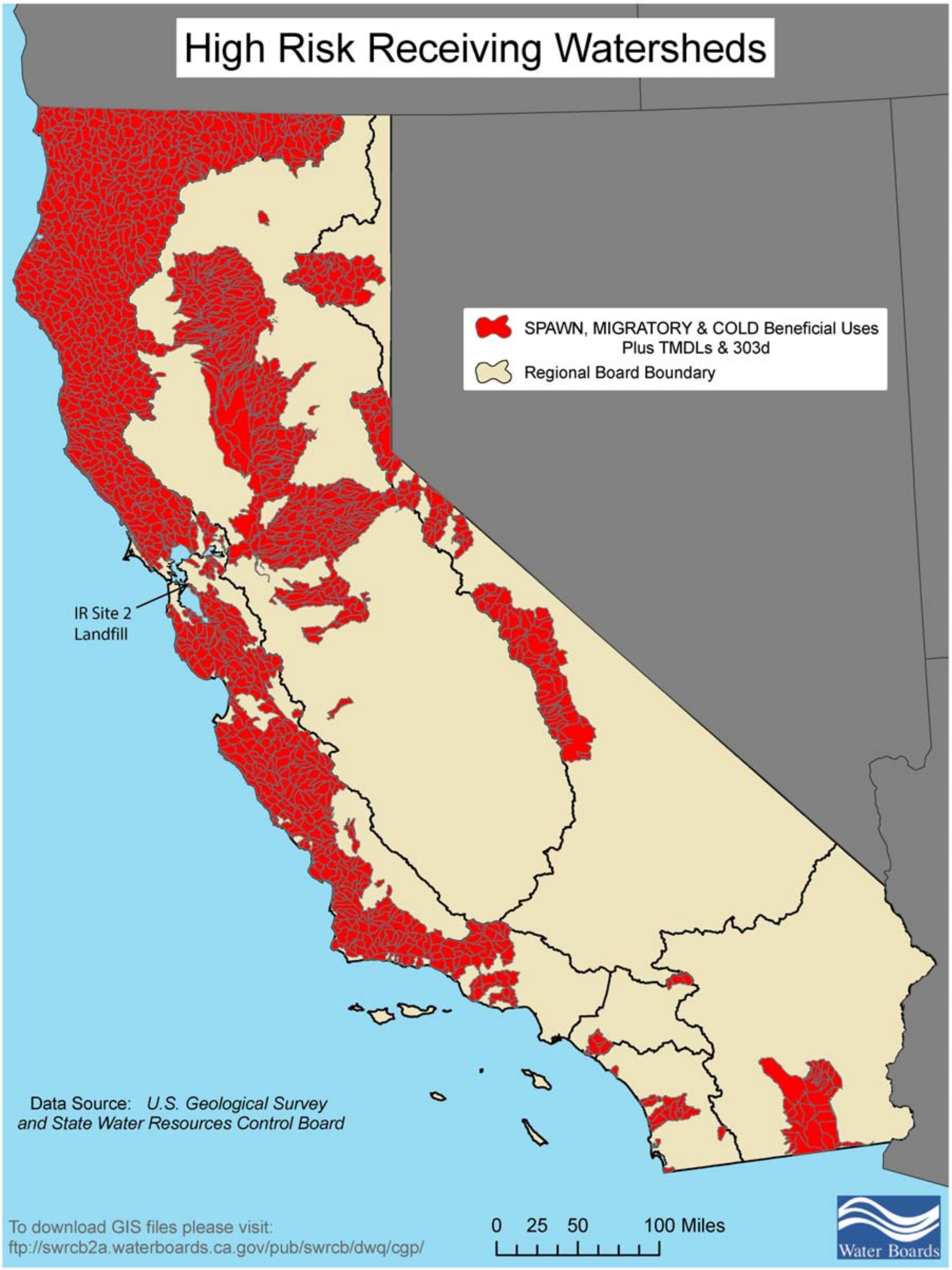
PROJECT IR Site 2 Landfill, Alameda, CA

SUBJECT Risk Level Calculation for SWPPP



Meaning that the tables include listings still requiring the development of a TMDL, those that have a completed TMDL approved by USEPA, and those that are being addressed by actions other than a TMDL.

***** USGS HUC = US Geological Survey Hydrologic Unit Code. Calwater = State Water Resources Control Board hydrological subunit area or even smaller planning watershed.

****** TMDL requirement status definitions for listed pollutants are: A= TMDL still required, B= being addressed by USEPA approved TMDL, C= being addressed by action other than a TMDL

******* Dates relate to the TMDL requirement status, so there will only be one applicable date for each listing.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
1	Bodega HU, Bodega Harbor HA	Bay & Harbor	CAB1152200020020108171136	5	18010111	11522000	810	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Bodega HU, Estero Americano HA, Americano Creek	River & Stream	CAR1153001219980709164509	5	18010111	11530000	38	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Bodega HU, Estero Americano HA, Americano Creek includes the following Calwater Super Planning Watersheds (SPWs): 115.30010 and 115.30011. A Water Quality Attainment Strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek TMDL Water Quality Attainment Strategy, adopted by North Coast RWQCB in December 1997.
1	Bodega HU, Estero Americano HA, estuary	Estuary	CAE1153001219990217134534	5	18010111	11530012	199	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Bodega HU, Estero Americano HA, Americano Creek includes the following Calwater Super Planning Watersheds (SPWs): 115.30010 and 115.30011. A Water Quality Attainment Strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek TMDL Water Quality Attainment Strategy, adopted by North Coast RWQCB in December 1997.
1	Bodega HU, Estero Americano HA, estuary	Estuary	CAE1153001219990217134534	5	18010111	11530012	199	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			A Water Quality Attainment Strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek TMDL Water Quality Attainment Strategy, adopted by North Coast RWQCB in December 1997.
1	Bodega HU, Estero de San Antonio HA, Stemple Creek/Estero de San Antonio	River & Stream	CAR1154001219990602120940	4a	18010111	11540000	61	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			11-Dec-97	
1	Bodega HU, Estero de San Antonio HA, Stemple Creek/Estero de San Antonio	River & Stream	CAR1154001219990602120940	4a	18010111	11540000	61	Miles	Sediment	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-97	To date, the Total Maximum Daily Load and Attainment Strategy for the Stemple Creek Watershed has not been fully implemented, and beneficial uses are still impaired by sediment.
1	Campbell Cove	Coastal & Bay Shoreline	CAC1152100020070319132228	5	18010111	11522000	0	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Cape Mendocino HU, Mattole River HA, Mattole River	River & Stream	CAR1123007219980708151559	4a	18010108	11230000	503	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-03	
1	Cape Mendocino HU, Mattole River HA, Mattole River	River & Stream	CAR1123007219980708151559	4a	18010108	11230000	503	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-03	
1	Clam Beach	Coastal & Bay Shoreline	CAC1091002020070319150720	5	18010102	10820012	1	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Copco Lake	Lake & Reservoir	CAL1053802120020720133912	5	18010206	10538021	776	Acres	Cyanobacteria hepatotoxic microcystins	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing applies to the Copco 1 and Copco 2 Reservoirs.
1	Eel River HU, Lower Eel River HA (includes the Eel River Delta)	River & Stream	CAR1111103219980709182643	5	18010105	11110000	426	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Eel River HU, Lower Eel River HA (includes the Eel River Delta)	River & Stream	CAR1111103219980709182643	5	18010105	11110000	426	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Eel River HU, Lower Eel River HA (includes the Eel River Delta)	River & Stream	CAR1111103219980709182643	5	18010105	11110000	426	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Dec-07	
1	Eel River HU, Lower Eel River HA (includes the Eel River Delta)	River & Stream	CAR1111103219980709182643	5	18010105	11110000	426	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-07			
1	Eel River HU, Middle Fork HA, Eden Valley and Round Valley HSAs	River & Stream	CAR1117104419980710113432	5	18010103	11170000	596	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Eel River HU, Middle Fork HA, Eden Valley and Round Valley HSAs	River & Stream	CAR1117104419980710113432	5	18010103	11170000	596	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			31-Dec-03	The entire Middle Fork Eel River Watershed was listed as sediment-impaired in 1994. The USEPA approved the "Middle Fork Eel River Total Maximum Daily Loads for Temperature and Sediment" in December 2003. For the 2008 303(d) List, the watershed was divided into an upper and lower section. The upper section includes the Wilderness HSA and the Black Butte River HSA. The lower section includes the Eden Valley HSA and the Round Valley HSA. This division was made in order to consider sediment data specific to individual HSAs.
1	Eel River HU, Middle Fork HA, Eden Valley and Round Valley HSAs	River & Stream	CAR1117104419980710113432	5	18010103	11170000	596	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			31-Dec-03	The entire Middle Fork Eel River Watershed was listed as temperature-impaired in 1994. The USEPA approved the "Middle Fork Eel River Total Maximum Daily Loads for Temperature and Sediment" in December 2003. For the 2008 303(d) List, the watershed was divided into an upper and lower section. The upper section includes the Wilderness HSA and the Black Butte River HSA. The lower section includes the Eden Valley HSA and the Round Valley HSA. This division was made in order to consider sediment data specific to individual HSAs.
1	Eel River HU, Middle Fork HA, Wilderness and Black Butte HSAs	River & Stream	CAR1117401120090128173104	4a	18010103	11174011	642	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			31-Dec-03	The entire Middle Fork Eel River Watershed was listed as temperature-impaired in 1994. The USEPA approved the "Middle Fork Eel River Total Maximum Daily Loads for Temperature and Sediment" in December 2003. For the 2008 303(d) List, the watershed was divided into an upper and lower section. The upper section includes the Wilderness HSA and the Black Butte River HSA. The lower section includes the Eden Valley HSA and the Round Valley HSA. This division was made in order to consider sediment data specific to individual HSAs.
1	Eel River HU, Middle Main HA	River & Stream	CAR1114106119990601095147	5	18010103	11140000	674	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Eel River HU, Middle Main HA	River & Stream	CAR1114106119990601095147	5	18010103	11140000	674	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			31-Dec-05	
1	Eel River HU, Middle Main HA	River & Stream	CAR1114106119990601095147	5	18010103	11140000	674	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			31-Dec-05	
1	Eel River HU, North Fork HA, Lower North Fork Eel River Watershed	River & Stream	CAR1115006519980709161134	4a	18010104	11142042	209	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-02	The entire North Fork Eel River Watershed was listed as sediment-impaired in 1994. The USEPA approved the "North Fork Eel River Total Maximum Daily Loads for Sediment and Temperature" on December 30, 2002. For the 2008 303(d) List, the watershed was divided into Upper and Lower sections. The Upper North Fork Eel River Watershed is the area of the North Fork Eel River Watershed that drains to the North Fork Eel River north of the Six Rivers National Forest boundary with the River. The Lower Watershed is the area that drains into the North Fork Eel River south of the Six Rivers National Forest boundary with the River. The division was made in order to consider sediment data specific to individual areas of the watershed.
1	Eel River HU, North Fork HA, Lower North Fork Eel River Watershed	River & Stream	CAR1115006519980709161134	4a	18010104	11142042	209	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-02	The entire North Fork Eel River Watershed was listed as temperature-impaired in 1994. The USEPA approved the "North Fork Eel River Total Maximum Daily Loads for Sediment and Temperature" on December 30, 2002. For the 2008 303(d) List, the watershed was divided into Upper and Lower sections. The Upper North Fork Eel River Watershed is the area of the North Fork Eel River Watershed that drains to the North Fork Eel River north of the Six Rivers National Forest boundary with the River. The Lower Watershed is the area that drains into the North Fork Eel River south of the Six Rivers National Forest boundary with the River. The division was made in order to consider sediment data specific to individual areas of the watershed.
1	Eel River HU, North Fork HA, Upper North Fork Eel River Watershed	River & Stream	CAR1115003020090129010733	4a	18010105	11150030	173	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Dec-02	The entire North Fork Eel River Watershed was listed as temperature-impaired in 1994. The USEPA approved the "North Fork Eel River Total Maximum Daily Loads for Sediment and Temperature" on December 30, 2002. For the 2008 303(d) List, the watershed was divided into Upper and Lower sections. The Upper North Fork Eel River Watershed is the area of the North Fork Eel River Watershed that drains to the North Fork Eel River north of the Six Rivers National Forest boundary with the River. The Lower Watershed is the area that drains into the North Fork Eel River south of the Six Rivers National Forest boundary with the River. The division was made in order to consider sediment data specific to individual areas of the watershed.
1	Eel River HU, South Fork HA	River & Stream	CAR1113103019980710155233	5	18010108	11130000	943	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Eel River HU, South Fork HA	River & Stream	CAR1113103019980710155233	5	18010108	11130000	943	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Dec-99	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
1	Eel River HU, South Fork HA	River & Stream	CAR1113103019980710155233	5	18010108	11130000	943	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Dec-99	
1	Eel River HU, Upper Main HA (Includes Tomki Creek)	River & Stream	CAR1116206119990528152745	4a	18010110	11160000	1141	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Dec-04	
1	Eel River HU, Upper Main HA (Includes Tomki Creek)	River & Stream	CAR1116206119990528152745	4a	18010110	11160000	1141	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Dec-04	
1	Eel River HU, Upper Main HA, Lake Pillsbury HSA, Lake Pillsbury	Lake & Reservoir	CAL1116305119990217103140	5	18010103	11163000	1973	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
1	Eel River HU, Van Duzen River HA	River & Stream	CAR1112101219990602104416	4a	18010105	11120000	585	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Dec-99	
1	Eureka Plain HU, Elk River	River & Stream	CAR1100004219980707112307	5	18010102	11000000	88	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-11			The Eureka Plain HU, Elk River includes the following Calwater Planning Watersheds (PWS): Upper North Fork Elk River (1110000202), Lower North Fork Elk River (1110000201), Upper South Fork Elk River (1110000301), Lower South Fork Elk River (1110000302), Lower Elk River (1110000402), and Martin Slough (1110000401).
1	Eureka Plain HU, Freshwater Creek	River & Stream	CAR1100005019980707102630	5	18010105	11000000	84	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-11			The Eureka Plain HU, Freshwater Creek includes the following Calwater Planning Watersheds (PWS): Upper Freshwater Creek (1110000101), Little Freshwater Creek (1110000103), Cloney Gulch (1110000102), Ryan Slough (1110000104), and Fay Slough (1110000105).
1	Eureka Plain HU, Humboldt Bay	Bay & Harbor	CAB1100000020020108173626	5	18010105	11000000	16075	Acres	Dioxin Toxic Equivalents	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Eureka Plain HU, Humboldt Bay	Bay & Harbor	CAB1100000020020108173626	5	18010105	11000000	16075	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Eureka Plain HU, Jacoby Creek watershed	River & Stream	CAR1100001319990617093415	5	18010102	11000000	19	Miles	Sediment	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Eureka Plain HU, Jacoby Creek watershed includes the following Calwater Planning Watersheds (PWS): 110.00010 and 110.00013. The beneficial uses of Jacoby Creek appear to be threatened. Specifically, records show a decline in the salmonid fishery in Jacoby Creek, and this decline appears to be correlated with sedimentation.
1	Hare Creek Beach	Coastal & Bay Shoreline	CAC1132004120081013222913	5	18010108	11320041	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Iron Gate Reservoir	Lake & Reservoir	CAL1053702320020720133707	5	18010206	10537023	1073	Acres	Cyanobacteria hepatotoxic microcystins	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Klamath River HU, Butte Valley HA	River & Stream	CAR1058103319990610123037	5	18010205	10580000	253	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Klamath River, from source to mouth, is listed as water quality impaired (by both Oregon and California) under Section 303(d) of the Federal Clean Water Act. In 1992 the California State Water Quality Control Board (SWQCB) proposed that the Klamath River be listed for both temperature and nutrients, requiring the development of total maximum daily load (TMDL) limits and implementation plans. The United States Environmental Protection Agency (USEPA) and the NCRWQCB accepted this action in 1993. The basis for listing the Klamath River as impaired was aquatic habitat degradation due to excessively warm water temperatures and algae blooms associated with high nutrient loads, water impoundments, and agricultural water diversions.
1	Klamath River HU, Butte Valley HA	River & Stream	CAR1058103319990610123037	5	18010205	10580000	253	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Klamath River, from source to mouth, is listed as water quality impaired (by both Oregon and California) under Section 303(d) of the Federal Clean Water Act. In 1992 the SWQCB proposed that the Klamath River be listed for both temperature and nutrients, requiring the development of total maximum daily load (TMDL) limits and implementation plans. The United States Environmental Protection Agency (USEPA) and the NCRWQCB accepted this action in 1993. The basis for listing the Klamath River as impaired was aquatic habitat degradation due to excessively warm water temperatures and algae blooms associated with high nutrient loads, water impoundments, and agricultural water diversions.
1	Klamath River HU, Lost River HA, Tule Lake and Mt Dome HSAs	River & Stream	CAR1059101019990217163525	4a	18010204	10590000	612	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-08	The Klamath River HU, Lost River HA, Tule Lake and Mt Dome includes the following Hydrologic Sub Areas (HSAs): Mt. Dome HSA 105.91 and Tule Lake HSA 105.92.
1	Klamath River HU, Lower HA, Klamath Glen HSA	River & Stream	CAR1051108619990608084033	5	18010102	10511000	609	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Klamath Falls (Oregon) municipal wastewater discharge, industrial facilities, and US Bureau of Reclamation pumped discharge of agricultural waste are significant sources of nutrient loads to the Klamath River as it enters California.
1	Klamath River HU, Lower HA, Klamath Glen HSA	River & Stream	CAR1051108619990608084033	5	18010102	10511000	609	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Klamath Falls (Oregon) municipal wastewater discharge, industrial facilities, and US Bureau of Reclamation pumped discharge of agricultural waste are significant sources of organic enrichment of Klamath River waters flowing to California.
1	Klamath River HU, Lower HA, Klamath Glen HSA	River & Stream	CAR1051108619990608084033	5	18010102	10511000	609	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			If this listing is determined to be on tribal lands, USEPA should place this water body and pollutant on the Section 303(d) List for the tribal lands. It is not the State Water Board's intent that this listing affect other actions related to decommissioning and removal of dams on the Klamath River
1	Klamath River HU, Lower HA, Klamath Glen HSA	River & Stream	CAR1051108619990608084033	5	18010102	10511000	609	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Flow regulation and diversion, coupled with reduced riparian vegetative cover and darker material on the channel bottom, all contribute to elevated water temperatures.
1	Klamath River HU, Middle HA and Lower HA, Scott River to Trinity River	River & Stream	CAR1053107519990610152950	5	18010211	10500000	1389	Miles	Cyanobacteria hepatotoxic microcystins	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-10			This listing applies to the mainstem Klamath River in the Klamath River Hydrologic Unit, Middle and Lower Klamath River Hydrologic Areas, Scott River to Trinity River reach.
1	Klamath River HU, Middle HA and Lower HA, Scott River to Trinity River	River & Stream	CAR1053107519990610152950	5	18010211	10500000	1389	Miles	Nutrients	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Scott River to Trinity River includes the following Hydrologic Sub Areas (HSAs) : Orleans HSA 105.12, Ukonom HSA 105.31, Happy Camp HSA 105.32, and Seiad Valley HSA 105.33
1	Klamath River HU, Middle HA and Lower HA, Scott River to Trinity River	River & Stream	CAR1053107519990610152950	5	18010211	10500000	1389	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Scott River to Trinity River includes the following Hydrologic Sub Areas (HSAs) : Orleans HSA 105.12, Ukonom HSA 105.31, Happy Camp HSA 105.32, and Seiad Valley HSA 105.33
1	Klamath River HU, Middle HA and Lower HA, Scott River to Trinity River	River & Stream	CAR1053107519990610152950	5	18010211	10500000	1389	Miles	Sediment	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Klamath River HU, Middle HA and Lower HA, Scott River to Trinity River	River & Stream	CAR1053107519990610152950	5	18010211	10500000	1389	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Scott River to Trinity River includes the following Hydrologic Sub Areas (HSAs) : Orleans HSA 105.12, Ukonom HSA 105.31, Happy Camp HSA 105.32, and Seiad Valley HSA 105.33 .
1	Klamath River HU, Middle HA, Iron Gate Dam to Scott River	River & Stream	CAR1053505320011215015907	5	18010208	10530000	548	Miles	Cyanobacteria hepatotoxic microcystins	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-10			This listing applies to the mainstem Klamath River in the Klamath River Hydrologic Unit, Middle Klamath River Hydrologic Area, Iron Gate Dam to Scott River reach.
1	Klamath River HU, Middle HA, Iron Gate Dam to Scott River	River & Stream	CAR1053505320011215015907	5	18010208	10530000	548	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Iron Gate Dam to Scott River includes the following Hydrologic Sub Areas (HSAs) : Beaver Creek HSA 105.35 and Hornbrook HSA 105.36. The Klamath River, from source to mouth, is listed as water quality impaired by both Oregon and California.
1	Klamath River HU, Middle HA, Iron Gate Dam to Scott River	River & Stream	CAR1053505320011215015907	5	18010208	10530000	548	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Iron Gate Dam to Scott River includes the following Hydrologic Sub Areas (HSAs) : Beaver Creek HSA 105.35 and Hornbrook HSA 105.36. The impairment listing regarding dissolved oxygen was prompted by a 1997 United States Fish and Wildlife Service Report.
1	Klamath River HU, Middle HA, Iron Gate Dam to Scott River	River & Stream	CAR1053505320011215015907	5	18010208	10530000	548	Miles	Sediment	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Klamath River HU, Middle HA, Iron Gate Dam to Scott River	River & Stream	CAR1053505320011215015907	5	18010208	10530000	548	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Iron Gate Dam to Scott River includes the following Hydrologic Sub Areas (HSAs) : Beaver Creek HSA 105.35 and Hornbrook HSA 105.36.
1	Klamath River HU, Middle HA, Oregon to Iron Gate	River & Stream	CAR1053702220011219001110	5	18010205	10530000	129	Miles	Cyanobacteria hepatotoxic microcystins	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			This listing applies to the mainstem Klamath River in the Klamath River Hydrologic Unit, Middle Klamath River Hydrologic Area, Oregon to Iron Gate reach, excluding the riverine reach from the Oregon border downstream to the beginning of Copco 1 Reservoir.
1	Klamath River HU, Middle HA, Oregon to Iron Gate	River & Stream	CAR1053702220011219001110	5	18010205	10530000	129	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Oregon to Iron Gate Dam includes the following Hydrologic Sub Areas (HSAs): Iron Gate HSA 115.37 and Copco HSA 105.38.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
1	Klamath River HU, Middle HA, Oregon to Iron Gate	River & Stream	CAR1053702220011219001110	5	18010205	10530000	129	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Oregon to Iron Gate Dam includes the following Hydrologic Sub Areas (HSAs): Iron Gate HSA 115.37 and Copco HSA 105.38.
1	Klamath River HU, Middle HA, Oregon to Iron Gate	River & Stream	CAR1053702220011219001110	5	18010205	10530000	129	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The Klamath River HU, Middle HA, Oregon to Iron Gate Dam includes the following Hydrologic Sub Areas (HSAs): Iron Gate HSA 115.37 and Copco HSA 105.38.
1	Klamath River HU, Salmon River HA	River & Stream	CAR1052103419990610171042	4a	18010211	10520000	694	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			29-Mar-06	In 2008, the "Klamath River Hydrologic Unit, Wooley Creek Hydrologic Sub-Area" was removed from the "Klamath River Hydrologic Unit, Salmon River Hydrologic Area" in order to consider delisting the Wooley Creek Watershed for temperature as monitoring data indicated there may be different conditions in the Wooley Creek Watershed than the rest of the Salmon River Watershed. Upon review of the available data, there was insufficient information to determined if conditions in the Wooley Creek Watershed were different from the rest of the Salmon River Watershed. Additionally, temperature data in the Wooley Creek Watershed showed an exceedance of the evaluation guideline. Therefore, it was determined that the waterbody-pollutant combination should not be removed from the Section 303(d) List because applicable water quality standards for the pollutant are being exceeded.
1	Klamath River HU, Salmon River HA, Wooley Creek HSA	River & Stream	CAR1052201020081010154452	4a	18010210	10522010	184	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			29-Mar-06	Previous to the 2008 Integrated Report, the Wooley Creek Hydrologic Sub-Area (HSA) was included as part of the Klamath River Hydrologic Unit, Salmon River Hydrologic Area.
1	Klamath River HU, Scott River HA	River & Stream	CAR1054103519980707120412	4a	18010210	10540000	902	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			08-Sep-06	
1	Klamath River HU, Scott River HA	River & Stream	CAR1054103519980707120412	4a	18010210	10540000	902	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			08-Sep-06	
1	Klamath River HU, Shasta River HA	River & Stream	CAR1055000119990528113804	4a	18010208	10550000	630	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-Jan-07	
1	Klamath River HU, Shasta River HA	River & Stream	CAR1055000119990528113804	4a	18010208	10550000	630	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-Jan-07	
1	Klamath River HU, Tule Lake and Lower Klamath Lake National Wildlife Refuge	Lake & Reservoir	CAL1059102020020130221305	4a	18010204	10590000	26998	Acres	pH (high)	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-08	The Klamath River HU, Tule Lake and Lower Klamath Lake National Wildlife Refuge includes the following Calwater Planning Watersheds (PWS): Lower Klamath Lake National Wildlife Refuge PWS 105.91020 and Tule Lake PWS 105.92020.
1	Luffenholtz Beach	Coastal & Bay Shoreline	CAC1081001220070319155307	5	18010102	10810012	0	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Mad River HU, Mad River	River & Stream	CAR1091001119980706155140	4a	18010104	10900000	654	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Dec-07	
1	Mad River HU, Mad River	River & Stream	CAR1091001119980706155140	4a	18010104	10900000	654	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Dec-07	
1	Mad River HU, Mad River	River & Stream	CAR1091001119980706155140	4a	18010104	10900000	654	Miles	Turbidity	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Dec-07	
1	Mendocino Coast HU, Albion River HA, Albion River	River & Stream	CAR1134001319980708180108	5	18010108	11340000	91	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			31-Dec-01	
1	Mendocino Coast HU, Albion River HA, Albion River	River & Stream	CAR1134001319980708180108	5	18010108	11340000	91	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Mendocino Coast HU, Big River HA, Big River	River & Stream	CAR1133004319980708174237	5	18010108	11330000	225	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Nov-04	
1	Mendocino Coast HU, Big River HA, Big River	River & Stream	CAR1133004319980708174237	5	18010108	11330000	225	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Big River include uses associated with the cold water fishery and municipal and domestic supply. The Big River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Populations of coho salmon and steelhead trout in the Big River are extremely low compared to historical levels. Recent (1996-2000) temperature data gathered in the Big River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the river. This listing is specific to the area of the watershed from the confluence with the North Fork Big River, including the watersheds of the mainstem Big River and the North Fork Big River.
1	Mendocino Coast HU, Garcia River HA, Garcia River	River & Stream	CAR1137002619980709103133	5	18010109	11370000	154	Miles	Sediment	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			07-Mar-02	
1	Mendocino Coast HU, Garcia River HA, Garcia River	River & Stream	CAR1137002619980709103133	5	18010109	11370000	154	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Elevated temperatures impacting cold water fisheries in these reaches and sub_areas: Planning Units 113.70010 (Pardaloe Creek), 113.70011, 12, 13, 14, 20, 21 and the entire mainstem Garcia River from Pardaloe Creek to the estuary, which includes that portion of 113.70022, 23, 24, 25, and 26. February 2002- The Garcia River TMDL for sediment has been adopted by NCRWQCB and approved by SWRCB and Office of Administrative Law. It is possible that voluntary compliance with measures in this TMDL will improve conditions related to temperature prior to development of a TMDL for temperature.
1	Mendocino Coast HU, Gualala River HA, Gualala River	River & Stream	CAR1138502119980709123111	5	18010109	11380000	455	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Mendocino Coast HU, Gualala River HA, Gualala River	River & Stream	CAR1138502119980709123111	5	18010109	11380000	455	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-04	
1	Mendocino Coast HU, Gualala River HA, Gualala River	River & Stream	CAR1138502119980709123111	5	18010109	11380000	455	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Recent (1994-2000) temperature data collected in the Gualala River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed. Temperatures in the Little North Fork are generally below threshold levels and appear to exhibit properly functioning conditions with respect to stream temperature. The Gualala River is listed for temperature, with the exception of the Little North Fork.
1	Mendocino Coast HU, Navarro River HA	River & Stream	CAR1135007719980709093957	4a	18010109	11350000	415	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Feb-00	Sediment TMDLs have been developed for: (1) the area tributary to and including the Navarro River above Philo and (2) the area tributary to and including the Navarro River below Philo
1	Mendocino Coast HU, Navarro River HA	River & Stream	CAR1135007719980709093957	4a	18010109	11350000	415	Miles	Temperature, water	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Dec-00	
1	Mendocino Coast HU, Navarro River HA, Delta	Estuary	CAE1135007719990217142112	4a	18010108	11350077	48	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Dec-00	
1	Mendocino Coast HU, Noyo River HA, Noyo River	River & Stream	CAR1132004019980708170110	5	18010108	11320000	144	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Dec-99	
1	Mendocino Coast HU, Noyo River HA, Noyo River	River & Stream	CAR1132004019980708170110	5	18010108	11320000	144	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing only applies to the following areas of the Noyo River watershed: (1) The Noyo River mainstem from the confluence of Duffy Gulch downstream to the confluence with Hayshed Gulch; (2) The South Fork Noyo River mainstem from the confluence of Kass Creek downstream to the confluence with Noyo River mainstem; and (3) The Little North Fork Noyo River, Duffy Gulch, and Kass Creek tributaries.
1	Mendocino Coast HU, Noyo River HA, Pudding Creek	River & Stream	CAR1132005020020227182345	5	18010108	11320050	24	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Mendocino Coast HU, Rockport HA, Ten Mile River HSA	River & Stream	CAR1131304519980708163410	5	18010108	11310000	162	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Dec-00	
1	Mendocino Coast HU, Rockport HA, Ten Mile River HSA	River & Stream	CAR1131304519980708163410	5	18010108	11310000	162	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Moonstone County Park	Coastal & Bay Shoreline	CAC1081001220070319154339	5	18010102	10820012	0	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Pudding Creek Beach	Coastal & Bay Shoreline	CAC1132005020081013224604	5	18010108	11320050	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
1	Redwood Creek HU, Redwood Creek	River & Stream	CAR1071002019990528100152	5	18010102	10700000	332	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Dec-98	
1	Redwood Creek HU, Redwood Creek	River & Stream	CAR1071002019990528100152	5	18010102	10700000	332	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Russian River HU, Lower Russian River HA, Austin Creek HSA	River & Stream	CAR1141201419990614115350	5	18010109	11412000	81	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
1	Russian River HU, Lower Russian River HA, Austin Creek HSA	River & Stream	CAR1141201419990614115350	5	18010109	11412000	81	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Lower Russian River HA, Guerneville HSA	River & Stream	CAR1141104119990614110247	5	18010111	11411000	195	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			This listing covers the mainstem Russian River from the confluence of Dutch Bill Creek to the confluence of Fife Creek. The pollutant for this listing was named as "pathogens" prior to 2008.
1	Russian River HU, Lower Russian River HA, Guerneville HSA	River & Stream	CAR1141104119990614110247	5	18010111	11411000	195	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing applies to the entire Russian River HU, Lower Russian River HA, Guerneville HSA except for the Pocket Canyon Creek watershed.
1	Russian River HU, Lower Russian River HA, Guerneville HSA	River & Stream	CAR1141104119990614110247	5	18010111	11411000	195	Miles	Temperature, water	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Russian River HU, Lower Russian River HA, Guerneville HSA, Green Valley Creek watershed	River & Stream	CAR1141101320081204231407	5	18010111	11411013	39	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
1	Russian River HU, Lower Russian River HA, Guerneville HSA, Green Valley Creek watershed	River & Stream	CAR1141101320081204231407	5	18010111	11411013	39	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	River & Stream	CAR1142602319990614155325	5	18010110	11426000	85	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
1	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	River & Stream	CAR1142602319990614155325	5	18010110	11426000	85	Miles	Specific Conductivity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	River & Stream	CAR1142602319990614155325	5	18010110	11426000	85	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Middle Russian River HA, Geyserville HSA	River & Stream	CAR1142503219990615082353	5	18010110	11425000	242	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			The listing applies to the mainstem Russian River from the railroad bridge to the Highway 101 bridge and to Stream 1 on Fitch Mountain. The mainstem Russian River listing was included in the Guerneville HSA listing previous to 2008.
1	Russian River HU, Middle Russian River HA, Geyserville HSA	River & Stream	CAR1142503219990615082353	5	18010110	11425000	242	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
1	Russian River HU, Middle Russian River HA, Geyserville HSA	River & Stream	CAR1142503219990615082353	5	18010110	11425000	242	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-12			In 2008, the name of this pollutant was changed from "pathogens" to "indicator bacteria."
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Nitrogen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Oxygen, Dissolved	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			The Laguna de Santa Rosa was added to the 303(d) List in 1990 for high levels of ammonia and low dissolved oxygen (DO) concentrations. A TMDL was completed for the Laguna for ammonia and dissolved oxygen in 1995. The TMDL concluded that high ammonia levels in the Laguna were the result of point and non-point source nitrogen inputs of various forms. Low dissolved oxygen concentrations were a result of inputs of organic matter and nutrients which stimulate algal growth and subsequently cause depressed dissolved oxygen levels when the algae dies and decays. The TMDL took the form of a Waste Reduction Strategy (WRS) which addressed the reduction of nitrogen loading from point and non-point sources. With the implementation of the WRS and operational improvements at the City of Santa Rosa Waste Water Treatment Plant as well as improvements in waste storage and disposal activities at local dairies, nitrogen inputs to the Laguna were significantly reduced. Following implementation of the WRS and the subsequent attainment of nitrogen-ammonia interim concentration goals, as stated in the WRS, the Laguna was removed from the 303(d) List for ammonia and dissolved oxygen in 1998, pursuant to a recommendation by US EPA. However, dissolved oxygen levels in the Laguna continue to fall below the Regional Water Board Basin Plan minimum DO objective of 7.0 mg/L and in many cases fluctuate significantly on a daily and seasonal basis. Based on available information, it appears that phosphorus may contribute to the dissolved oxygen fluctuations. However, the cause of the low dissolved oxygen levels is not certain. While elevated phosphorus levels may contribute to low DO, nitrogen to phosphorus ratios, based on recent Laguna measurements, indicate that nitrogen may be the macronutrient controlling plant growth in the Laguna. A TMDL addressing nutrients (both nitrogen and phosphorus) and dissolved oxygen is necessary for water quality objective attainment.
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			The entire Russian River watershed (including the Laguna de Santa Rosa) is listed for sedimentation.
1	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	River & Stream	CAR1142102019980709171122	5	18010111	11421000	96	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-12			Entire Russian River watershed (including Laguna de Santa Rosa) is listed for temperature. The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Middle Russian River HA, Mark West Creek HSA	River & Stream	CAR1142302119990614151221	5	18010110	11423000	99	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-12			Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
1	Russian River HU, Middle Russian River HA, Mark West Creek HSA	River & Stream	CAR1142302119990614151221	5	18010110	11423000	99	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-12			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Middle Russian River HA, Santa Rosa Creek	River & Stream	CAR1142201319990614135920	5	18010110	11422000	87	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
1	Russian River HU, Middle Russian River HA, Santa Rosa Creek	River & Stream	CAR1142201319990614135920	5	18010110	11422000	87	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-12			The entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
1	Russian River HU, Middle Russian River HA, Santa Rosa Creek	River & Stream	CAR1142201319990614135920	5	18010110	11422000	87	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-12			The entire Russian River watershed (including Santa Rosa Creek) is listed for temperature.
1	Russian River HU, Middle Russian River HA, Warm Springs HSA	River & Stream	CAR1142403419990615103858	5	18010110	11424000	255	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
1	Russian River HU, Middle Russian River HA, Warm Springs HSA	River & Stream	CAR1142403419990615103858	5	18010110	11424000	255	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Middle Russian River HA, Warm Springs HSA, Lake Sonoma [Reservoir]	Lake & Reservoir	CAL1142403020020720145307	5	18010110	11424000	2377	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			The Russian River HU, Middle Russian River HA, Warm Springs HSA, Lake Sonoma [Reservoir] includes the following Calwater Planning Watersheds (PWS): 114.24022, 114.24030 and 114.24032.
1	Russian River HU, Upper Russian River HA, Coyote Valley HSA	River & Stream	CAR1143206019990615153325	5	18010110	11432000	171	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
1	Russian River HU, Upper Russian River HA, Coyote Valley HSA	River & Stream	CAR1143206019990615153325	5	18010110	11432000	171	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Upper Russian River HA, Coyote Valley HSA, Lake Mendocino [Reservoir]	Lake & Reservoir	CAL1143206020020720145403	5	18010110	11432060	1704	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
1	Russian River HU, Upper Russian River HA, Forsythe Creek HSA	River & Stream	CAR1143304019990615161317	5	18010110	11433000	122	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
1	Russian River HU, Upper Russian River HA, Forsythe Creek HSA	River & Stream	CAR1143304019990615161317	5	18010110	11433000	122	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Russian River HU, Upper Russian River HA, Ukiah HSA	River & Stream	CAR1143107119990615121503	5	18010110	11431000	460	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
1	Russian River HU, Upper Russian River HA, Ukiah HSA	River & Stream	CAR1143107119990615121503	5	18010110	11431000	460	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Temperature data collected from 1997 to 2000 in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed.
1	Shastina, Lake	Lake & Reservoir	CAL1055007720020720134715	5	18010207	10550077	1414	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
1	Trinidad State Beach	Coastal & Bay Shoreline	CAC1081001220070319161337	5	18010102	10810012	1	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Trinity Lake (was Claire Engle Lake)	Lake & Reservoir	CAL1064007420020720144409	5	18010211	10640000	15985	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Trinity River HU, Lower Trinity HA	River & Stream	CAR1061103419990607150231	4a	18010212	10610000	1256	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Dec-01	
1	Trinity River HU, Middle HA	River & Stream	CAR1063102119990604163706	4a	18010211	10630000	331	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Dec-01	
1	Trinity River HU, South Fork HA	River & Stream	CAR1062302019990216114308	5	18010104	10620000	1161	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Dec-01	
1	Trinity River HU, South Fork HA	River & Stream	CAR1062302019990216114308	5	18010104	10620000	1161	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
1	Trinity River HU, Upper HA	River & Stream	CAR1064000319990607101807	4a	18010211	10640000	570	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Dec-01	
1	Trinity River HU, Upper HA, Trinity River, East Fork	River & Stream	CAR1064003020021003231112	5	18010211	10640000	92	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Trinity River HU, Upper HA, Trinity River, East Fork includes the following Calwater Super Planning Watersheds (SPWs): Mumbo Creek SPW 106.40030 and Blue Ridge SPW 106.40040.
1	Trinity River HU, Upper HA, Trinity River, East Fork	River & Stream	CAR1064003020021003231112	5	18010211	10640000	92	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Dec-01	The Trinity River HU, Upper HA, Trinity River, East Fork includes the following Calwater Super Planning Watersheds (SPWs): Mumbo Creek SPW 106.40030 and Blue Ridge SPW 106.40040.
2	Alameda Creek	River & Stream	CAR2043005119990218134634	4a	18050003	20430051	39	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Alamitos Creek	River & Stream	CAR2054004119980928110616	5	18050003	20540041	7	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Almaden Lake	Lake & Reservoir	CAL2054005020080714115011	5	18050003	20540050	21	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Almaden Reservoir	Lake & Reservoir	CAL2054003020000304125701	5	18050003	20540030	52	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Anderson Reservoir	Lake & Reservoir	CAL2053005020000304122049	5	18050003	20530050	1013	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Anderson Reservoir	Lake & Reservoir	CAL2053005020000304122049	5	18050003	20530050	1013	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Aquatic Park Beach	Coastal & Bay Shoreline	CAC2034001020070321140604	5	18050002	20340010	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Arroyo Corte Madera Del Presidio	River & Stream	CAR2032002020000413134900	4a	18050002	20320020	4	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Arroyo De La Laguna	River & Stream	CAR2043008419990218135005	4a	18050004	20430084	7	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Arroyo Del Valle	River & Stream	CAR2043002319990218135233	4a	18050004	20430023	31	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Arroyo Las Positas	River & Stream	CAR2043008020010905115005	5	18050004	20430080	14	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Arroyo Las Positas	River & Stream	CAR2043008020010905115005	5	18050004	20430080	14	Miles	Nutrient/Eutrophication Biological Indicators	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	Arroyo Mocho	River & Stream	CAR2043008020010905115519	5	18050004	20430080	34	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Arroyo Mocho	River & Stream	CAR2043008020010905115519	5	18050004	20430080	34	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Baxter Creek (Contra Costa County)	River & Stream	CAR2066001320080626144111	5	18050002	20330011	1	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Bon Tempe Reservoir	Lake & Reservoir	CAL2011302020050519182103	5	18050005	20113020	120	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Butano Creek	River & Stream	CAR2024003020000413112319	5	18050006	20240031	4	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			Impairment to steelhead habitat.
2	Calabazas Creek	River & Stream	CAR2064001219990218114210	4a	18050002	20640012	5	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Calaveras Reservoir	Lake & Reservoir	CAL2043004920091208101255	5	18050004	20430049	1501	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Calero Reservoir	Lake & Reservoir	CAL2054003119980928111759	5	18050003	20540031	334	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Candlestick Point	Coastal & Bay Shoreline	CAC2044001120070321142147	5	18050004	20440011	2	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006. This listing includes the area of Candlestick Point at Jackrabbit Beach, Windsurfer Circle, and Sunnydale Cove.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6, 7,8,-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish is in place.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Carquinez Strait	Estuary	CAE2071002019980928134605	5	18050001	20710020	5657	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	Castro Cove, Richmond (San Pablo Basin)	Estuary	CAE2066001420020530174802	4b	18050002	20660014	71	Acres	Dieldrin (sediment)	Pesticides	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-10		
2	Castro Cove, Richmond (San Pablo Basin)	Estuary	CAE2066001420020530174802	4b	18050002	20660014	71	Acres	Mercury (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-10		
2	Castro Cove, Richmond (San Pablo Basin)	Estuary	CAE2066001420020530174802	4b	18050002	20660014	71	Acres	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-10		
2	Castro Cove, Richmond (San Pablo Basin)	Estuary	CAE2066001420020530174802	4b	18050002	20660014	71	Acres	Selenium (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-10		
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Mercury (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish in place.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Central Basin, San Francisco (part of SF Bay, Lower)	Bay & Harbor	CAB2044001020020930154937	5	18050004	20440010	40	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	Cerrito Creek	River & Stream	CAR2033001120080624162810	5	18050002	20330011	2	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Chicken Ranch Beach	Coastal & Bay Shoreline	CAC2011403320070320160601	5	18050005	20114033	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-10			This listing was made by USEPA for 2006.
2	China Camp Beach	Coastal & Bay Shoreline	CAC2032001220070320145548	5	18050002	20610010	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Codornices Creek	River & Stream	CAR2033001120080624162950	5	18050002		2	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Codornices Creek	River & Stream	CAR2033001120080624162950	5	18050002		2	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Colma Creek	River & Stream	CAR2044002020080624163112	5	18050004	20440020	4	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Corte Madera Creek	River & Stream	CAR2032001119990218112526	4a	18050002	20320011	4	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Coyote Creek (Marin County)	River & Stream	CAR2032002019990219110049	4a	18050002	20320020	3	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	Coyote Creek (Santa Clara Co.)	River & Stream	CAR2053002119990218112824	5	18050003	20530021	55	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Coyote Creek (Santa Clara Co.)	River & Stream	CAR2053002119990218112824	5	18050003	20530021	55	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Crissy Field Beach	Coastal & Bay Shoreline	CAC2031201020070321145701	5	18050002	20340010	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006. This listing includes the east and west areas of Crissy Field.
2	Damon Slough	River & Stream	CAR2042004020080626134918	5	18050004	20420040	1	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Del Valle Reservoir	Lake & Reservoir	CAL2043002420050519181540	5	18050004	20430024	1022	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Del Valle Reservoir	Lake & Reservoir	CAL2043002420050519181540	5	18050004	20430024	1022	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Gallinas Creek	River & Stream	CAR2062001320000413113524	4a	18050002	20620013	2	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Golden Hinde Beach	Coastal & Bay Shoreline	CAC2011403320070321181528	5	18050005	20114033	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Grayson Creek	River & Stream	CAR2073301020080624163514	5	18050001		7	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Guadalupe Creek	River & Stream	CAR2054005019980929112519	5	18050003	20540050	8	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Guadalupe Reservoir	Lake & Reservoir	CAL2054004019980928155642	5	18050003	20540040	63	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Guadalupe River	River & Stream	CAR2054005019980928160437	5	18050003	20540050	18	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Guadalupe River	River & Stream	CAR2054005019980928160437	5	18050003	20540050	18	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Guadalupe River	River & Stream	CAR2054005019980928160437	5	18050003	20540050	18	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Hearts Desire Beach	Coastal & Bay Shoreline	CAC2011403320070320164103	5	18050005	20114033	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-10			This listing was made by USEPA for 2006.
2	Islais Creek	Estuary	CAE2044001020020129151927	5	18050004	20440010	46	Acres	Ammonia	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Islais Creek	Estuary	CAE2044001020020129151927	5	18050004	20440010	46	Acres	Chlordane (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Islais Creek	Estuary	CAE2044001020020129151927	5	18050004	20440010	46	Acres	Dieldrin (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Islais Creek	Estuary	CAE2044001020020129151927	5	18050004	20440010	46	Acres	Hydrogen Sulfide	Other Inorganics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Islais Creek	Estuary	CAE2044001020020129151927	5	18050004	20440010	46	Acres	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Islais Creek	Estuary	CAE2044001020020129151927	5	18050004	20440010	46	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Kirker Creek	River & Stream	CAR2073104020080624164244	5	18050001	20731040	4	Miles	Pyrethroids	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
2	Kirker Creek	River & Stream	CAR2073104020080624164244	5	18050001	20731040	4	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Kirker Creek	River & Stream	CAR2073104020080624164244	5	18050001	20731040	4	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Lafayette Reservoir	Lake & Reservoir	CAL2073201020050519182313	5	18050001	20732010	114	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Lafayette Reservoir	Lake & Reservoir	CAL2073201020050519182313	5	18050001	20732010	114	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Lagunitas Creek	River & Stream	CAR2011302019980928162224	5	18050005	20113020	17	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.
2	Lagunitas Creek	River & Stream	CAR2011302019980928162224	5	18050005	20113020	17	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-07	
2	Lagunitas Creek	River & Stream	CAR2011302019980928162224	5	18050005	20113020	17	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.
2	Lake Chabot (Alameda Co)	Lake & Reservoir	CAL2042003020060515154933	5	18050004	20420030	312	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Lake Chabot (Alameda Co)	Lake & Reservoir	CAL2042003020060515154933	5	18050004	20420030	312	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Lake Chabot (Alameda Co)	Lake & Reservoir	CAL2042003020060515154933	5	18050004	20420030	312	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Lake Chabot (Alameda Co)	Lake & Reservoir	CAL2042003020060515154933	5	18050004	20420030	312	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Lake Chabot (Alameda Co)	Lake & Reservoir	CAL2042003020060515154933	5	18050004	20420030	312	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Lake Herman	Lake & Reservoir	CAL2072103019980928163418	5	18050001	20721030	108	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Additional monitoring and assessment needed. Problem due to historical mining.
2	Lake Merced	Lake & Reservoir	CAL2021001020020315204138	5	18050006	20210010	299	Acres	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
2	Lake Merced	Lake & Reservoir	CAL2021001020020315204138	5	18050006	20210010	299	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
2	Lake Merritt	Lake & Reservoir	CAL2042004019990218150956	5	18050004	20420040	142	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
2	Lake Merritt	Lake & Reservoir	CAL2042004019990218150956	5	18050004	20420040	142	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Laurel Creek (Solano Co)	River & Stream	CAR2044003319990218111511	4a	18050004	20440040	3	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Lawsons Landing	Coastal & Bay Shoreline	CAC2011203020070321183048	5	18050005	20112030	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Ledgewood Creek	River & Stream	CAR2072301019990218111805	4a	18050001	20723010	12	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Los Gatos Creek (R2)	River & Stream	CAR2054001119990218114518	4a	18050003	20540011	19	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Marina Lagoon (San Mateo County)	Estuary	CAE2044004020011017115908	5	18050004	20440040	169	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Matadero Creek	River & Stream	CAR2055004019990218130228	5	18050003	20550040	7	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Matadero Creek	River & Stream	CAR2055004019990218130228	5	18050003	20550040	7	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	McNears Beach	Coastal & Bay Shoreline	CAC2061001020070321190945	5	18050002	20610010	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Miller Creek	River & Stream	CAR2062001219990219101448	4a	18050005	20620012	9	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Millerton Point	Coastal & Bay Shoreline	CAC2011203220070321184816	5	18050005	20112032	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Chlordane (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Dieldrin (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Hydrogen Sulfide	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Lead (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Mercury (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	PAHs (Polycyclic Aromatic Hydrocarbons)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	PCBs (Polychlorinated biphenyls) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Silver (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mission Creek	Estuary	CAE2044001020020129151327	5	18050004	20440010	8	Acres	Zinc (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Mt. Diablo Creek	River & Stream	CAR2073104019990217163214	5	18050001	20731040	13	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Mt. Diablo Creek	River & Stream	CAR2073104019990217163214	5	18050001	20731040	13	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Napa River	River & Stream	CAR2065001019980928164417	5	18050002	20650010	65	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
2	Napa River	River & Stream	CAR2065001019980928164417	5	18050002	20650010	65	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.
2	Napa River	River & Stream	CAR2065001019980928164417	5	18050002	20650010	65	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-08			TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	Nicasio Reservoir	Lake & Reservoir	CAL2011301220050519182548	5	18050005	20113012	829	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Novato Creek	River & Stream	CAR2062001019990218113321	4a	18050002	20620010	17	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Chlordane (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish; uncertainty regarding water column concentration data.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	PCBs (Polychlorinated biphenyls) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish; uncertainty regarding water column concentration data.
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930181423	5	18050004	20420040	1	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Chlordane (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Copper (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Dieldrin (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA. □
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Lead (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Mercury (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish; uncertainty regarding water column concentration data.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	PCBs (Polychlorinated biphenyls) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930184151	5	18050004	20420040	2	Acres	Zinc (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Old Alameda Creek	River & Stream	CAR2042004020090201230919	5	18050004	20420040	11	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Olema Creek	River & Stream	CAR2011303020070615132740	4a	18050005	20113030	11	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-07	For 2006, this listing was added by USEPA to this being addressed list because of a completed USEPA approved TMDL.
2	Pacific Ocean at Baker Beach	Coastal & Bay Shoreline	CAX2034001020020115153523	5	18050002	20340010	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006. This listing includes the area of Baker Beach at Lobos Creek, Horseshoe Cove NW and NE.
2	Pacific Ocean at Bolinas Beach	Coastal & Bay Shoreline	CAC2013001120070320140924	5	18050005	20130011	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
2	Pacific Ocean at Fitzgerald Marine Reserve	Coastal & Bay Shoreline	CAX2022101220020117093910	5	18050006	20221012	0	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	Pacific Ocean at Muir Beach	Coastal & Bay Shoreline	CAC2013001320070321192155	5	18050005	20130013	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA for 2006.
2	Pacific Ocean at Pacifica State/Linda Mar Beach	Coastal & Bay Shoreline	CAX2022101120011017111429	5	18050006	20221011	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Linda Mar and San Pedro beaches are the areas affected.
2	Pacific Ocean at Pillar Point	Coastal & Bay Shoreline	CAC2022101220050916171253	5	18050006	20221012	1	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Pacific Ocean at Pillar Point Beach	Coastal & Bay Shoreline	CAX2022101220011017105702	5	18050006	20221012	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Pacific Ocean at Rockaway Beach	Coastal & Bay Shoreline	CAX2022101120011017111055	5	18050006	20221011	0	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
2	Pacific Ocean at Venice Beach	Coastal & Bay Shoreline	CAX2022201120011017105036	5	18050006	20222011	0	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Permanente Creek	River & Stream	CAR2055002119990218132449	5	18050003	20550021	13	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Permanente Creek	River & Stream	CAR2055002119990218132449	5	18050003	20550021	13	Miles	Selenium, Total	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Permanente Creek	River & Stream	CAR2055002119990218132449	5	18050003	20550021	13	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Permanente Creek	River & Stream	CAR2055002119990218132449	5	18050003	20550021	13	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Pescadero Creek	River & Stream	CAR2024001319980929143113	5	18050006	20240013	26	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-16			If California Department of Fish and Game and the National Marine Fisheries Service find that for this water body fish populations are not impacted, the State Water Board supports removing this water body and pollutant from the list.
2	Petaluma River	River & Stream	CAR2063002019980928165716	5	18050002	20630020	22	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Data source: Abelli-Amen, Petaluma Tree Planters, 1999.
2	Petaluma River	River & Stream	CAR2063002019980928165716	5	18050002	20630020	22	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.
2	Petaluma River	River & Stream	CAR2063002019980928165716	5	18050002	20630020	22	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Petaluma River	River & Stream	CAR2063002019980928165716	5	18050002	20630020	22	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Petaluma River	River & Stream	CAR2063002019980928165716	5	18050002	20630020	22	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Petaluma River (tidal portion)	River & Stream	CAR2063004020020916200425	5	18050002	20630040	1	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Petaluma River (tidal portion)	River & Stream	CAR2063004020020916200425	5	18050002	20630040	1	Miles	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Exceedance of California Toxic Rule dissolved criteria and National Toxic Rule total criteria; elevated water and sediment tissue levels.
2	Petaluma River (tidal portion)	River & Stream	CAR2063004020020916200425	5	18050002	20630040	1	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.
2	Petaluma River (tidal portion)	River & Stream	CAR2063004020020916200425	5	18050002	20630040	1	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment needed.
2	Pine Creek (Contra Costa Co)	River & Stream	CAR2073101119990218101152	4a	18050001	20731011	13	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Pinole Creek	River & Stream	CAR2066002019990218104959	4a	18050002	20660020	9	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Pomponio Creek	River & Stream	CAR2024002020010905115819	5	18050006	20240020	7	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6, 7,8,-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish in place.
2	Richardson Bay	Bay & Harbor	CAB2031201019980929120559	5	18050002	20312010	2439	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Rindler Creek	River & Stream	CAR2065007120080626111147	5	18050002	20650071	6	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Rodeo Creek (Contra Costa County)	River & Stream	CAR2066002219990219092843	4a	18050001	20660022	8	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6, 7,8,-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs.Interim health advisory for fish.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Sacramento San Joaquin Delta	Estuary	CAE2071001019980929134510	5	18050001	20710010	41736	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	San Antonio Creek (Marin/Sonoma Co)	River & Stream	CAR2063003019990218113646	4a	18050002	20630031	18	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	San Felipe Creek	River & Stream	CAR2053004119990218133351	4a	18050003	20530041	15	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish in place.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	San Francisco Bay, Central	Bay & Harbor	CAB2031201019981217171707	5	18050004	20312010	70992	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6, 7,8,-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources: water quality objective exceedances. Elevated sediment levels and elevated tissue levels.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish in place.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	San Francisco Bay, Lower	Bay & Harbor	CAB2041001019980925131322	5	18050004	20410010	92274	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources: water quality objective exceedances. Elevated sediment level and elevated tissue levels.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish in place.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	San Francisco Bay, South	Bay & Harbor	CAB2051000019980916164839	5	18050003	20510000	9204	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			A formal health advisory has been issued by OEHHA for benthic-feeding ducks in South San Francisco Bay. This health advisory clearly establishes that water contact recreation beneficial use (REC-1) is not fully supported and standards are not fully met.
2	San Francisquito Creek	River & Stream	CAR2055004019980929144005	5	18050003	20550040	12	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Francisquito Creek	River & Stream	CAR2055004019980929144005	5	18050003	20550040	12	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Impairment to steelhead habitat.
2	San Francisquito Creek	River & Stream	CAR2055004019980929144005	5	18050003	20550040	12	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Gregorio Creek	River & Stream	CAR2023001419980929144335	5	18050006	20230014	11	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Gregorio Creek	River & Stream	CAR2023001419980929144335	5	18050006	20230014	11	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Impairment to steelhead habitat.
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Chlordane	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Lead (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Mercury (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Pesticides (sediment)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Leandro Bay (part of SF Bay, Lower)	Bay & Harbor	CAB2042004020020930194957	5	18050004	20420040	588	Acres	Zinc (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Leandro Creek, Lower	River & Stream	CAR2042001219990218140451	5	18050004	20420012	9	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Leandro Creek, Lower	River & Stream	CAR2042001219990218140451	5	18050004	20420012	9	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Lorenzo Creek	River & Stream	CAR2042002319990218140753	4a	18050004	20420023	11	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Mateo Creek	River & Stream	CAR2044003219990219102616	5	18050004	20440032	5	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Mateo Creek	River & Stream	CAR2044003219990219102616	5	18050004	20440032	5	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Mateo Creek, Lower	River & Stream	CAR2044003320090202015405	5	18050004	20440033	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA in 1998.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6, 7,8,-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non dioxin-like PCBs. Interim health advisory for fish in place.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5,-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	San Pablo Bay	Bay & Harbor	CAB2061001019980928100945	5	18050002	20610010	68349	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	San Pablo Creek	River & Stream	CAR2066001419990219094913	5	18050002	20660014	10	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Pablo Creek	River & Stream	CAR2066001419990219094913	5	18050002	20660014	10	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Pablo Reservoir	Lake & Reservoir	CAL2066001220020129134014	5	18050002	20660012	784	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Pablo Reservoir	Lake & Reservoir	CAL2066001220020129134014	5	18050002	20660012	784	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Pablo Reservoir	Lake & Reservoir	CAL2066001220020129134014	5	18050002	20660012	784	Acres	Heptachlor epoxide	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Pablo Reservoir	Lake & Reservoir	CAL2066001220020129134014	5	18050002	20660012	784	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	San Pablo Reservoir	Lake & Reservoir	CAL2066001220020129134014	5	18050002	20660012	784	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Pablo Reservoir	Lake & Reservoir	CAL2066001220020129134014	5	18050002	20660012	784	Acres	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	San Pedro Creek	River & Stream	CAR2022101120010905120841	5	18050006	20221011	2	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
2	San Rafael Creek	River & Stream	CAR2032001220000413114045	4a	18050002	20320012	4	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	San Tomas Aquinas Creek	River & Stream	CAR2055004020080624165713	5	18050003	20550040	9	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	San Vicente Creek	River & Stream	CAR2022101220010905121128	5	18050006	20221012	4	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Saratoga Creek	River & Stream	CAR2055004019990218133956	5	18050003	20550040	18	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Saratoga Creek	River & Stream	CAR2055004019990218133956	5	18050003	20550040	18	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Sausal Creek	River & Stream	CAR2042003020080624165925	5	18050004	20420030	3	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Shadow Cliffs Reservoir	Lake & Reservoir	CAL2043008020050624182314	5	18050004	20430080	90	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Shadow Cliffs Reservoir	Lake & Reservoir	CAL2043008020050624182314	5	18050004	20430080	90	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Silver Creek (Santa Clara County)	River & Stream	CAR2053008020080624170225	5	18050003		4	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Sonoma Creek	River & Stream	CAR2064005019980916140112	5	18050002	20640050	30	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
2	Sonoma Creek	River & Stream	CAR2064005019980916140112	5	18050002	20640050	30	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Feb-08	
2	Sonoma Creek	River & Stream	CAR2064005019980916140112	5	18050002	20640050	30	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Soulajule Reservoir	Lake & Reservoir	CAL2011201220050602211738	5	18050005	20112012	49	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Soulajule Reservoir	Lake & Reservoir	CAL2011201220050602211738	5	18050005	20112012	49	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	Chlordane	Pesticides	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	Copper	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	Dacthal	Pesticides	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	Dieldrin	Pesticides	Do Not Delist from 303(d) list (being addressed with action other than TMDL)	5C		01-Jan-19		
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (being addressed with action other than TMDL)	5C		01-Jan-19		
2	Stege Marsh	Estuary	CAE2033001120020129144149	4b	18050002	20330011	29	Acres	Zinc	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
2	Stevens Creek	River & Stream	CAR2055002019990218134341	5	18050003	20550020	20	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Stevens Creek	River & Stream	CAR2055002019990218134341	5	18050003	20550020	20	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Stevens Creek	River & Stream	CAR2055002019990218134341	5	18050003	20550020	20	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Stevens Creek	River & Stream	CAR2055002019990218134341	5	18050003	20550020	20	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Stevens Creek Reservoir	Lake & Reservoir	CAL2055003120050519182844	5	18050003	20550031	85	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Stevens Creek Reservoir	Lake & Reservoir	CAL2055003120050519182844	5	18050003	20550031	85	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Stevens Creek Reservoir	Lake & Reservoir	CAL2055003120050519182844	5	18050003	20550031	85	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Stevens Creek Reservoir	Lake & Reservoir	CAL2055003120050519182844	5	18050003	20550031	85	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
2	Strawberry Creek (Alameda County)	River & Stream	CAR2033001020080626110746	5	18050002	20330010	1	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Dioxin compounds (including 2,3,7,8-TCDD)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and OCDD. This listing was made by USEPA.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The specific compounds are 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. This listing was made by USEPA.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Disrupt natural benthos; change pollutant availability in food chain; disrupt food availability to native species.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			12-Feb-08	Current data indicate fish consumption and wildlife consumption impacted uses. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing covers non-dioxin-like PCBs. Interim health advisory for fish in place.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	PCBs (Polychlorinated biphenyls) (dioxin-like)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			The specific dioxin-like compounds are 3,4,4,5-TCB (81), 3,3,3,3-TCB (77), 3,3,4,4,5-PeCB (126), 3,3,4,4,4,4-HxCB (169), 2,3,3,4,4-PeCB (105), 2,3,4,4,5-PeCB (114), 2,3,4,4,5-PeCB (118), 2,3,4,4,5-PeCB (123), 2,3,3,4,4,5-HxCB (156), 2,3,3,4,4,5-HxCB (157), 2,3,4,4,5,5-HxCB (167), 2,3,3,4,4,5,5-HpCB (189). This listing was made by USEPA.
2	Suisun Bay	Bay & Harbor	CAB2071002020011017135055	5	18050001	20710020	25335	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Affected use is one branch of the food chain; most sensitive indicator is hatchability in nesting diving birds, significant contributions from oil refineries (control program in place) and agriculture (carried downstream by rivers); exotic species may have made food chain more susceptible to accumulation of selenium; health consumption advisory in effect for scaup and scoter (diving ducks).
2	Suisun Creek	River & Stream	CAR2072201220080624165213	5	18050001	20722012	19	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Suisun Creek	River & Stream	CAR2072201220080624165213	5	18050001	20722012	19	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
2	Suisun Marsh Wetlands	Wetland, Tidal	CAT2072400019980929145809	5	18050001	20723000	66339	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
2	Suisun Marsh Wetlands	Wetland, Tidal	CAT2072400019980929145809	5	18050001	20723000	66339	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Additional monitoring and assessment needed.
2	Suisun Marsh Wetlands	Wetland, Tidal	CAT2072400019980929145809	5	18050001	20723000	66339	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Additional monitoring and assessment needed.
2	Suisun Marsh Wetlands	Wetland, Tidal	CAT2072400019980929145809	5	18050001	20723000	66339	Acres	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Additional monitoring and assessment needed.
2	Suisun Slough	Estuary	CAE2072300020020315202246	4a	18050001	20723000	1124	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Tomales Bay	Bay & Harbor	CAB2011403319980929125721	5	18050005	20114033	8545	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			Current data indicate fish consumption and wildlife consumption impacted uses: health consumption advisory in effect for multiple fish species including striped bass and shark. Major source is historic: gold mining sediments and local mercury mining; most significant ongoing source is erosion and drainage from abandoned mines; moderate to low level inputs from point sources.
2	Tomales Bay	Bay & Harbor	CAB2011403319980929125721	5	18050005	20114033	8545	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			TMDL will be developed as part of ongoing watershed management effort.
2	Tomales Bay	Bay & Harbor	CAB2011403319980929125721	5	18050005	20114033	8545	Acres	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-07	
2	Tomales Bay	Bay & Harbor	CAB2011403319980929125721	5	18050005	20114033	8545	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			TMDL will be developed as part of ongoing watershed management effort.
2	Walker Creek	River & Stream	CAR2011201319980928173807	5	18050005	20112013	16	Miles	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			29-Sep-08	
2	Walker Creek	River & Stream	CAR2011201319980928173807	5	18050005	20112013	16	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.
2	Walker Creek	River & Stream	CAR2011201319980928173807	5	18050005	20112013	16	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-07	
2	Walker Creek	River & Stream	CAR2011201319980928173807	5	18050005	20112013	16	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment needed.
2	Walnut Creek	River & Stream	CAR2073104019990218110904	4a	18050001	20731040	9	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
2	Wildcat Creek	River & Stream	CAR2066001319990218111129	4a	18050002	20660013	12	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	This listing was made by USEPA for the 1998 303(d) list. For 2006, diazinon was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
3	Alamo Creek	River & Stream	CAR3123008319980825153136	5	18060007	31230071	8	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Alisal Creek (Monterey County)	River & Stream	CAR3097009519990222130537	5	18060011	30970093	16	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Alisal Creek (Monterey County)	River & Stream	CAR3097009519990222130537	5	18060011	30970093	16	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Alisal Creek (Monterey County)	River & Stream	CAR3097009519990222130537	5	18060011	30970093	16	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Alisal Creek (Monterey County)	River & Stream	CAR3097009519990222130537	5	18060011	30970093	16	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-18			
3	Alisal Slough (Monterey County)	River & Stream	CAR3091101020090311204028	5	18060011	30911010	7	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Alisal Slough (Monterey County)	River & Stream	CAR3091101020090311204028	5	18060011	30911010	7	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Alisal Slough (Monterey County)	River & Stream	CAR3091101020090311204028	5	18060011	30911010	7	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Alisal Slough (Monterey County)	River & Stream	CAR3091101020090311204028	5	18060011	30911010	7	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Aptos Creek	River & Stream	CAR3041302320020319065717	5	18060001	30413023	8	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			Impaired length for Fecal Coliform is below Bridge Creek to the mouth (approximately 5 miles).
3	Aptos Creek	River & Stream	CAR3041302320020319065717	5	18060001	30413023	8	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arana Gulch	River & Stream	CAR3041205119990222133711	5	18060001	30412051	5	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arana Gulch	River & Stream	CAR3041205119990222133711	5	18060001	30412051	5	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arana Gulch	River & Stream	CAR3041205119990222133711	5	18060001	30412051	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Burro Creek	River & Stream	CAR3153201019990222134526	5	18060013	31532010	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Arroyo Burro Creek	River & Stream	CAR3153201019990222134526	5	18060013	31532010	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Arroyo De La Cruz	River & Stream	CAR3101201320020117141339	5	18060006	31012013	11	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo De La Cruz	River & Stream	CAR3101201320020117141339	5	18060006	31012013	11	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Grande Creek (below Lopez Lake)	River & Stream	CAR3103101419980804113947	5	18060006	31031020	13	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Grande Creek (below Lopez Lake)	River & Stream	CAR3103101419980804113947	5	18060006	31031020	13	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Paredon	River & Stream	CAR3153401019990222143223	5	18060013	31534010	5	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Seco River	River & Stream	CAR3096003219990222144047	5	18060005	30960032	43	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Arroyo Seco River	River & Stream	CAR3096003219990222144047	5	18060005	30960032	43	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (San Luis Obispo County)	River & Stream	CAR3098112419990222145136	5	18060005	30981124	5	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (San Luis Obispo County)	River & Stream	CAR3098112419990222145136	5	18060005	30981124	5	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (San Luis Obispo County)	River & Stream	CAR3098112419990222145136	5	18060005	30981124	5	Miles	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Atascadero Creek (Santa Barbara county)	River & Stream	CAR3153101119990222145750	5	18060013	31531011	6	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Beach Road Ditch	River & Stream	CAR3051003020080603123839	5	18060002	30510030	1	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Beach Road Ditch	River & Stream	CAR3051003020080603123839	5	18060002	30510030	1	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Beach Road Ditch	River & Stream	CAR3051003020080603123839	5	18060002	30510030	1	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Beach Road Ditch	River & Stream	CAR3051003020080603123839	5	18060002	30510030	1	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Bean Creek	River & Stream	CAR3041204119990222152251	4a	1.806e+0	30412041	9	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Bear Creek(Santa Cruz County)	River & Stream	CAR3041203019990222153339	4a	18060001	30412030	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Bell Creek (Santa Barbara Co)	River & Stream	CAR3151001320050531122629	5	18060013	31510013	1	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Bell Creek (Santa Barbara Co)	River & Stream	CAR3151001320050531122629	5	18060013	31510013	1	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Bell Creek (Santa Barbara Co)	River & Stream	CAR3151001320050531122629	5	18060013	31510013	1	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Bennett Slough	River & Stream	CAR3060001420080611160605	5	18060011	30600014	2	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Bennett Slough	River & Stream	CAR3060001420080611160605	5	18060011	30600014	2	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Bennett Slough	River & Stream	CAR3060001420080611160605	5	18060011	30600014	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Blanco Drain	River & Stream	CAR3091101019981209161509	5	18060011	30911010	15	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blanco Drain	River & Stream	CAR3091101019981209161509	5	18060011	30911010	15	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blanco Drain	River & Stream	CAR3091101019981209161509	5	18060011	30911010	15	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blanco Drain	River & Stream	CAR3091101019981209161509	5	18060011	30911010	15	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blanco Drain	River & Stream	CAR3091101019981209161509	5	18060011	30911010	15	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blanco Drain	River & Stream	CAR3091101019981209161509	5	18060011	30911010	15	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blosser Channel	River & Stream	CAR3121003020011121135941	5	18060008	31210030	2	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blosser Channel	River & Stream	CAR3121003020011121135941	5	18060008	31210030	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blosser Channel	River & Stream	CAR3121003020011121135941	5	18060008	31210030	2	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blosser Channel	River & Stream	CAR3121003020011121135941	5	18060008	31210030	2	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Blosser Channel	River & Stream	CAR3121003020011121135941	5	18060008	31210030	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Boulder Creek	River & Stream	CAR3041202019990223102514	4a	1.806e+0	30412020	8	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Canyon Creek	River & Stream	CAR3121003020011121144840	5	18060008	31210030	17	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Bradley Channel	River & Stream	CAR3121003020021002233532	5	18060008	31210030	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Branciforte Creek	River & Stream	CAR3041205119990223104548	5	18060001	30412051	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Branciforte Creek	River & Stream	CAR3041205119990223104548	5	18060001	30412051	6	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Branciforte Creek	River & Stream	CAR3041205119990223104548	5	18060001	30412051	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Branciforte Creek	River & Stream	CAR3041205119990223104548	5	18060001	30412051	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Branciforte Creek	River & Stream	CAR3041205119990223104548	5	18060001	30412051	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Canada De La Gaviota	River & Stream	CAR3151003119990223115746	5	18060013	31510031	7	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Canada De La Gaviota	River & Stream	CAR3151003119990223115746	5	18060013	31510031	7	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Canada De La Gaviota	River & Stream	CAR3151003119990223115746	5	18060013	31510031	7	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Canada De La Gaviota	River & Stream	CAR3151003119990223115746	5	18060013	31510031	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Canada De La Gaviota	River & Stream	CAR3151003119990223115746	5	18060013	31510031	7	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Canada Del Refugio	River & Stream	CAR3151002219990223132423	5	18060013	31510022	7	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Canada Del Refugio	River & Stream	CAR3151002219990223132423	5	18060013	31510022	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Canada Del Refugio	River & Stream	CAR3151002219990223132423	5	18060013	31510022	7	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carbonera Creek	River & Stream	CAR3041205319980825105618	5	18060001	30412050	10	Miles	Nutrients	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			14-Jan-03	
3	Carbonera Creek	River & Stream	CAR3041205319980825105618	5	18060001	30412050	10	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Carbonera Creek	River & Stream	CAR3041205319980825105618	5	18060001	30412050	10	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-03	
3	Carnadero Creek	River & Stream	CAR3053002019990223155037	5	18060002	30530020	2	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Carnadero Creek	River & Stream	CAR3053002019990223155037	5	18060002	30530020	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Carnadero Creek	River & Stream	CAR3053002019990223155037	5	18060002	30530020	2	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carnadero Creek	River & Stream	CAR3053002019990223155037	5	18060002	30530020	2	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carnadero Creek	River & Stream	CAR3053002019990223155037	5	18060002	30530020	2	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carnadero Creek	River & Stream	CAR3053002019990223155037	5	18060002	30530020	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carneros Creek (Monterey County)	River & Stream	CAR3060001020090115165216	5	18060011	30600010	12	Miles	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carneros Creek (Monterey County)	River & Stream	CAR3060001020090115165216	5	18060011	30600010	12	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carneros Creek (Monterey County)	River & Stream	CAR3060001020090115165216	5	18060011	30600010	12	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carneros Creek (Monterey County)	River & Stream	CAR3060001020090115165216	5	18060011	30600010	12	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carneros Creek (Monterey County)	River & Stream	CAR3060001020090115165216	5	18060011	30600010	12	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carneros Creek (Monterey County)	River & Stream	CAR3060001020090115165216	5	18060011	30600010	12	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Creek	River & Stream	CAR3153402019980825112405	5	18060013	31534020	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Creek	River & Stream	CAR3153402019980825112405	5	18060013	31534020	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Creek	River & Stream	CAR3153402019980825112405	5	18060013	31534020	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Creek	River & Stream	CAR3153402019980825112405	5	18060013	31534020	6	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Creek	River & Stream	CAR3153402019980825112405	5	18060013	31534020	6	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Marsh (El Estero Marsh)	Estuary	CAE3153402019980827165144	5	18060013	31534020	188	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Marsh (El Estero Marsh)	Estuary	CAE3153402019980827165144	5	18060013	31534020	188	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Carpinteria Marsh (El Estero Marsh)	Estuary	CAE3153402019980827165144	5	18060013	31534020	188	Acres	Priority Organics	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Casmalia Canyon Creek	River & Stream	CAR3130004020020117145508	5	18060009	31300040	5	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Chesbro Reservoir	Lake & Reservoir	CAL3052001420020124162255	5	18060002	30520014	214	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cholame Creek	River & Stream	CAR3170008120011127080727	5	1.806e+0	31700053	9	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Chorro Creek	River & Stream	CAR3102201219980825120817	4a	18060006	31022012	14	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jan-04	
3	Chorro Creek	River & Stream	CAR3102201219980825120817	4a	18060006	31022012	14	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			20-Jan-04	
3	Chorro Creek	River & Stream	CAR3102201219980825120817	4a	18060006	31022012	14	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			17-Jul-07	
3	Chorro Creek	River & Stream	CAR3102201219980825120817	4a	18060006	31022012	14	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jan-04	
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chualar Creek	River & Stream	CAR3091900020080604161337	5	18060011	30919000	14	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Chumash Creek	River & Stream	CAR3102201120021001213514	5	18060006	31022011	2	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			For 2006, fecal coliform was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
3	Cieneguitas Creek	River & Stream	CAR3153101120080612165908	5	18060013	31531011	3	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cieneguitas Creek	River & Stream	CAR3153101120080612165908	5	18060013	31531011	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cieneguitas Creek	River & Stream	CAR3153101120080612165908	5	18060013	31531011	3	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cieneguitas Creek	River & Stream	CAR3153101120080612165908	5	18060013	31531011	3	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Clear Creek (San Benito County)	River & Stream	CAR3055001320021004181146	4a	18060002	30550013	10	Miles	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			03-Jun-04	For 2006, mercury was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
3	Corcoran Lagoon	Wetland, Freshwater	CAW3041301420100816171123	5	18060001	30413014	12	Acres	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Corcoran Lagoon	Wetland, Freshwater	CAW3041301420100816171123	5	18060001	30413014	12	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Corralitos Creek	River & Stream	CAR3051001019990225102704	5	18060002	30510010	13	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Corralitos Creek	River & Stream	CAR3051001019990225102704	5	18060002	30510010	13	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Corralitos Creek	River & Stream	CAR3051001019990225102704	5	18060002	30510010	13	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			The impaired length is from the Salsipuedes Creek to Browns Valley Road. There is no evidence of impairment above Browns Valley Road.
3	Corralitos Creek	River & Stream	CAR3051001019990225102704	5	18060002	30510010	13	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cuyama River (above Twitchell Reservior)	River & Stream	CAR3123006020080611173645	5	18060007	31230060	80	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			The impaired length is below the Highway 33 Bridge (between Buckhorn Road and Highway 33 Bridge).
3	Cuyama River (above Twitchell Reservior)	River & Stream	CAR3123006020080611173645	5	18060007	31230060	80	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			The impaired length is between Twitchell Reservoir and the Highway 33 Bridge.
3	Cuyama River (above Twitchell Reservior)	River & Stream	CAR3123006020080611173645	5	18060007	31230060	80	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cuyama River (above Twitchell Reservior)	River & Stream	CAR3123006020080611173645	5	18060007	31230060	80	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			The impaired length is between Twitchel Reservoir and the Highway 33 Bridge.
3	Cuyama River (above Twitchell Reservior)	River & Stream	CAR3123006020080611173645	5	18060007	31230060	80	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Cuyama River (above Twitchell Reservior)	River & Stream	CAR3123006020080611173645	5	18060007	31230060	80	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Dairy Creek	River & Stream	CAR3102201019990225114123	4a	18060006	31022010	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jan-04	For 2006, fecal coliform was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
3	Dairy Creek	River & Stream	CAR3102201019990225114123	4a	18060006	31022010	5	Miles	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-04	
3	Devereux Creek	River & Stream	CAR3153102020080612164650	5	18060013	31531020	1	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Devereux Creek	River & Stream	CAR3153102020080612164650	5	18060013	31531020	1	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Dos Pueblos Canyon Creek	River & Stream	CAR3151001119990225122436	5	18060013	31510011	7	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Elkhorn Slough	Estuary	CAE3060001419981209073137	5	18060011	30600014	2034	Acres	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Elkhorn Slough	Estuary	CAE3060001419981209073137	5	18060011	30600014	2034	Acres	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Elkhorn Slough	Estuary	CAE3060001419981209073137	5	18060011	30600014	2034	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Elkhorn Slough	Estuary	CAE3060001419981209073137	5	18060011	30600014	2034	Acres	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Elkhorn Slough	Estuary	CAE3060001419981209073137	5	18060011	30600014	2034	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Esperanza Creek	River & Stream	CAR3091101020080604161515	5	18060011	30911010	4	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Lake	Lake & Reservoir	CAL3091900020020117151744	5	18060011	30919000	163	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Lake	Lake & Reservoir	CAL3091900020020117151744	5	18060011	30919000	163	Acres	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Priority Organics	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Espinosa Slough	River & Stream	CAR3091101019981230135152	5	18060011	30911010	1	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Estrella River	River & Stream	CAR3170007119990225125807	5	18060004	31700071	28	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Estrella River	River & Stream	CAR3170007119990225125807	5	18060004	31700071	28	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Estrella River	River & Stream	CAR3170007119990225125807	5	18060004	31700071	28	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Estrella River	River & Stream	CAR3170007119990225125807	5	18060004	31700071	28	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Estrella River	River & Stream	CAR3170007119990225125807	5	18060004	31700071	28	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Fall Creek	River & Stream	CAR3041202219990225133326	4a	1.806e+0	30412022	5	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Franklin Creek (Santa Barbara County)	River & Stream	CAR3153402019990225134357	5	18060013	31534020	3	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Franklin Creek (Santa Barbara County)	River & Stream	CAR3153402019990225134357	5	18060013	31534020	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Franklin Creek (Santa Barbara County)	River & Stream	CAR3153402019990225134357	5	18060013	31534020	3	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Franklin Creek (Santa Barbara County)	River & Stream	CAR3153402019990225134357	5	18060013	31534020	3	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Franklin Creek (Santa Barbara County)	River & Stream	CAR3153402019990225134357	5	18060013	31534020	3	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Franklin Creek (Santa Barbara County)	River & Stream	CAR3153402019990225134357	5	18060013	31534020	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Furlong Creek	River & Stream	CAR3053002019990222111932	5	18060002	30530020	9	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Furlong Creek	River & Stream	CAR3053002019990222111932	5	18060002	30530020	9	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Furlong Creek	River & Stream	CAR3053002019990222111932	5	18060002	30530020	9	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Furlong Creek	River & Stream	CAR3053002019990222111932	5	18060002	30530020	9	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Furlong Creek	River & Stream	CAR3053002019990222111932	5	18060002	30530020	9	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Gabilan Creek	River & Stream	CAR3091900019990304092345	5	18060005	30919000	6	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Galligan Slough	River & Stream	CAR3051003020080616145053	4a	18060002	30510030	3	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jul-07	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Glen Annie Canyon	River & Stream	CAR3153102019990304102735	5	18060013	31531020	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Goleta Slough/Estuary	Estuary	CAE3153102019981209141309	5	18060013	31531020	196	Acres	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Goleta Slough/Estuary	Estuary	CAE3153102019981209141309	5	18060013	31531020	196	Acres	Priority Organics	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Greene Valley Creek (Santa Barbara County)	River & Stream	CAR3121003020080611165954	5	18060008	31210030	4	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Hanson Slough	River & Stream	CAR3051003020080616145237	4a	18060002	30510030	1	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jul-07	
3	Harkins Slough	River & Stream	CAR3051001320080603122917	5	18060002	30510013	7	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Harkins Slough	River & Stream	CAR3051001320080603122917	5	18060002	30510013	7	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Harkins Slough	River & Stream	CAR3051001320080603122917	5	18060002	30510013	7	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jul-07	
3	Hernandez Reservoir	Lake & Reservoir	CAL3055001619980828154910	4a	18060002	30550016	626	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			03-Jun-04	For 2006, mercury was moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
3	Jalama Creek	River & Stream	CAR3151005119990304115034	5	18060013	31510051	10	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Jalama Creek	River & Stream	CAR3151005119990304115034	5	18060013	31510051	10	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Kings Creek	River & Stream	CAR3041201119990304115830	4a	1.806e+0	30412011	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Las Tablas Creek	River & Stream	CAR3098129319980825123721	5	18060005	30981293	6	Miles	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Las Tablas Creek, North Fork	River & Stream	CAR3098129019980828104645	5	18060005	30981290	6	Miles	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Las Tablas Creek, South Fork	River & Stream	CAR3098129019980828110227	5	18060006	30981290	5	Miles	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Little Oso Flaco Creek	River & Stream	CAR3121003020080611165546	5	18060008	31210030	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Little Oso Flaco Creek	River & Stream	CAR3121003020080611165546	5	18060008	31210030	2	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Little Oso Flaco Creek	River & Stream	CAR3121003020080611165546	5	18060008	31210030	2	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Little Oso Flaco Creek	River & Stream	CAR3121003020080611165546	5	18060008	31210030	2	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Llagas Creek (above Chesbro Reservoir)	River & Stream	CAR3052001419980826100148	5	18060002	30520014	9	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Llagas Creek (above Chesbro Reservoir)	River & Stream	CAR3052001419980826100148	5	18060002	30520014	9	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Chloride	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired section for Chlorides is located downstream of confluence with Miller Slough (approximately 1 mile of stream near Southside Drive).
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			Impaired section for Fecal Coliform is located between the confluence with Church Creek and the confluence with Pajaro River (approximately 9.5 miles of stream length).
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			This listing was made by USEPA.
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-Oct-06	Nutrients Medium 16 Impaired section for Nutrients is located between the confluence with Church Creek and the confluence with Pajaro River (approximately 9.5 miles of stream length).
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			03-May-07	Impaired section for Sediment/Siltation is located between the confluence with Church Creek and the confluence with Pajaro River (approximately 9.5 miles of stream length).
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired section for Sodium is located downstream of confluence with Miller Slough (approximately 1 mile of stream near Southside Drive).
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired section for Total Dissolved Solids is located between the confluence with Church Creek and the confluence with Pajaro River (approximately 9.5 miles of stream length).
3	Llagas Creek (below Chesbro Reservoir)	River & Stream	CAR3053002020020319075726	5	18060002	30530020	16	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Lockhart Gulch	River & Stream	CAR3041204119990304141558	5	18060001	30412041	3	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Lockhart Gulch	River & Stream	CAR3041204119990304141558	5	18060001	30412041	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Lompico Creek	River & Stream	CAR3041204019980826100810	5	18060001	30412040	4	Miles	Nutrients	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			14-Jan-03	
3	Lompico Creek	River & Stream	CAR3041204019980826100810	5	18060001	30412040	4	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Lompico Creek	River & Stream	CAR3041204019980826100810	5	18060001	30412040	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	Los Berros Creek	River & Stream	CAR3103102319990304143314	5	18060008	31031023	13	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Los Berros Creek	River & Stream	CAR3103102319990304143314	5	18060008	31031023	13	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Los Berros Creek	River & Stream	CAR3103102319990304143314	5	18060008	31031023	13	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Los Carneros Creek	River & Stream	CAR3153102019990304143658	5	18060013	31531020	6	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Los Carneros Creek	River & Stream	CAR3153102019990304143658	5	18060013	31531020	6	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Los Carneros Creek	River & Stream	CAR3153102019990304143658	5	18060013	31531020	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Los Carneros Creek	River & Stream	CAR3153102019990304143658	5	18060013	31531020	6	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Los Carneros Creek	River & Stream	CAR3153102019990304143658	5	18060013	31531020	6	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Los Osos Creek	River & Stream	CAR3102301219980826102833	5	1.806e+0	31023012	4	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			20-Jan-04	
3	Los Osos Creek	River & Stream	CAR3102301219980826102833	5	1.806e+0	31023012	4	Miles	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			This listing was made by USEPA.
3	Los Osos Creek	River & Stream	CAR3102301219980826102833	5	1.806e+0	31023012	4	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			04-Feb-05	Impaired Length is below Los Osos Valley Road to Creek Mouth. There is no evidence of impairment at Los Osos Valley Road.
3	Los Osos Creek	River & Stream	CAR3102301219980826102833	5	1.806e+0	31023012	4	Miles	Nutrients	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Mar-05	Impaired Length is below Los Osos Valley Road to Creek Mouth. There is no evidence of impairment at Los Osos Valley Road.
3	Los Osos Creek	River & Stream	CAR3102301219980826102833	5	1.806e+0	31023012	4	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			20-Jan-04	
3	Love Creek	River & Stream	CAR3041202119990304144104	5	1.806e+0	30412021	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Main Street Canal	River & Stream	CAR3121003020020819110803	5	18060008	31210030	5	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Majors Creek (Monterey County)	River & Stream	CAR3095004220090226140639	5	18060012	30950042	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Majors Creek (Monterey County)	River & Stream	CAR3095004220090226140639	5	18060012	30950042	1	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Majors Creek (Monterey County)	River & Stream	CAR3095004220090226140639	5	18060012	30950042	1	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Majors Creek (Monterey County)	River & Stream	CAR3095004220090226140639	5	18060012	30950042	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Maria Ygnacio Creek	River & Stream	CAR3153102020080612165648	5	18060013	31531020	7	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Maria Ygnacio Creek	River & Stream	CAR3153102020080612165648	5	18060013	31531020	7	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Maria Ygnacio Creek	River & Stream	CAR3153102020080612165648	5	18060013	31531020	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Maria Ygnacio Creek	River & Stream	CAR3153102020080612165648	5	18060013	31531020	7	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Maria Ygnacio Creek	River & Stream	CAR3153102020080612165648	5	18060013	31531020	7	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	McEnery Spring	Wetland, Freshwater	CAR3041204120100620215953	5	18060001	30412040	0	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	McGowan Ditch	River & Stream	CAR3051003020100620223644	5	18060002	30510030	3	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Merrit Ditch	River & Stream	CAR3091101020080604152147	5	18060011	30911010	0	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Merrit Ditch	River & Stream	CAR3091101020080604152147	5	18060011	30911010	0	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Merrit Ditch	River & Stream	CAR3091101020080604152147	5	18060011	30911010	0	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Merrit Ditch	River & Stream	CAR3091101020080604152147	5	18060011	30911010	0	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Merrit Ditch	River & Stream	CAR3091101020080604152147	5	18060011	30911010	0	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Merrit Ditch	River & Stream	CAR3091101020080604152147	5	18060011	30911010	0	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Millers Canal	River & Stream	CAR3053002020080603171000	5	18060002	30530020	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Mission Creek (Santa Barbara County)	River & Stream	CAR3153201119980826110307	5	18060013	31532011	9	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Mission Creek (Santa Barbara County)	River & Stream	CAR3153201119980826110307	5	18060013	31532011	9	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Mission Creek (Santa Barbara County)	River & Stream	CAR3153201119980826110307	5	18060013	31532011	9	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Mission Creek (Santa Barbara County)	River & Stream	CAR3153201119980826110307	5	18060013	31532011	9	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Monterey Harbor	Bay & Harbor	CAB3091201419980827160747	5	18060012	30950042	76	Acres	Metals	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Monterey Harbor	Bay & Harbor	CAB3091201419980827160747	5	18060012	30950042	76	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moore Creek	River & Stream	CAR3041103120080602125209	5	18060001	30411031	2	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moore Creek	River & Stream	CAR3041103120080602125209	5	18060001	30411031	2	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moore Creek	River & Stream	CAR3041103120080602125209	5	18060001	30411031	2	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moore Creek	River & Stream	CAR3041103120080602125209	5	18060001	30411031	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moro Cojo Slough	Estuary	CAE3060001519981209132246	5	18060011	30913011	62	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Morro Bay	Bay & Harbor	CAB3102201219980827141506	5	18060006	31022012	1922	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Morro Bay	Bay & Harbor	CAB3102201219980827141506	5	18060006	31022012	1922	Acres	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jan-04	
3	Morro Bay	Bay & Harbor	CAB3102201219980827141506	5	18060006	31022012	1922	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jan-04	
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Moss Landing Harbor	Bay & Harbor	CAB3060001419981214121135	5	18060011	30600014	79	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Mountain Charlie Gulch	River & Stream	CAR3041204020020124160454	5	1.806e+0	30412040	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Nacimiento Reservoir	Lake & Reservoir	CAL3098200019981214171711	5	18060005	30982000	5736	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Nacimiento Reservoir	Lake & Reservoir	CAL3098200019981214171711	5	18060005	30982000	5736	Acres	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Natividad Creek	River & Stream	CAR3091101020050531125140	5	18060011	30911010	7	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Newell Creek (Lower)	River & Stream	CAR3041203120020219170752	5	18060001	30412031	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Newell Creek (Upper)	River & Stream	CAR3041203120020124115808	5	1.806e+0	30412031	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Nipomo Creek	River & Stream	CAR3121001120011129124911	5	18060008	31210011	9	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Nipomo Creek	River & Stream	CAR3121001120011129124911	5	18060008	31210011	9	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Nipomo Creek	River & Stream	CAR3121001120011129124911	5	18060008	31210011	9	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Nobel Gulch Creek	River & Stream	CAR3041301420080603122127	5	18060001	30413014	2	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	North Main Street Channel	River & Stream	CAR3121003020080620111045	5	18060008	31210030	1	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River	River & Stream	CAR3091101020080611145518	5	18060011	30911010	4	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River Estuary	Estuary	CAE3060001419981214143807	5	18060011	30911010	16	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Old Salinas River Estuary	Estuary	CAE3060001419981214143807	5	18060011	30911010	16	Acres	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA.
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Orcutt Creek	River & Stream	CAR3121003020011129154708	5	18060008	31210030	10	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Oso Flaco Creek	River & Stream	CAR3121003020020124122144	5	18060008	31210030	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Lake	Lake & Reservoir	CAL3121003020011121102545	5	18060008	31210030	56	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Oso Flaco Lake	Lake & Reservoir	CAL3121003020011121102545	5	18060008	31210030	56	Acres	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacheco Creek	River & Stream	CAR3053002020020103133745	5	18060002	30540021	25	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
3	Pacheco Creek	River & Stream	CAR3053002020020103133745	5	18060002	30540021	25	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacheco Creek	River & Stream	CAR3053002020020103133745	5	18060002	30540021	25	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean (Point Ano Nuevo to Soquel Point)	Ocean	CAO3041102220090612082544	5	18060001	30411022	26832	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Arroyo Burro Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201020020107155347	5	18060013	31532010	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Arroyo Burro Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201020020107155347	5	18060013	31532010	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Avila Beach (Avila Pier)	Coastal & Bay Shoreline	CAC3102402120100404115848	5	18060006	31024021	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Avila Beach (Avila Pier)	Coastal & Bay Shoreline	CAC3102402120100404115848	5	18060006	31024021	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Avila Beach (SLO creek mouth)	Coastal & Bay Shoreline	CAC3102402120100404162226	5	18060006	31024021	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Capitola Beach (Santa Cruz County)	Coastal & Bay Shoreline	CAX3041301420021001205532	5	18060001	304130104	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Capitola Beach (Santa Cruz County)	Coastal & Bay Shoreline	CAX3041301420021001205532	5	18060001	304130104	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Carpinteria State Beach (Carpinteria Creek mouth, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153402020021001211616	5	18060013	31534020	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Pacific Ocean at Cayucos (Cayucos Creek Mouth)	Coastal & Bay Shoreline	CAC3101601020100414170217	5	18060006	31016010	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at East Beach (mouth of Mission Creek, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201120020107160116	5	18060013	31532011	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at East Beach (mouth of Mission Creek, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201120020107160116	5	18060013	31532011	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at East Beach (mouth of Mission Creek, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201120020107160116	5	18060013	31532011	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at East Beach (mouth of Sycamore Creek, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201220021002193849	5	18060013	31532012	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Goleta Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153102020021002211230	5	18060013	31531020	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Hammonds Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153301020021002211858	5	18060013	31533010	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Pacific Ocean at Hammonds Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153301020021002211858	5	18060013	31533010	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Haskells Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAC3151001220070328183439	5	18060013	31510012	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			This listing was made by USEPA for 2006.
3	Pacific Ocean at Hope Ranch Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201020021002213053	5	18060013	31532010	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Pacific Ocean at Hope Ranch Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201020021002213053	5	18060013	31532010	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Jalama Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3151005120020107155608	5	18060013	31510051	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Jalama Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3151005120020107155608	5	18060013	31510051	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Pacific Ocean at Jalama Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3151005120020107155608	5	18060013	31510051	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Leadbetter Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3153201120021002214553	5	18060013	31532011	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Ocean Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3141005020021002220006	5	18060010	31410050	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Pacific Ocean at Ocean Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3141005020021002220006	5	18060010	31410050	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Olde Port Beach (at restrooms)	Coastal & Bay Shoreline	CAC3102501220100404164219	5	18060006	31025012	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Pismo State Beach (San Luis Obispo County), south of Pismo Pier	Coastal & Bay Shoreline	CAC3102601420100622164704	5	18060006	31026014	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Point Rincon (mouth of Rincon Cr, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153401220000326134941	5	18060013	31534012	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Point Rincon (mouth of Rincon Cr, Santa Barbara County)	Coastal & Bay Shoreline	CAX3153401220000326134941	5	18060013	31534012	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Refugio Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3151002220021002221432	5	18060013	31510022	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pacific Ocean at Refugio Beach (Santa Barbara County)	Coastal & Bay Shoreline	CAX3151002220021002221432	5	18060013	31510022	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pacific Ocean at Stillwater Cove Beach	Coastal & Bay Shoreline	CAC3095004220041214174739	5	18060012	30950042	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired length for Boron is below Main Street (in Watsonville) to the mouth.
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	DDD (Dichlorodiphenyldichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			Impaired reach is changed from 2006 to include the entire Pajaro River.
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			13-Oct-06	In 2006, Nitrate was added by USEPA to this being addressed list because of a completed USEPA approved TMDL for Nutrients.
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-Oct-06	
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			03-May-07	
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pajaro River	River & Stream	CAR3051003019980826115152	5	1.806e+0	30510030	32	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pennington Creek	River & Stream	CAR3102201120020124123809	5	18060006	31022011	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			For 2006, fecal coliform was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
3	Pico Creek	River & Stream	CAR3101302020020124125005	5	18060006	31013020	1	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired section for low dissolved oxygen is located between the creek mouth and the top of the lagoon (approximately 1/2 mile).
3	Pinto Lake	Lake & Reservoir	CAL3051003020020124122807	5	18060002	30510030	115	Acres	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pinto Lake	Lake & Reservoir	CAL3051003020020124122807	5	18060002	30510030	115	Acres	Cyanobacteria hepatotoxic microcystins	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pinto Lake	Lake & Reservoir	CAL3051003020020124122807	5	18060002	30510030	115	Acres	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Pinto Lake	Lake & Reservoir	CAL3051003020020124122807	5	18060002	30510030	115	Acres	Scum/Foam-unnatural	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pinto Lake	Lake & Reservoir	CAL3051003020020124122807	5	18060002	30510030	115	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Pismo Creek	River & Stream	CAR3102601420020124125144	5	18060006	31026014	5	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pismo Creek	River & Stream	CAR3102601420020124125144	5	18060006	31026014	5	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pismo Creek	River & Stream	CAR3102601420020124125144	5	18060006	31026014	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pismo Creek	River & Stream	CAR3102601420020124125144	5	18060006	31026014	5	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Pismo Creek	River & Stream	CAR3102601420020124125144	5	18060006	31026014	5	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Porter Gulch Creek	River & Stream	CAR3041301320080603122516	5	18060001	30413013	2	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Porter Gulch Creek	River & Stream	CAR3041301320080603122516	5	18060001	30413013	2	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Prefumo Creek	River & Stream	CAR3102401220020124125422	5	18060006	31024012	8	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Prefumo Creek	River & Stream	CAR3102401220020124125422	5	18060006	31024012	8	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Prefumo Creek	River & Stream	CAR3102401220020124125422	5	18060006	31024012	8	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Prefumo Creek	River & Stream	CAR3102401220020124125422	5	18060006	31024012	8	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Quail Creek	River & Stream	CAR3091900020011227140647	5	1.806e+0	30919000	4	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Rider Creek	River & Stream	CAR3051001019981207100234	4a	18060002	30510010	2	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			03-May-07	
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Rincon Creek	River & Stream	CAR3153401220020124130528	5	18060013	31534012	10	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Rodeo Creek Gulch	River & Stream	CAR3041301420020124131242	5	18060001	30413014	6	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Rodeo Creek Gulch	River & Stream	CAR3041301420020124131242	5	18060001	30413014	6	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Romero Creek	River & Stream	CAR3153301120080612170700	5	18060013	31533011	5	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Ammonia (Unionized)	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-18			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Priority Organics	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas Reclamation Canal	River & Stream	CAR3091101019980828112229	5	18060011	30911010	8	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-18			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	DDD (Dichlorodiphenyldichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			Impaired length for conductivity is from Del Monte Road to the River Mouth.
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-18			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-18			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920)	River & Stream	CAR3091101020021007193102	5	18060011	30917000	31	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Area affected is the lower 20 miles of the middle Salinas River.
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River)	River & Stream	CAR3091101020020319092611	5	18060005	30917000	72	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (upper, confluence of Nacimiento River to Santa Margarita Reservoir)	River & Stream	CAR3098117720020319112226	5	18060005	30981112	49	Miles	Chloride	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (upper, confluence of Nacimiento River to Santa Margarita Reservoir)	River & Stream	CAR3098117720020319112226	5	18060005	30981112	49	Miles	Sodium	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River (upper, confluence of Nacimiento River to Santa Margarita Reservoir)	River & Stream	CAR3098117720020319112226	5	18060005	30981112	49	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salinas River Lagoon (North)	Estuary	CAE3091101019980828143232	5	18060011	30911010	197	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River Lagoon (North)	Estuary	CAE3091101019980828143232	5	18060011	30911010	197	Acres	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River Refuge Lagoon (South)	Estuary	CAE3091101019981209125800	5	18060011	30911010	30	Acres	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salinas River Refuge Lagoon (South)	Estuary	CAE3091101019981209125800	5	18060011	30911010	30	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Salsipuedes Creek (Santa Barbara County)	River & Stream	CAR3142002320080612154159	5	18060013	31420023	9	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salsipuedes Creek (Santa Barbara County)	River & Stream	CAR3142002320080612154159	5	18060013	31420023	9	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salsipuedes Creek (Santa Cruz County)	River & Stream	CAR3051003020080603123522	5	18060002	30510030	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Salsipuedes Creek (Santa Cruz County)	River & Stream	CAR3051003020080603123522	5	18060002	30510030	3	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Salsipuedes Creek (Santa Cruz County)	River & Stream	CAR3051003020080603123522	5	18060002	30510030	3	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salsipuedes Creek (Santa Cruz County)	River & Stream	CAR3051003020080603123522	5	18060002	30510030	3	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Salsipuedes Creek (Santa Cruz County)	River & Stream	CAR3051003020080603123522	5	18060002	30510030	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			This listing was made by USEPA.
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Nitrogen, Nitrite	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Creek (San Antonio Watershed, Rancho del las Flores Bridge at Hwy 135 to downstream at Railroad Bridge)	River & Stream	CAR3130001020020918211049	5	18060009	31300050	14	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio Reservoir	Lake & Reservoir	CAL3098300020080114173957	5	18060005	30983000	5417	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio River (below San Antonio Reservoir)	River & Stream	CAR3098100520080114174629	5	18060005	30981005	11	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Antonio River (below San Antonio Reservoir)	River & Stream	CAR3098100520080114174629	5	18060005	30981005	11	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			03-May-07	
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Benito River	River & Stream	CAR3053002019981207091641	5	1.806e+0	30530020	86	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Bernardo Creek	River & Stream	CAR3102201220020124134314	5	18060006	31022012	7	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			For 2006, fecal coliform was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Jose Creek (Santa Barbara County)	River & Stream	CAR3153101020080613155318	5	18060013	31531010	10	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Juan Creek (San Benito County)	River & Stream	CAR3052005020090204001958	5	18060002	30520050	7	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	San Juan Creek (San Benito County)	River & Stream	CAR3052005020090204001958	5	18060002	30520050	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	San Juan Creek (San Benito County)	River & Stream	CAR3052005020090204001958	5	18060002	30520050	7	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Juan Creek (San Benito County)	River & Stream	CAR3052005020090204001958	5	18060002	30520050	7	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Juan Creek (San Benito County)	River & Stream	CAR3052005020090204001958	5	18060002	30520050	7	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Juan Creek (San Benito County)	River & Stream	CAR3052005020090204001958	5	18060002	30520050	7	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
3	San Lorenzo Creek (Monterey County)	River & Stream	CAR3091800020020103133204	5	18060005	30970023	49	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo River	River & Stream	CAR3041202219980827084709	5	18060001	30412022	27	Miles	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo River	River & Stream	CAR3041202219980827084709	5	18060001	30412022	27	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired length from San Lorenzo River Lagoon to confluence with Zayante Creek (approximately 7 miles).
3	San Lorenzo River	River & Stream	CAR3041202219980827084709	5	18060001	30412022	27	Miles	Nutrients	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			14-Jan-03	
3	San Lorenzo River	River & Stream	CAR3041202219980827084709	5	18060001	30412022	27	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Lorenzo River	River & Stream	CAR3041202219980827084709	5	18060001	30412022	27	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	San Lorenzo River	River & Stream	CAR3041202219980827084709	5	18060001	30412022	27	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
3	San Lorenzo River Lagoon	Estuary	CAE3041205319980828094349	5	18060001	30412053	66	Acres	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	San Luis Obispo Creek (above Osos Street)	River & Stream	CAR3102401119980824143123	5	18060006	31024011	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired length is Marsh Street Bridge to Cuesta Park.
3	San Luis Obispo Creek (below Osos Street)	River & Stream	CAR3102402119980828115513	5	18060006	31024012	10	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Luis Obispo Creek (below Osos Street)	River & Stream	CAR3102402119980828115513	5	18060006	31024012	10	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Luis Obispo Creek (below Osos Street)	River & Stream	CAR3102402119980828115513	5	18060006	31024012	10	Miles	Nitrate as Nitrate (NO3)	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			10-Jan-07	For 2006, nitrate as nitrate (NO3) was moved by USEPA from the 303(d) list to the being addressed list because of a completed USEPA approved TMDL.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	San Luis Obispo Creek (below Osos Street)	River & Stream	CAR3102402119980828115513	5	18060006	31024012	10	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-07	For 2006, nutrients moved by USEPA from the 303(d) list to this being addressed list because of a completed USEPA approved TMDL.
3	San Luis Obispo Creek (below Osos Street)	River & Stream	CAR3102402119980828115513	5	18060006	31024012	10	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-04	
3	San Luis Obispo Creek (below Osos Street)	River & Stream	CAR3102402119980828115513	5	18060006	31024012	10	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Luisito Creek	River & Stream	CAR3102201120020124141107	5	18060006	31022011	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			For 2006, fecal coliform was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
3	San Miguelito Creek	River & Stream	CAR3141004020020124141622	5	18060013	31410040	10	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Miguelito Creek	River & Stream	CAR3141004020020124141622	5	18060013	31410040	10	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Miguelito Creek	River & Stream	CAR3141004020020124141622	5	18060013	31410040	10	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Miguelito Creek	River & Stream	CAR3141004020020124141622	5	18060013	31410040	10	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Pedro Creek (Santa Barbara County)	River & Stream	CAR3153102020080612165413	5	18060013	31531020	7	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	San Pedro Creek (Santa Barbara County)	River & Stream	CAR3153102020080612165413	5	18060013	31531020	7	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	San Pedro Creek (Santa Barbara County)	River & Stream	CAR3153102020080612165413	5	18060013	31531020	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	San Pedro Creek (Santa Barbara County)	River & Stream	CAR3153102020080612165413	5	18060013	31531020	7	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Pedro Creek (Santa Barbara County)	River & Stream	CAR3153102020080612165413	5	18060013	31531020	7	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Pedro Creek (Santa Barbara County)	River & Stream	CAR3153102020080612165413	5	18060013	31531020	7	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Simeon Creek	River & Stream	CAR3101301220020124141805	5	18060006	31013012	6	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired length for Chloride is the Creek mouth to the first San Simeon Creek Road crossing, approximately 4 miles.
3	San Simeon Creek	River & Stream	CAR3101301220020124141805	5	18060006	31013012	6	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	San Simeon Creek	River & Stream	CAR3101301220020124141805	5	18060006	31013012	6	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired length for Nitrate is the Creek mouth to the first San Simeon Creek Road crossing, approximately 4 miles.
3	San Simeon Creek	River & Stream	CAR3101301220020124141805	5	18060006	31013012	6	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Impaired length for Sodium is the Creek mouth to the first San Simeon Creek Road crossing, approximately 4 miles.
3	San Vicente Creek (Santa Cruz County)	River & Stream	CAR3041102320020124141932	5	18060001	30411023	9	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Endrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River	River & Stream	CAR3121003020011228103528	5	1.806e+0	31210030	51	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River Estuary	Estuary	CAE3121003020020311125938	5	18060008	31210030	6	Acres	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River Estuary	Estuary	CAE3121003020020311125938	5	18060008	31210030	6	Acres	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Maria River Estuary	Estuary	CAE3121003020020311125938	5	18060008	31210030	6	Acres	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Monica Creek	River & Stream	CAR3153402020020124142850	5	18060013	31534020	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Monica Creek	River & Stream	CAR3153402020020124142850	5	18060013	31534020	6	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-18			
3	Santa Rita Creek (Monterey County)	River & Stream	CAR3091900020060731111350	5	18060011	30919000	11	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Santa Rosa Creek (San Luis Obispo County)	River & Stream	CAR3142001120020124143542	5	18060010	31420011	23	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (Cachuma Lake to below city of Lompoc)	River & Stream	CAR3141005019980827094226	5	18060010	31440050	43	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (Cachuma Lake to below city of Lompoc)	River & Stream	CAR3141005019980827094226	5	18060010	31440050	43	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (Cachuma Lake to below city of Lompoc)	River & Stream	CAR3141005019980827094226	5	18060010	31440050	43	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (Cachuma Lake to below city of Lompoc)	River & Stream	CAR3141005019980827094226	5	18060010	31440050	43	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Santa Ynez River (below city of Lompoc to Ocean)	River & Stream	CAR3141004020050816125631	5	18060010	31410040	4	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Schwan Lake	Lake & Reservoir	CAL3041205319981209102156	5	18060001	30412053	23	Acres	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Schwan Lake	Lake & Reservoir	CAL3041205319981209102156	5	18060001	30412053	23	Acres	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Schwan Lake	Lake & Reservoir	CAL3041205319981209102156	5	18060001	30412053	23	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Schwan Lake	Lake & Reservoir	CAL3041205319981209102156	5	18060001	30412053	23	Acres	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Shingle Mill Creek	River & Stream	CAR3041202219980827102347	4a	18060001	30412022	2	Miles	Nutrients	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			14-Jan-03	
3	Shingle Mill Creek	River & Stream	CAR3041202219980827102347	4a	18060001	30412022	2	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-03	
3	Shuman Canyon Creek	River & Stream	CAR3130004120020124144205	5	18060009	31300041	9	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Soda Lake	Saline Lake	CAL3110005019980805102204	5	18060003	31100050	2627	Acres	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Soquel Creek	River & Stream	CAR3041301420020124145258	5	18060001	30413011	18	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Soquel Creek	River & Stream	CAR3041301420020124145258	5	18060001	30413011	18	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Soquel Creek	River & Stream	CAR3041301420020124145258	5	18060001	30413011	18	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Soquel Creek	River & Stream	CAR3041301420020124145258	5	18060001	30413011	18	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Soquel Lagoon	Estuary	CAE3041301419981209132827	5	18060001	30413014	1	Acres	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Soquel Lagoon	Estuary	CAE3041301419981209132827	5	18060001	30413014	1	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Spring Lakes Creek	River & Stream	CAR3041204120080603112335	5	18060001	30412050	0	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Stenner Creek	River & Stream	CAR3102401020020124145945	5	18060006	31024010	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Struve Slough	River & Stream	CAR3051003020080603125227	5	18060002	30510030	3	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Struve Slough	River & Stream	CAR3051003020080603125227	5	18060002	30510030	3	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jul-07	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
3	Struve Slough	River & Stream	CAR3051003020080603125227	5	18060002	30510030	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Sycamore Creek	River & Stream	CAR3153201220080612170100	5	18060013	31532012	4	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Sycamore Creek	River & Stream	CAR3153201220080612170100	5	18060013	31532012	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Sycamore Creek	River & Stream	CAR3153201220080612170100	5	18060013	31532012	4	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tecolote Creek (Santa Barbara County)	River & Stream	CAR3151001320080612163911	5	18060013	31510013	7	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tecolote Creek (Santa Barbara County)	River & Stream	CAR3151001320080612163911	5	18060013	31510013	7	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Chlorophyll-a	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tembladero Slough	River & Stream	CAR3091101019981209131830	5	18060011	30911010	6	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
3	Tequisquita Slough	River & Stream	CAR3053002020011121091332	5	18060002	30530020	7	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Tequisquita Slough	River & Stream	CAR3053002020011121091332	5	18060002	30530020	7	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tequisquita Slough	River & Stream	CAR3053002020011121091332	5	18060002	30530020	7	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tequisquita Slough	River & Stream	CAR3053002020011121091332	5	18060002	30530020	7	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Toro Canyon Creek	River & Stream	CAR3153401020080612170925	5	18060013	31534010	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Toro Creek	River & Stream	CAR3101801020020124151249	5	18060006	31018010	16	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Toro Creek	River & Stream	CAR3101801020020124151249	5	18060006	31018010	16	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tres Pinos Creek	River & Stream	CAR3053002020020124151519	5	18060002	30530020	31	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Tres Pinos Creek	River & Stream	CAR3053002020020124151519	5	18060002	30530020	31	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Tres Pinos Creek	River & Stream	CAR3053002020020124151519	5	18060002	30530020	31	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tularcitos Creek	River & Stream	CAR3070003220020124151854	5	18060012	30700032	14	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tularcitos Creek	River & Stream	CAR3070003220020124151854	5	18060012	30700032	14	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Tularcitos Creek	River & Stream	CAR3070003220020124151854	5	18060012	30700032	14	Miles	Sodium	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Uvas Creek (above Uvas Reservoir)	River & Stream	CAR3052001020080603162913	5	18060002	30520010	8	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Uvas Creek (above Uvas Reservoir)	River & Stream	CAR3052001020080603162913	5	18060002	30520010	8	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Uvas Creek (below Uvas Reservoir)	River & Stream	CAR3052002120080603163208	5	18060002	30520021	8	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Uvas Creek (below Uvas Reservoir)	River & Stream	CAR3052002120080603163208	5	18060002	30520021	8	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Uvas Reservoir	Lake & Reservoir	CAL3052001220020124163614	5	18060002	30520012	212	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Valencia Creek	River & Stream	CAR3041302319980827104158	5	18060001	30413023	6	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
3	Valencia Creek	River & Stream	CAR3041302319980827104158	5	18060001	30413023	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Walters Creek	River & Stream	CAR3102201120021002231800	5	18060006	31022011	3	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			For 2006, fecal coliform was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
3	Warden Creek	River & Stream	CAR3102301020021002232250	5	18060006	31023010	6	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			20-Jan-04	
3	Warden Creek	River & Stream	CAR3102301020021002232250	5	18060006	31023010	6	Miles	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Warden Creek	River & Stream	CAR3102301020021002232250	5	18060006	31023010	6	Miles	Nitrate	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Mar-05	
3	Watsonville Creek	River & Stream	CAR3051003020080603171443	5	18060011	30510030	5	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Creek	River & Stream	CAR3051003020080603171443	5	18060011	30510030	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Creek	River & Stream	CAR3051003020080603171443	5	18060011	30510030	5	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Creek	River & Stream	CAR3051003020080603171443	5	18060011	30510030	5	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Creek	River & Stream	CAR3051003020080603171443	5	18060011	30510030	5	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Slough	River & Stream	CAR3051003019981209150043	5	18060002	30510030	6	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Slough	River & Stream	CAR3051003019981209150043	5	18060002	30510030	6	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jul-07	
3	Watsonville Slough	River & Stream	CAR3051003019981209150043	5	18060002	30510030	6	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Watsonville Slough	River & Stream	CAR3051003019981209150043	5	18060002	30510030	6	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Zayante Creek	River & Stream	CAR3041202220020124155410	5	18060001	30412040	9	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Zayante Creek	River & Stream	CAR3041202220020124155410	5	18060001	30412040	9	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
3	Zayante Creek	River & Stream	CAR3041202220020124155410	5	18060001	30412040	9	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Feb-04	
4	Abalone Cove Beach	Coastal & Bay Shoreline	CAX4051100019990924093655	5	18070104	40511000	1	Miles	DDT (sediment)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Abalone Cove Beach	Coastal & Bay Shoreline	CAX4051100019990924093655	5	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Abalone Cove Beach	Coastal & Bay Shoreline	CAX4051100019990924093655	5	18070104	40511000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Alamitos Bay	Bay & Harbor	CAB4051200020070329124415	5	18070104	40512000	328	Acres	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The listing includes the areas 1st St. and Bayshore and 2nd St. Bridge and Bayshore.
4	Aliso Canyon Wash	River & Stream	CAR4052100019990201130918	5	18070105	40521000	10	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Aliso Canyon Wash	River & Stream	CAR4052100019990201130918	5	18070105	40521000	10	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Aliso Canyon Wash	River & Stream	CAR4052100019990201130918	5	18070105	40521000	10	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Amarillo Beach	Coastal & Bay Shoreline	CAX4043100020000312160831	5	18070104	40431000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Amarillo Beach	Coastal & Bay Shoreline	CAX4043100020000312160831	5	18070104	40431000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Arroyo Seco Reach 1 (LA River to West Holly Ave.)	River & Stream	CAR4051501019990202132906	5	18070104	40515010	5	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Arroyo Seco Reach 1 (LA River to West Holly Ave.)	River & Stream	CAR4051501019990202132906	5	18070104	40515010	5	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Arroyo Seco Reach 1 (LA River to West Holly Ave.)	River & Stream	CAR4051501019990202132906	5	18070104	40515010	5	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Arroyo Seco Reach 2 (West Holly Ave to Devils Gate Dam)	River & Stream	CAR4051501019990202133129	5	18070104	40515010	4	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Arroyo Seco Reach 2 (West Holly Ave to Devils Gate Dam)	River & Stream	CAR4051501019990202133129	5	18070104	40515010	4	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Artesia-Norwalk Drain	River & Stream	CAR4051501020081010131508	5	18070104	40515010	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Artesia-Norwalk Drain	River & Stream	CAR4051501020081010131508	5	18070104	40515010	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Avalon Beach	Coastal & Bay Shoreline	CAX4051100020020130162914	5	18070107	40511000	1	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Area affected is between Pier and BB restaurant (2/3), between Pier and BB restaurant (1/3), between storm drain and Pier (1/3). and between BB restaurant and the Tuna Club.
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Cadmium (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-05			A USEPA-approved TMDL has made a finding of non-impairment for this pollutant.
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-Mar-07	
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Copper, Dissolved	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Cyanide	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-01	
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Viruses (enteric)	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-Mar-07	
4	Ballona Creek	River & Stream	CAR4051300019980918142302	5	18070104	40513000	6	Miles	Zinc	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Chlordane (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-07	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	DDT (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Lead (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	PCBs (Polychlorinated biphenyls) (tissue & sediment)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Shellfish Harvesting Advisory	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Silver	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Estuary	River & Stream	CAR4051300019990203132149	5	18070104	40513000	2	Miles	Zinc (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Ballona Creek Wetlands	Wetland, Tidal	CAT4051700020000301101951	5	18070104	40517000	289	Acres	Exotic Vegetation	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ballona Creek Wetlands	Wetland, Tidal	CAT4051700020000301101951	5	18070104	40517000	289	Acres	Habitat alterations	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ballona Creek Wetlands	Wetland, Tidal	CAT4051700020000301101951	5	18070104	40517000	289	Acres	Hydromodification	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ballona Creek Wetlands	Wetland, Tidal	CAT4051700020000301101951	5	18070104	40517000	289	Acres	Reduced Tidal Flushing	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ballona Creek Wetlands	Wetland, Tidal	CAT4051700020000301101951	5	18070104	40517000	289	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-19	
4	Bell Creek	River & Stream	CAR4052100019990202135335	5	18070104	40521000	9	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Big Rock Beach	Coastal & Bay Shoreline	CAX4043100019990922101223	5	18070104	40431000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Big Rock Beach	Coastal & Bay Shoreline	CAX4043100019990922101223	5	18070104	40431000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Big Rock Beach	Coastal & Bay Shoreline	CAX4043100019990922101223	5	18070104	40431000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Bluff Cove Beach	Coastal & Bay Shoreline	CAX4051100019990922105503	5	18070104	40511000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Bluff Cove Beach	Coastal & Bay Shoreline	CAX4051100019990922105503	5	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Bluff Cove Beach	Coastal & Bay Shoreline	CAX4051100019990922105503	5	18070104	40511000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Brown Barranca/Long Canyon	River & Stream	CAR4032100019990202153640	4a	18070103	40321000	3	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Bull Creek	River & Stream	CAR4052100020090409143400	5	18070105	40521000	2	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Burbank Western Channel	River & Stream	CAR4052100019990202134403	5	18070105	40521000	13	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Burbank Western Channel	River & Stream	CAR4052100019990202134403	5	18070105	40521000	13	Miles	Cyanide	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Burbank Western Channel	River & Stream	CAR4052100019990202134403	5	18070105	40521000	13	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Burbank Western Channel	River & Stream	CAR4052100019990202134403	5	18070105	40521000	13	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Burbank Western Channel	River & Stream	CAR4052100019990202134403	5	18070105	40521000	13	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Burbank Western Channel	River & Stream	CAR4052100019990202134403	5	18070105	40521000	13	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Cabrillo Beach (Outer)	Coastal & Bay Shoreline	CAX4051200019990922141809	5	18070104	40512000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for DDT.
4	Cabrillo Beach (Outer)	Coastal & Bay Shoreline	CAX4051200019990922141809	5	18070104	40512000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Cabrillo Beach (Outer)	Coastal & Bay Shoreline	CAX4051200019990922141809	5	18070104	40512000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for PCBs.
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Chlordane (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			23-Mar-07	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	DDT (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-Mar-07	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Nickel	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			23-Mar-07	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Nitrogen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-00	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Toxaphene	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	Estuary	CAE4031300020000229155722	4a	18070103	40311000	344	Acres	Zinc	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			23-Mar-07	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	Historical use of pesticides and lubricants.
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Chlordane (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Copper, Dissolved	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			23-Mar-07	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	DDT (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			Area affected is at the mouth of the creek.
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Nitrogen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-05			
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 2 (estuary to Potrero Rd- was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4031200020000228111202	5	18070103	40312000	4	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-03	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-19	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-19	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Toxaphene	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-19	
4	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	River & Stream	CAR4031200020000228113723	5	18070103	40312000	3	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	Historical use of pesticides and lubricants.
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Chlordane (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Chlorpyrifos (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	Chlorpyrifos also exceeds in water.
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	DDT (tissue & sediment)	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			27-Nov-05	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Dieldrin (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Endosulfan (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Nitrate as Nitrate (NO3)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-03	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Nitrogen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			23-Mar-07	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	River & Stream	CAR4031100019990202140512	5	18070103	40311000	7	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Chlordane (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Chlorpyrifos (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	Chlorpyrifos also exceeds in water.
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	DDT (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Dieldrin (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Endosulfan (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Nitrogen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-05			
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	River & Stream	CAR4036100019990202141016	5	18070103	40311000	4	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	DDT (sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Nitrate as Nitrate (NO3)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-05			
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228094015	5	18070103	40362000	15	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Boron	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Organophosphorus Pesticides	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036200020000228103510	5	18070103	40367000	14	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Boron	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	River & Stream	CAR4036700020000228151947	5	18070103	40366000	7	Miles	Toxaphene	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Chlordane (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	Historical use of pesticides and lubricants.
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Dieldrin (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	Historical use of pesticides and lubricants.
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Lindane/gamma-Hexachlorocyclohexane (gamma-HCH) (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	Historical use of pesticides and lubricants.
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Nitrate as Nitrate (NO3)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Nitrogen, Nitrate	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	Historical use of pesticides and lubricants.
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9A (was lower part of Conejo Creek Reach 1 on 1998 303d list)	River & Stream	CAR4031200019990202144636	5	18070103	40312000	2	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 9B (was part of Conejo Creek Reaches 1 and 2 on 1998 303d list)	River & Stream	CAR4036300019990202145135	5	18070103	40363000	6	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Nitrogen, Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-10	
4	Calleguas Creek Reach 10 (Conejo Creek (Hill Canyon)-was part of Conejo Crk Reaches 2 & 3, and lower Conejo Crk/Arroyo Conejo N Fk on 1998 303d list)	River & Stream	CAR4036400020020226083118	5	18070103	40364000	3	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-05			
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 11 (Arroyo Santa Rosa, was part of Conejo Creek Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229094459	5	18070103	40365000	9	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	Chlordane (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 12 (was Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	River & Stream	CAR4036400019990202145922	4a	18070103	40364000	5	Miles	Toxaphene	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Chlordane	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Dieldrin	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Endosulfan (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Toxaphene (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Cr Reach 4 and part of Reach 3 on 1998 303d list)	River & Stream	CAR4036400020000229100105	4a	18070104	40368000	17	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Canada Larga (Ventura River Watershed)	River & Stream	CAR4021001020020131161119	5	18070103	40210010	8	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Horse stables, land use, cattle, and wildlife may be sources.
4	Canada Larga (Ventura River Watershed)	River & Stream	CAR4021001020020131161119	5	18070103	40210010	8	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Canada Larga (Ventura River Watershed)	River & Stream	CAR4021001020020131161119	5	18070103	40210010	8	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Carbon Beach	Coastal & Bay Shoreline	CAX4041600019990922144015	5	18070104	40416000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Carbon Beach	Coastal & Bay Shoreline	CAX4041600019990922144015	5	18070104	40416000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Carbon Beach	Coastal & Bay Shoreline	CAX4041600019990922144015	5	18070104	40416000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Casitas, Lake	Lake & Reservoir	CAL4022003220091208111831	5	18070101	40220032	2069	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Castaic Lake	Lake & Reservoir	CAL4035100020091208105546	5	18070102	40351000	2282	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Castlerock Beach	Coastal & Bay Shoreline	CAX4051300020000407104603	5	18070104	40513000	0	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Castlerock Beach	Coastal & Bay Shoreline	CAX4051300020000407104603	5	18070104	40513000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Castlerock Beach	Coastal & Bay Shoreline	CAX4051300020000407104603	5	18070104	40513000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Channel Islands Harbor Beach	Coastal & Bay Shoreline	CAX4031100020021007131415	4a	18070103	40311000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			08-Dec-08	
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	Chlordane (tissue & sediment)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	DDT (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	Dieldrin (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing includes the north, center, and south areas of the lagoon.
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	Lead (sediment)	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Colorado Lagoon	Wetland, Tidal	CAT4051200020000229133322	5	18070104	40512000	13	Acres	Zinc (sediment)	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Compton Creek	River & Stream	CAR4051501019990202111430	5	18070104	40515010	9	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Compton Creek	River & Stream	CAR4051501019990202111430	5	18070104	40515010	9	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Compton Creek	River & Stream	CAR4051501019990202111430	5	18070104	40515010	9	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Compton Creek	River & Stream	CAR4051501019990202111430	5	18070104	40515010	9	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Compton Creek	River & Stream	CAR4051501019990202111430	5	18070104	40515010	9	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Compton Creek	River & Stream	CAR4051501019990202111430	5	18070104	40515010	9	Miles	pH	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	Ammonia	Nutrients	Do Not Delist from 303(d) list (being addressed with action other than TMDL)	5C		01-Jan-19		
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	Copper, Dissolved	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Mar-07	
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Mar-07	
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-08			This listing was made by USEPA for 2002.
4	Coyote Creek	River & Stream	CAR4051501019980917123914	5	18070104	40515010	13	Miles	pH	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Coyote Creek, North Fork	River & Stream	CAR4051501020081117111917	5	18070104	40515010	5	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Coyote Creek, North Fork	River & Stream	CAR4051501020081117111917	5	18070104	40515010	5	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Crystal Lake	Lake & Reservoir	CAL4054300019980918124349	5	18070106	40543000	4	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dan Blocker Memorial (Coral) Beach	Coastal & Bay Shoreline	CAX4043100019990922145850	4a	18070104	40431000	2	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-02	(This listing includes the area of the beach at Latigo Beach and Solstice Canyon.)
4	Dockweiler Beach	Coastal & Bay Shoreline	CAX4051200019990922151826	4a	18070104	40512000	5	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Lead	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Dominguez Channel (lined portion above Vermont Ave)	River & Stream	CAR4051200019980918161017	5	18070104	40351000	7	Miles	Zinc	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Benzo(a)pyrene (3,4-Benzopyrene -7-d)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Benzo[a]anthracene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Chlordane (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Chrysene (C1-C4)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	DDT (tissue & sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Dieldrin (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Lead (tissue)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Phenanthrene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Pyrene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Estuary	CAE4051200020050203154519	5	18070104	40512000	140	Acres	Zinc (sediment)	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Dry Canyon Creek	River & Stream	CAR4052100020020130145656	5	18070104	40521000	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Dry Canyon Creek	River & Stream	CAR4052100020020130145656	5	18070104	40521000	4	Miles	Selenium, Total	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	Chlordane (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	DDT (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	Nitrogen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	Toxaphene (tissue)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Mar-06	
4	Duck Pond Agricultural Drains/Mugu Drain/Oxnard Drain No 2	River & Stream	CAR4031100020000228145414	4a	18070103	40311000	12	Miles	Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Algae	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Odor	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Echo Park Lake	Lake & Reservoir	CAL4051501020000228155002	5	18070104	40515010	13	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	Algae	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	Mercury (tissue)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	El Dorado Lakes	Lake & Reservoir	CAL4051501020000228153407	5	18070104	40515010	31	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Elizabeth Lake	Lake & Reservoir	CAL4035100019990202155114	5	18070102	40351000	123	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Elizabeth Lake	Lake & Reservoir	CAL4035100019990202155114	5	18070102	40351000	123	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Elizabeth Lake	Lake & Reservoir	CAL4035100019990202155114	5	18070102	40351000	123	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Elizabeth Lake	Lake & Reservoir	CAL4035100019990202155114	5	18070102	40351000	123	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Escondido Beach	Coastal & Bay Shoreline	CAX4043400019990922153218	5	18070104	40434000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			Fish Consumption Advisory for DDT.
4	Escondido Beach	Coastal & Bay Shoreline	CAX4043400019990922153218	5	18070104	40434000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Escondido Beach	Coastal & Bay Shoreline	CAX4043400019990922153218	5	18070104	40434000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Flat Rock Point Beach Area	Coastal & Bay Shoreline	CAX4051100019990922154626	5	18070104	40511000	0	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Flat Rock Point Beach Area	Coastal & Bay Shoreline	CAX4051100019990922154626	5	18070104	40511000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Flat Rock Point Beach Area	Coastal & Bay Shoreline	CAX4051100019990922154626	5	18070104	40511000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Fox Barranca (tributary to Calleguas Creek Reach 6)	River & Stream	CAR4036200020000228144008	4a	18070103	40362000	7	Miles	Boron	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Fox Barranca (tributary to Calleguas Creek Reach 6)	River & Stream	CAR4036200020000228144008	4a	18070103	40362000	7	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Fox Barranca (tributary to Calleguas Creek Reach 6)	River & Stream	CAR4036200020000228144008	4a	18070103	40362000	7	Miles	Sulfates	Other Inorganics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Fox Barranca (tributary to Calleguas Creek Reach 6)	River & Stream	CAR4036200020000228144008	4a	18070103	40362000	7	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			02-Dec-08	
4	Hermosa Beach	Coastal & Bay Shoreline	CAX4051200019990922160827	4a	18070104	40512000	2	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Hobie Beach (Channel Islands Harbor)	Coastal & Bay Shoreline	CAX4031100020020131155257	4a	18070103	40311000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Dec-08	
4	Hopper Creek	River & Stream	CAR4034100020020131112807	5	18070102	40341000	13	Miles	Sulfates	Other Inorganics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Hopper Creek	River & Stream	CAR4034100020020131112807	5	18070102	40341000	13	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Inspiration Point Beach	Coastal & Bay Shoreline	CAX4051100019990922164306	5	18070104	40511000	0	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Inspiration Point Beach	Coastal & Bay Shoreline	CAX4051100019990922164306	5	18070104	40511000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Inspiration Point Beach	Coastal & Bay Shoreline	CAX4051100019990922164306	5	18070104	40511000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	La Costa Beach	Coastal & Bay Shoreline	CAX4041600019990922162849	5	18070104	40416000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	La Costa Beach	Coastal & Bay Shoreline	CAX4041600019990922162849	5	18070104	40416000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	La Costa Beach	Coastal & Bay Shoreline	CAX4041600019990922162849	5	18070104	40416000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Lake Calabasas	Lake & Reservoir	CAL4052100019990203084034	5	18070105	40521000	18	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
4	Lake Calabasas	Lake & Reservoir	CAL4052100019990203084034	5	18070105	40521000	18	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Calabasas	Lake & Reservoir	CAL4052100019990203084034	5	18070105	40521000	18	Acres	Odor	Nuisance	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Calabasas	Lake & Reservoir	CAL4052100019990203084034	5	18070105	40521000	18	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Calabasas	Lake & Reservoir	CAL4052100019990203084034	5	18070105	40521000	18	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Hughes	Lake & Reservoir	CAL4035100019990202154623	5	18070102	40351000	21	Acres	Algae	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Hughes	Lake & Reservoir	CAL4035100019990202154623	5	18070102	40351000	21	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Hughes	Lake & Reservoir	CAL4035100019990202154623	5	18070102	40351000	21	Acres	Fish Kills	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Hughes	Lake & Reservoir	CAL4035100019990202154623	5	18070102	40351000	21	Acres	Odor	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Hughes	Lake & Reservoir	CAL4035100019990202154623	5	18070102	40351000	21	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Eutrophic	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Odor	Nuisance	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Specific Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Lindero	Lake & Reservoir	CAL4042300019990201145528	5	18070104	40423000	15	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Sherwood	Lake & Reservoir	CAL4042600019990201154540	5	18070104	40426000	135	Acres	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lake Sherwood	Lake & Reservoir	CAL4042600019990201154540	5	18070104	40426000	135	Acres	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lake Sherwood	Lake & Reservoir	CAL4042600019990201154540	5	18070104	40426000	135	Acres	Eutrophic	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lake Sherwood	Lake & Reservoir	CAL4042600019990201154540	5	18070104	40426000	135	Acres	Mercury (tissue)	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lake Sherwood	Lake & Reservoir	CAL4042600019990201154540	5	18070104	40426000	135	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Las Flores Beach	Coastal & Bay Shoreline	CAX4041500019990922165924	5	18070104	40415000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Las Flores Beach	Coastal & Bay Shoreline	CAX4041500019990922165924	5	18070104	40415000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Las Flores Beach	Coastal & Bay Shoreline	CAX4041500019990922165924	5	18070104	40415000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Las Tunas Beach	Coastal & Bay Shoreline	CAX4041200019990922170849	5	18070104	40412000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Las Tunas Beach	Coastal & Bay Shoreline	CAX4041200019990922170849	5	18070104	40412000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Las Tunas Beach	Coastal & Bay Shoreline	CAX4041200019990922170849	5	18070104	40412000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Scum/Foam-unnatural	Nuisance	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Las Virgenes Creek	River & Stream	CAR4042201019990201141611	5	18070104	40422010	12	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Legg Lake	Lake & Reservoir	CAL4053100019980917155807	5	18070105	40531000	25	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Legg Lake	Lake & Reservoir	CAL4053100019980917155807	5	18070105	40531000	25	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Legg Lake	Lake & Reservoir	CAL4053100019980917155807	5	18070105	40531000	25	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Legg Lake	Lake & Reservoir	CAL4053100019980917155807	5	18070105	40531000	25	Acres	Odor	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Legg Lake	Lake & Reservoir	CAL4053100019980917155807	5	18070105	40531000	25	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Legg Lake	Lake & Reservoir	CAL4053100019980917155807	5	18070105	40531000	25	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Leo Carillo Beach (South of County Line)	Coastal & Bay Shoreline	CAX4044400019990922180357	4a	18070104	40444000	2	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Lincoln Park Lake	Lake & Reservoir	CAL4051501020000303205453	5	18070104	40515010	4	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lincoln Park Lake	Lake & Reservoir	CAL4051501020000303205453	5	18070104	40515010	4	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lincoln Park Lake	Lake & Reservoir	CAL4051501020000303205453	5	18070104	40515010	4	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lincoln Park Lake	Lake & Reservoir	CAL4051501020000303205453	5	18070104	40515010	4	Acres	Odor	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lincoln Park Lake	Lake & Reservoir	CAL4051501020000303205453	5	18070104	40515010	4	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lincoln Park Lake	Lake & Reservoir	CAL4051501020000303205453	5	18070104	40515010	4	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Scum/Foam-unnatural	Nuisance	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lindero Creek Reach 1	River & Stream	CAR4042300019990201144612	5	18070104	40423000	3	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lindero Creek Reach 2 (Above Lake)	River & Stream	CAR4042500019990201150614	5	18070104	40425000	4	Miles	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lindero Creek Reach 2 (Above Lake)	River & Stream	CAR4042500019990201150614	5	18070104	40425000	4	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Lindero Creek Reach 2 (Above Lake)	River & Stream	CAR4042500019990201150614	5	18070104	40425000	4	Miles	Scum/Foam-unnatural	Nuisance	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Lindero Creek Reach 2 (Above Lake)	River & Stream	CAR4042500019990201150614	5	18070104	40425000	4	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Lindero Creek Reach 2 (Above Lake)	River & Stream	CAR4042500019990201150614	5	18070104	40425000	4	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Long Beach City Beach	Coastal & Bay Shoreline	CAC4051600020070503140939	5	18070104	40512000	5	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing includes the beach area at 3rd pl., 5th pl., 10th pl., 16th pl., 36th pl., 72nd pl., Coronado ave., Molino ave., and the east side and west side of Belmont Pier.
4	Long Point Beach	Coastal & Bay Shoreline	CAX4051100019990922172103	5	18070104	40511000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Long Point Beach	Coastal & Bay Shoreline	CAX4051100019990922172103	5	18070104	40511000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Long Point Beach	Coastal & Bay Shoreline	CAX4051100019990922172103	5	18070104	40511000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Los Angeles Harbor - Cabrillo Marina	Bay & Harbor	CAB4051200020050207104954	5	18070104	40512000	77	Acres	Benzo(a)pyrene (3,4-Benzopyrene -7-d)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Los Angeles Harbor - Cabrillo Marina	Bay & Harbor	CAB4051200020050207104954	5	18070104	40512000	77	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Cabrillo Marina	Bay & Harbor	CAB4051200020050207104954	5	18070104	40512000	77	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	2-Methylnaphthalene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Benzo(a)pyrene (3,4-Benzopyrene -7-d)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Benzo[a]anthracene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Cadmium (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants, stormwater runoff, aerial deposition, and historical discharges for metals.
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Chlordane (tissue & sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Chromium (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Chrysene (C1-C4)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Copper (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	DDT (tissue & sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Lead (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Mercury (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants, stormwater runoff, aerial deposition, and historical discharges for metals.
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	PCBs (Polychlorinated biphenyls) (tissue & sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Phenanthrene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Pyrene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Toxaphene (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Consolidated Slip	Bay & Harbor	CAB4051200020000229082107	5	18070104	40512000	36	Acres	Zinc (sediment)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants, stormwater runoff, aerial deposition, and historical discharges for metals.
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Benzo(a)pyrene (3,4-Benzopyrene -7-d)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Benzo[a]anthracene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Chrysene (C1-C4)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Dibenz[a,h]anthracene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	PAHs (Polycyclic Aromatic Hydrocarbons)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Phenanthrene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Pyrene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Fish Harbor	Bay & Harbor	CAB4051800020000229113919	5	18070104	40518000	91	Acres	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles Harbor - Inner Cabrillo Beach Area	Bay & Harbor	CAB4051200020050201175100	5	18070104	40512000	82	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Los Angeles Harbor - Inner Cabrillo Beach Area	Bay & Harbor	CAB4051200020050201175100	5	18070104	40512000	82	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-04	
4	Los Angeles Harbor - Inner Cabrillo Beach Area	Bay & Harbor	CAB4051200020050201175100	5	18070104	40512000	82	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Los Angeles River Estuary (Queensway Bay)	Estuary	CAE4051200020020226101749	5	18070104	40512000	207	Acres	Chlordane (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants.
4	Los Angeles River Estuary (Queensway Bay)	Estuary	CAE4051200020020226101749	5	18070104	40512000	207	Acres	DDT (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants.
4	Los Angeles River Estuary (Queensway Bay)	Estuary	CAE4051200020020226101749	5	18070104	40512000	207	Acres	PCBs (Polychlorinated biphenyls) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants.
4	Los Angeles River Estuary (Queensway Bay)	Estuary	CAE4051200020020226101749	5	18070104	40512000	207	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles River Estuary (Queensway Bay)	Estuary	CAE4051200020020226101749	5	18070104	40512000	207	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Copper, Dissolved	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Cyanide	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	Zinc, Dissolved	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 1 (Estuary to Carson Street)	River & Stream	CAR4051200019990202083037	5	18070104	40512000	3	Miles	pH	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-03	
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Oil	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles River Reach 2 (Carson to Figueroa Street)	River & Stream	CAR4051501019990202085021	5	18070104	40515010	19	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	River & Stream	CAR4052100019990202090157	4a	18070104	40521000	8	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	River & Stream	CAR4052100019990202090157	4a	18070104	40521000	8	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	River & Stream	CAR4052100019990202090157	4a	18070104	40521000	8	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	River & Stream	CAR4052100019990202090157	4a	18070104	40521000	8	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	River & Stream	CAR4052100019990202090157	4a	18070104	40521000	8	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	River & Stream	CAR4052100019990202091417	5	18070105	40521000	11	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	River & Stream	CAR4052100019990202091417	5	18070105	40521000	11	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	River & Stream	CAR4052100019990202091417	5	18070105	40521000	11	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	River & Stream	CAR4052100019990202091417	5	18070105	40521000	11	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	River & Stream	CAR4052100019990202091417	5	18070105	40521000	11	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	River & Stream	CAR4052100019990202091417	5	18070105	40521000	11	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Los Angeles River Reach 5 (within Sepulveda Basin)	River & Stream	CAR4052100019990202093310	5	18070105	40521000	2	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 5 (within Sepulveda Basin)	River & Stream	CAR4052100019990202093310	5	18070105	40521000	2	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 5 (within Sepulveda Basin)	River & Stream	CAR4052100019990202093310	5	18070105	40521000	2	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles River Reach 5 (within Sepulveda Basin)	River & Stream	CAR4052100019990202093310	5	18070105	40521000	2	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Los Angeles River Reach 5 (within Sepulveda Basin)	River & Stream	CAR4052100019990202093310	5	18070105	40521000	2	Miles	Oil	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles River Reach 5 (within Sepulveda Basin)	River & Stream	CAR4052100019990202093310	5	18070105	40521000	2	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Los Angeles River Reach 6 (Above Sepulveda Flood Control Basin)	River & Stream	CAR4052100019990202110610	5	18070105	40521000	7	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Los Angeles River Reach 6 (Above Sepulveda Flood Control Basin)	River & Stream	CAR4052100019990202110610	5	18070105	40521000	7	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Beach Closures	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-04			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Benzo(a)pyrene (3,4-Benzopyrene -7-d)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Chrysene (C1-C4)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Los Angeles/Long Beach Inner Harbor	Bay & Harbor	CAB4051200020050207122133	5	18070104	40518000	3003	Acres	Zinc	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Angeles/Long Beach Outer Harbor (inside breakwater)	Bay & Harbor	CAB4051800020050208092107	5	18070104	40512000	4042	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles/Long Beach Outer Harbor (inside breakwater)	Bay & Harbor	CAB4051800020050208092107	5	18070104	40512000	4042	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Angeles/Long Beach Outer Harbor (inside breakwater)	Bay & Harbor	CAB4051800020050208092107	5	18070104	40512000	4042	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Ammonia	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Bis(2ethylhexyl)phthalate (DEHP)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Chlordane (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-00			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Los Cerritos Channel	Wetland, Tidal	CAT4051501020000229140756	5	18070104	40515010	31	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Lunada Bay Beach	Coastal & Bay Shoreline	CAX4051100019990922174008	4a	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			11-Mar-09	
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			11-Mar-09	
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	ChemA (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants.
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Chlordane (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory.
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	DDT (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory.
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Dieldrin (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Eutrophic	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			11-Mar-09	
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Odor	Nuisance	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			11-Mar-09	
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Machado Lake (Harbor Park Lake)	Lake & Reservoir	CAL4051200020000229084938	5	18070104	40512000	45	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			06-Mar-08	
4	Malaga Cove Beach	Coastal & Bay Shoreline	CAX4051100019990923080316	5	18070104	40511000	0	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Malaga Cove Beach	Coastal & Bay Shoreline	CAX4051100019990923080316	5	18070104	40511000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Malaga Cove Beach	Coastal & Bay Shoreline	CAX4051100019990923080316	5	18070104	40511000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Malibou Lake	Lake & Reservoir	CAL4042400019990201142748	4a	18070104	40424000	40	Acres	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Malibou Lake	Lake & Reservoir	CAL4042400019990201142748	4a	18070104	40424000	40	Acres	Eutrophic	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Malibou Lake	Lake & Reservoir	CAL4042400019990201142748	4a	18070104	40424000	40	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Malibu Beach	Coastal & Bay Shoreline	CAX4042100020000321091234	5	18070104	40421000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Malibu Beach	Coastal & Bay Shoreline	CAX4042100020000321091234	5	18070104	40421000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-02	
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Fish Barriers (Fish Passage)	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Nutrients (Algae)	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Scum/Foam-unnatural	Nuisance	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Malibu Creek	River & Stream	CAR4042100019990201132825	5	18070104	40421000	11	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			07-Jul-09	
4	Malibu Lagoon	Estuary	CAE4042100019990201160355	5	18070104	40421000	15	Acres	Benthic Community Effects	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
4	Malibu Lagoon	Estuary	CAE4042100019990201160355	5	18070104	40421000	15	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-06	
4	Malibu Lagoon	Estuary	CAE4042100019990201160355	5	18070104	40421000	15	Acres	Eutrophic	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Malibu Lagoon	Estuary	CAE4042100019990201160355	5	18070104	40421000	15	Acres	Swimming Restrictions	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Malibu Lagoon	Estuary	CAE4042100019990201160355	5	18070104	40421000	15	Acres	Viruses (enteric)	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Malibu Lagoon	Estuary	CAE4042100019990201160355	5	18070104	40421000	15	Acres	pH	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-06			Possible sources might be septic systems, storm drains, and birds.
4	Malibu Lagoon Beach (Surfrider)	Coastal & Bay Shoreline	CAX4042100019990923084019	5	18070104	40421000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Malibu Lagoon Beach (Surfrider)	Coastal & Bay Shoreline	CAX4042100019990923084019	5	18070104	40421000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Malibu Lagoon Beach (Surfrider)	Coastal & Bay Shoreline	CAX4042100019990923084019	5	18070104	40421000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Manhattan Beach	Coastal & Bay Shoreline	CAX4051200019990923092303	4a	18070104	40512000	2	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Chlordane (tissue & sediment)	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Copper (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Mar-06	
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	DDT (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-05			A USEPA-approved TMDL has made a finding of non-impairment for this pollutant.
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Dieldrin (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-05			A USEPA-approved TMDL has made a finding of non-impairment for this pollutant.
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Fish Consumption Advisory	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-05	
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Lead (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Mar-06	
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	PCBs (Polychlorinated biphenyls) (tissue & sediment)	Other Organics	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Mar-06	Historical use of pesticides, storm water runoff/aerial deposition from urban areas. Shellfish harvesting advisory for PCBs in tissue.
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-05	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Marina del Rey Harbor - Back Basins	Bay & Harbor	CAB4051700019990921120356	5	18070104	40517000	391	Acres	Zinc (sediment)	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Mar-06	
4	Marina del Rey Harbor Beach	Coastal & Bay Shoreline	CAX4051700019990923093513	4a	18070104	40517000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Matilija Creek Reach 1 (Jct. With N. Fork to Reservoir)	River & Stream	CAR4022001219990202161144	5	18070101	40220012	1	Miles	Fish Barriers (Fish Passage)	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Matilija Creek Reach 2 (Above Reservoir)	River & Stream	CAR4022001019990202160841	5	18070101	40220010	15	Miles	Fish Barriers (Fish Passage)	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Matilija Reservoir	Lake & Reservoir	CAL4022001219990202160007	5	18070101	40220012	121	Acres	Fish Barriers (Fish Passage)	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	McCoy Canyon Creek	River & Stream	CAR4052100020020130141858	5	18070104	40521000	4	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
4	McCoy Canyon Creek	River & Stream	CAR4052100020020130141858	5	18070104	40521000	4	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	McCoy Canyon Creek	River & Stream	CAR4052100020020130141858	5	18070104	40521000	4	Miles	Nitrogen, Nitrate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	McCoy Canyon Creek	River & Stream	CAR4052100020020130141858	5	18070104	40521000	4	Miles	Selenium, Total	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	McGrath Beach	Coastal & Bay Shoreline	CAX4031100019990923094745	4a	18070103	40311000	2	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Nov-03	
4	McGrath Lake	Lake & Reservoir	CAL4031100019990203110047	5	18070103	40311000	20	Acres	Chlordane (sediment)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	McGrath Lake	Lake & Reservoir	CAL4031100019990203110047	5	18070103	40311000	20	Acres	DDT (sediment)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	McGrath Lake	Lake & Reservoir	CAL4031100019990203110047	5	18070103	40311000	20	Acres	Dieldrin (sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants, storm water runoff/aerial deposition from agricultural fields.
4	McGrath Lake	Lake & Reservoir	CAL4031100019990203110047	5	18070103	40311000	20	Acres	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	McGrath Lake	Lake & Reservoir	CAL4031100019990203110047	5	18070103	40311000	20	Acres	PCBs (Polychlorinated biphenyls) (sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Historical use of pesticides and lubricants, storm water runoff/aerial deposition from agricultural fields.
4	McGrath Lake	Lake & Reservoir	CAL4031100019990203110047	5	18070103	40311000	20	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Medea Creek Reach 1 (Lake to Confl. with Lindero)	River & Stream	CAR4042400019990201134442	5	18070104	40424000	3	Miles	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Medea Creek Reach 1 (Lake to Confl. with Lindero)	River & Stream	CAR4042400019990201134442	5	18070104	40424000	3	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Medea Creek Reach 1 (Lake to Confl. with Lindero)	River & Stream	CAR4042400019990201134442	5	18070104	40424000	3	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Medea Creek Reach 1 (Lake to Confl. with Lindero)	River & Stream	CAR4042400019990201134442	5	18070104	40424000	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Medea Creek Reach 1 (Lake to Confl. with Lindero)	River & Stream	CAR4042400019990201134442	5	18070104	40424000	3	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Medea Creek Reach 2 (Abv Confl. with Lindero)	River & Stream	CAR4042300019990201140017	5	18070104	40423000	5	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Mint Canyon Creek Reach 1 (Confl to Rowler Cyn)	River & Stream	CAR4035100019990203103930	4a	18070102	40351000	8	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Monrovia Canyon Creek	River & Stream	CAR4053100019990202115838	4a	18070105	40531000	3	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Munz Lake	Lake & Reservoir	CAL4035100019990202154903	5	18070102	40351000	7	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Munz Lake	Lake & Reservoir	CAL4035100019990202154903	5	18070102	40351000	7	Acres	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Nicholas Canyon Beach	Coastal & Bay Shoreline	CAX4044400019990923074411	5	18070104	40444000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Nicholas Canyon Beach	Coastal & Bay Shoreline	CAX4044400019990923074411	5	18070104	40444000	2	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Nicholas Canyon Beach	Coastal & Bay Shoreline	CAX4044400019990923074411	5	18070104	40444000	2	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Ormond Beach	Coastal & Bay Shoreline	CAX4031100020020926125623	5	18070103	40311000	3	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			This listing includes the area of Ormond Beach at Oxnard Drain.
4	Palo Comado Creek	River & Stream	CAR4042300019990201151533	4a	18070104	40423000	7	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Palo Verde Shoreline Park Beach	Coastal & Bay Shoreline	CAX4051100019990923151134	5	18070104	40511000	0	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Palo Verde Shoreline Park Beach	Coastal & Bay Shoreline	CAX4051100019990923151134	5	18070104	40511000	0	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Paradise Cove Beach	Coastal & Bay Shoreline	CAX4043500019990923104303	5	18070104	40435000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for DDT.
4	Paradise Cove Beach	Coastal & Bay Shoreline	CAX4043500019990923104303	5	18070104	40435000	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Paradise Cove Beach	Coastal & Bay Shoreline	CAX4043500019990923104303	5	18070104	40435000	2	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for PCBs.
4	Peck Road Park Lake	Lake & Reservoir	CAL4053100020000303195323	5	18070105	40531000	103	Acres	Chlordane (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Peck Road Park Lake	Lake & Reservoir	CAL4053100020000303195323	5	18070105	40531000	103	Acres	DDT (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Peck Road Park Lake	Lake & Reservoir	CAL4053100020000303195323	5	18070105	40531000	103	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Peck Road Park Lake	Lake & Reservoir	CAL4053100020000303195323	5	18070105	40531000	103	Acres	Odor	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Peck Road Park Lake	Lake & Reservoir	CAL4053100020000303195323	5	18070105	40531000	103	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Peck Road Park Lake	Lake & Reservoir	CAL4053100020000303195323	5	18070105	40531000	103	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Peninsula Beach	Coastal & Bay Shoreline	CAX4031100020020131145033	5	18070103	40311000	0	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Area affected is beach area north of South Jetty.
4	Piru Creek (from gaging station below Santa Felicia Dam to headwaters)	River & Stream	CAR4034100020020131113814	5	18070102	40342000	67	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Piru Creek (from gaging station below Santa Felicia Dam to headwaters)	River & Stream	CAR4034100020020131113814	5	18070102	40342000	67	Miles	pH	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Point Dume Beach	Coastal & Bay Shoreline	CAX4043500019990923104958	5	18070104	40435000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for DDT.
4	Point Dume Beach	Coastal & Bay Shoreline	CAX4043500019990923104958	5	18070104	40435000	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Point Dume Beach	Coastal & Bay Shoreline	CAX4043500019990923104958	5	18070104	40435000	3	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumtiion advisory for PCBs.
4	Point Fermin Park Beach	Coastal & Bay Shoreline	CAX4051200019990923110403	5	18070104	40512000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for DDT.
4	Point Fermin Park Beach	Coastal & Bay Shoreline	CAX4051200019990923110403	5	18070104	40512000	2	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for PCBs.
4	Point Fermin Park Beach	Coastal & Bay Shoreline	CAX4051200019990923110403	5	18070104	40512000	2	Miles	Total Coliform	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Point Vicente Beach	Coastal & Bay Shoreline	CAX405110001999092312311 1	4a	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Pole Creek (trib to Santa Clara River Reach 3)	River & Stream	CAR4033100020020131115122	5	18070102	40331000	9	Miles	Sulfates	Other Inorganics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Pole Creek (trib to Santa Clara River Reach 3)	River & Stream	CAR4033100020020131115122	5	18070102	40331000	9	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Port Hueneme Harbor (Back Basins)	Bay & Harbor	CAB4031100019990921141938	4b	18070103	40311000	65	Acres	DDT (tissue)	Pesticides	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
4	Port Hueneme Harbor (Back Basins)	Bay & Harbor	CAB4031100019990921141938	4b	18070103	40311000	65	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
4	Port Hueneme Pier	Coastal & Bay Shoreline	CAC4031100020050920160349	5	18070103	40311000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Portuguese Bend Beach	Coastal & Bay Shoreline	CAX4051100019990923124251	5	18070104	40511000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Portuguese Bend Beach	Coastal & Bay Shoreline	CAX4051100019990923124251	5	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Portuguese Bend Beach	Coastal & Bay Shoreline	CAX4051100019990923124251	5	18070104	40511000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCB.
4	Promenade Park Beach	Coastal & Bay Shoreline	CAX4021000020021007125121	5	18070101	40210000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-15			Area affected is at south of drain at Figueroa Street.
4	Puddingstone Reservoir	Lake & Reservoir	CAL4055200019980918113803	5	18070106	40552000	243	Acres	Chlordane (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Puddingstone Reservoir	Lake & Reservoir	CAL4055200019980918113803	5	18070106	40552000	243	Acres	DDT (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Puddingstone Reservoir	Lake & Reservoir	CAL4055200019980918113803	5	18070106	40552000	243	Acres	Mercury (tissue)	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Puddingstone Reservoir	Lake & Reservoir	CAL4055200019980918113803	5	18070106	40552000	243	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Puddingstone Reservoir	Lake & Reservoir	CAL4055200019980918113803	5	18070106	40552000	243	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Puente Creek	River & Stream	CAR4053100020081117111726	5	18070104	40515010	6	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Puente Creek	River & Stream	CAR4053100020081117111726	5	18070104	40515010	6	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Puerco Beach	Coastal & Bay Shoreline	CAX4043100019990923130035	5	18070104	40431000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Puerco Beach	Coastal & Bay Shoreline	CAX4043100019990923130035	5	18070104	40431000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Puerco Beach	Coastal & Bay Shoreline	CAX4043100019990923130035	5	18070104	40431000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Pyramid Lake	Lake & Reservoir	CAL4034200020091208113257	5	18070102	40342000	1483	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Redondo Beach	Coastal & Bay Shoreline	CAX4051200019990923132934	5	18070104	40512000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Redondo Beach	Coastal & Bay Shoreline	CAX4051200019990923132934	5	18070104	40512000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Redondo Beach	Coastal & Bay Shoreline	CAX4051200019990923132934	5	18070104	40512000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Resort Point Beach	Coastal & Bay Shoreline	CAX4051100019990923152141	4a	18070104	40511000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Rincon Beach	Coastal & Bay Shoreline	CAX4010001020020131134348	5	18070101	40100010	0	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			Area affected is 50 yards south of mouth of Rincon Creek.
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	ChemA (tissue)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	Chlordane (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	DDT (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	Nitrogen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Jun-03	
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio De Santa Clara/Oxnard Drain No. 3	River & Stream	CAR4031100020000228150910	5	18070103	40311000	2	Miles	Toxaphene (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	Zinc	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Rio Hondo Reach 1 (Confl. LA River to Snt Ana Fwy)	River & Stream	CAR4051501019990202112624	5	18070104	40515010	5	Miles	pH	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Rio Hondo Reach 2 (At Spreading Grounds)	River & Stream	CAR4051501019990202114543	5	18070104	40515010	5	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Rio Hondo Reach 2 (At Spreading Grounds)	River & Stream	CAR4051501019990202114543	5	18070104	40515010	5	Miles	Cyanide	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Robert H. Meyer Memorial Beach	Coastal & Bay Shoreline	CAX4044100019990923134843	5	18070104	40441000	1	Miles	Beach Closures	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Robert H. Meyer Memorial Beach	Coastal & Bay Shoreline	CAX4044100019990923134843	5	18070104	40441000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Robert H. Meyer Memorial Beach	Coastal & Bay Shoreline	CAX4044100019990923134843	5	18070104	40441000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Royal Palms Beach	Coastal & Bay Shoreline	CAX4051100019990923153531	5	18070104	40511000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for DDT.
4	Royal Palms Beach	Coastal & Bay Shoreline	CAX4051100019990923153531	5	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Royal Palms Beach	Coastal & Bay Shoreline	CAX4051100019990923153531	5	18070104	40511000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for PCBs.
4	San Antonio Creek (Tributary to Ventura River Reach 4)	River & Stream	CAR4022002320020131162536	5	18070101	40220023	10	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Antonio Creek (Tributary to Ventura River Reach 4)	River & Stream	CAR4022002320020131162536	5	18070101	40220023	10	Miles	Nitrogen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	San Antonio Creek (Tributary to Ventura River Reach 4)	River & Stream	CAR4022002320020131162536	5	18070101	40220023	10	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-23			
4	San Buenaventura Beach	Coastal & Bay Shoreline	CAC4021000020070614140217	5	18070103	40210000	2	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			This listing includes the area of San Buenaventura Beach at San Jon Rd.
4	San Gabriel River Estuary	River & Stream	CAR4051600020000229163853	5	18070104	40516000	3	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Mar-07	
4	San Gabriel River Estuary	River & Stream	CAR4051600020000229163853	5	18070104	40516000	3	Miles	Dioxin	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Gabriel River Estuary	River & Stream	CAR4051600020000229163853	5	18070104	40516000	3	Miles	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Gabriel River Estuary	River & Stream	CAR4051600020000229163853	5	18070104	40516000	3	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Gabriel River Reach 1 (Estuary to Firestone)	River & Stream	CAR4051501019980917144356	5	18070104	40515010	6	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	San Gabriel River Reach 1 (Estuary to Firestone)	River & Stream	CAR4051501019980917144356	5	18070104	40515010	6	Miles	pH	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	San Gabriel River Reach 2 (Firestone to Whittier Narrows Dam	River & Stream	CAR4051501019980917150749	5	18070104	40515010	12	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
4	San Gabriel River Reach 2 (Firestone to Whittier Narrows Dam	River & Stream	CAR4051501019980917150749	5	18070104	40515010	12	Miles	Cyanide	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Gabriel River Reach 2 (Firestone to Whittier Narrows Dam	River & Stream	CAR4051501019980917150749	5	18070104	40515010	12	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Mar-07	
4	San Gabriel River Reach 3 (Whittier Narrows to Ramona)	River & Stream	CAR4053100019980917153706	5	18070104	40531000	7	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Gabriel River, East Fork	River & Stream	CAR4054300019980918125729	4a	18070106	40543000	6	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			14-Dec-00	
4	San Jose Creek Reach 1 (SG Confluence to Temple St.)	River & Stream	CAR4053100019980918090950	5	18070105	40531000	3	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		
4	San Jose Creek Reach 1 (SG Confluence to Temple St.)	River & Stream	CAR4053100019980918090950	5	18070105	40531000	3	Miles	Coliform Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			
4	San Jose Creek Reach 1 (SG Confluence to Temple St.)	River & Stream	CAR4053100019980918090950	5	18070105	40531000	3	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Jose Creek Reach 1 (SG Confluence to Temple St.)	River & Stream	CAR4053100019980918090950	5	18070105	40531000	3	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	San Jose Creek Reach 1 (SG Confluence to Temple St.)	River & Stream	CAR4053100019980918090950	5	18070105	40531000	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	San Jose Creek Reach 2 (Temple to I-10 at White Ave.)	River & Stream	CAR4055100019980918093038	5	18070106	40531000	17	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	San Pedro Bay Near/Off Shore Zones	Bay & Harbor	CAB4051200019990921151740	5	18070104	40512000	8173	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	San Pedro Bay Near/Off Shore Zones	Bay & Harbor	CAB4051200019990921151740	5	18070104	40512000	8173	Acres	DDT (tissue & sediment)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	San Pedro Bay Near/Off Shore Zones	Bay & Harbor	CAB4051200019990921151740	5	18070104	40512000	8173	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Fish consumption advisory for PCBs.
4	San Pedro Bay Near/Off Shore Zones	Bay & Harbor	CAB4051200019990921151740	5	18070104	40512000	8173	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Santa Clara River Estuary	Estuary	CAE4031100020000229171211	5	18070103	40311000	49	Acres	ChemA	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Estuary	Estuary	CAE4031100020000229171211	5	18070103	40311000	49	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Estuary	Estuary	CAE4031100020000229171211	5	18070103	40311000	49	Acres	Nitrogen, Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Clara River Estuary	Estuary	CAE4031100020000229171211	5	18070103	40311000	49	Acres	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Estuary	Estuary	CAE4031100020000229171211	5	18070103	40311000	49	Acres	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 1 (Estuary to Hwy 101 Bridge)	River & Stream	CAR4031100019980917095027	5	18070103	40311000	10	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 3 (Freeman Diversion to A Street)	River & Stream	CAR4032100019990203101738	5	18070103	40331000	31	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Santa Clara River Reach 3 (Freeman Diversion to A Street)	River & Stream	CAR4032100019990203101738	5	18070103	40331000	31	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-02	
4	Santa Clara River Reach 3 (Freeman Diversion to A Street)	River & Stream	CAR4032100019990203101738	5	18070103	40331000	31	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
4	Santa Clara River Reach 3 (Freeman Diversion to A Street)	River & Stream	CAR4032100019990203101738	5	18070103	40331000	31	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Clara River Reach 5 (Blue Cut gaging station to West Pier Hwy 99 Bridge) (was named Santa Clara River Reach 7 on 2002 303(d) list)	River & Stream	CAR4035100019990203102901	5	18070102	40351000	9	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			28-Apr-05	Chloride was relisted by USEPA in 2002.
4	Santa Clara River Reach 5 (Blue Cut gaging station to West Pier Hwy 99 Bridge) (was named Santa Clara River Reach 7 on 2002 303(d) list)	River & Stream	CAR4035100019990203102901	5	18070102	40351000	9	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 5 (Blue Cut gaging station to West Pier Hwy 99 Bridge) (was named Santa Clara River Reach 7 on 2002 303(d) list)	River & Stream	CAR4035100019990203102901	5	18070102	40351000	9	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Chloride	Salinity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			28-Apr-05	Chloride was relisted by USEPA in 2002.
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Clara River Reach 6 (W Pier Hwy 99 to Bouquet Cyn Rd) (was named Santa Clara River Reach 8 on 2002 303(d) list)	River & Stream	CAR4035100019990204123459	5	18070102	40351000	5	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 7 (Bouquet Canyon Rd to above Lang Gaging Station) (was named Santa Clara River Reach 9 on 2002 303(d) list)	River & Stream	CAR4035100019990204124415	5	18070102	40351000	21	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 11 (Piru Creek, from confluence with Santa Clara River Reach 4 to gaging station below Santa Felicia Dam)	River & Stream	CAR4034100020050918185447	5	18070102	40341000	6	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 11 (Piru Creek, from confluence with Santa Clara River Reach 4 to gaging station below Santa Felicia Dam)	River & Stream	CAR4034100020050918185447	5	18070102	40341000	6	Miles	Specific Conductance	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Clara River Reach 11 (Piru Creek, from confluence with Santa Clara River Reach 4 to gaging station below Santa Felicia Dam)	River & Stream	CAR4034100020050918185447	5	18070102	40341000	6	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Clara River Reach 11 (Piru Creek, from confluence with Santa Clara River Reach 4 to gaging station below Santa Felicia Dam)	River & Stream	CAR4034100020050918185447	5	18070102	40341000	6	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Santa Fe Dam Park Lake	Lake & Reservoir	CAL4053100020000303202907	5	18070105	40531000	20	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Fe Dam Park Lake	Lake & Reservoir	CAL4053100020000303202907	5	18070105	40531000	20	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Fe Dam Park Lake	Lake & Reservoir	CAL4053100020000303202907	5	18070105	40531000	20	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Monica Bay Offshore/Nearshore	Bay & Harbor	CAB4051300019990921164318	5	18070104	40513000	146645	Acres	DDT (tissue & sediment)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Monica Bay Offshore/Nearshore	Bay & Harbor	CAB4051300019990921164318	5	18070104	40513000	146645	Acres	Debris	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Monica Bay Offshore/Nearshore	Bay & Harbor	CAB4051300019990921164318	5	18070104	40513000	146645	Acres	Fish Consumption Advisory	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The Fish Consumption Advisory is due to DDT and PCBs.
4	Santa Monica Bay Offshore/Nearshore	Bay & Harbor	CAB4051300019990921164318	5	18070104	40513000	146645	Acres	PCBs (Polychlorinated biphenyls) (tissue & sediment)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Santa Monica Bay Offshore/Nearshore	Bay & Harbor	CAB4051300019990921164318	5	18070104	40513000	146645	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Santa Monica Beach	Coastal & Bay Shoreline	CAX4051300019990924080458	4a	18070104	40513000	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Santa Monica Canyon	River & Stream	CAR4051300019980918150955	5	18070104	40513000	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Santa Monica Canyon	River & Stream	CAR4051300019980918150955	5	18070104	40513000	3	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Sawpit Creek	River & Stream	CAR4053100020050119104537	5	18070105	40531000	4	Miles	Bis(2ethylhexyl)phthalate (DEHP)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Sawpit Creek	River & Stream	CAR4053100020050119104537	5	18070105	40531000	4	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Sea Level Beach	Coastal & Bay Shoreline	CAX4044100020000301091908	5	18070104	40441000	0	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Sea Level Beach	Coastal & Bay Shoreline	CAX4044100020000301091908	5	18070104	40441000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Sea Level Beach	Coastal & Bay Shoreline	CAX4044100020000301091908	5	18070104	40441000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Sepulveda Canyon	River & Stream	CAR4051300019980918144753	5	18070104	405.13	1	Miles	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Sepulveda Canyon	River & Stream	CAR4051300019980918144753	5	18070104	405.13	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Sepulveda Canyon	River & Stream	CAR4051300019980918144753	5	18070104	405.13	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Sepulveda Canyon	River & Stream	CAR4051300019980918144753	5	18070104	405.13	1	Miles	Lead	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Sepulveda Canyon	River & Stream	CAR4051300019980918144753	5	18070104	405.13	1	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Sepulveda Canyon	River & Stream	CAR4051300019980918144753	5	18070104	405.13	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Sespe Creek (from 500 ft below confluence with Little Sespe Cr to headwaters)	River & Stream	CAR4033100020020131125908	5	18070102	40332020	54	Miles	Chloride	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Sespe Creek (from 500 ft below confluence with Little Sespe Cr to headwaters)	River & Stream	CAR4033100020020131125908	5	18070102	40332020	54	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Solstice Canyon Creek	River & Stream	CAR4043200020050623113649	5	18070104	40432000	5	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Stokes Creek	River & Stream	CAR4042202019990201161555	4a	18070104	40422020	5	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Jan-06	
4	Surfers Point at Seaside	Coastal & Bay Shoreline	CAX4021000020020131150607	5	18070101	40210000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-15			Area affected is the end of the access path via a wooden gate.
4	Topanga Beach	Coastal & Bay Shoreline	CAX4041300019990924081553	5	18070104	40413000	3	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Topanga Beach	Coastal & Bay Shoreline	CAX4041300019990924081553	5	18070104	40413000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Topanga Beach	Coastal & Bay Shoreline	CAX4041300019990924081553	5	18070104	40413000	3	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Topanga Canyon Creek	River & Stream	CAR4041100019980918145717	5	18070104	40411000	9	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Torrance Beach	Coastal & Bay Shoreline	CAX4051200019990924082657	4a	18070104	40512000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Torrance Carson Channel	River & Stream	CAR4051200020000229130309	5	18070104	40512000	3	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Torrance Carson Channel	River & Stream	CAR4051200020000229130309	5	18070104	40512000	3	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Torrance Carson Channel	River & Stream	CAR4051200020000229130309	5	18070104	40512000	3	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Torrey Canyon Creek	River & Stream	CAR4034100019990202154317	4a	18070103	40341000	2	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Trancas Beach (Broad Beach)	Coastal & Bay Shoreline	CAX4043700019990924083852	5	18070104	40437000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Trancas Beach (Broad Beach)	Coastal & Bay Shoreline	CAX4043700019990924083852	5	18070104	40437000	2	Miles	Fecal Coliform	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Trancas Beach (Broad Beach)	Coastal & Bay Shoreline	CAX4043700019990924083852	5	18070104	40437000	2	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Triunfo Canyon Creek Reach 1	River & Stream	CAR4042400019990202081341	5	18070104	40424000	3	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Triunfo Canyon Creek Reach 1	River & Stream	CAR4042400019990202081341	5	18070104	40424000	3	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Triunfo Canyon Creek Reach 1	River & Stream	CAR4042400019990202081341	5	18070104	40424000	3	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Triunfo Canyon Creek Reach 2	River & Stream	CAR4042400019990202082235	5	18070104	40424000	3	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Triunfo Canyon Creek Reach 2	River & Stream	CAR4042400019990202082235	5	18070104	40424000	3	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Triunfo Canyon Creek Reach 2	River & Stream	CAR4042400019990202082235	5	18070104	40424000	3	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Triunfo Canyon Creek Reach 2	River & Stream	CAR4042400019990202082235	5	18070104	40424000	3	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Tujunga Wash (LA River to Hansen Dam)	River & Stream	CAR4052100019990202134750	5	18070105	40521000	10	Miles	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Tujunga Wash (LA River to Hansen Dam)	River & Stream	CAR4052100019990202134750	5	18070105	40521000	10	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
4	Tujunga Wash (LA River to Hansen Dam)	River & Stream	CAR4052100019990202134750	5	18070105	40521000	10	Miles	Copper	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			22-Dec-05	
4	Tujunga Wash (LA River to Hansen Dam)	River & Stream	CAR4052100019990202134750	5	18070105	40521000	10	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Venice Beach	Coastal & Bay Shoreline	CAX4051300019990924084731	4a	18070104	40513000	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Ventura Harbor: Ventura Keys	Bay & Harbor	CAB4031100019990922090257	5	18070103	40311000	179	Acres	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura Marina Jetties	Coastal & Bay Shoreline	CAC4031100020050916175043	5	18070103	40311000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura Marina Jetties	Coastal & Bay Shoreline	CAC4031100020050916175043	5	18070103	40311000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Estuary	River & Stream	CAR4021001119990204110204	5	18070101	40210011	0	Miles	Algae	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Estuary	River & Stream	CAR4021001119990204110204	5	18070101	40210011	0	Miles	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Estuary	River & Stream	CAR4021001119990204110204	5	18070101	40210011	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Stables and horse property may be the sources.
4	Ventura River Estuary	River & Stream	CAR4021001119990204110204	5	18070101	40210011	0	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-08	
4	Ventura River Reach 1 and 2 (Estuary to Weldon Canyon)	River & Stream	CAR4021001119990203084656	5	18070101	40210011	4	Miles	Algae	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Reach 3 (Weldon Canyon to Confl. w/ Coyote Cr)	River & Stream	CAR4021001119990203085715	5	18070101	40210011	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Ventura River Reach 3 (Weldon Canyon to Confl. w/ Coyote Cr)	River & Stream	CAR4021001119990203085715	5	18070101	40210011	3	Miles	Pumping	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Reach 3 (Weldon Canyon to Confl. w/ Coyote Cr)	River & Stream	CAR4021001119990203085715	5	18070101	40210011	3	Miles	Water Diversion	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Reach 4 (Coyote Creek to Camino Cielo Rd)	River & Stream	CAR4022002119990203090836	5	18070101	40220021	19	Miles	Pumping	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Ventura River Reach 4 (Coyote Creek to Camino Cielo Rd)	River & Stream	CAR4022002119990203090836	5	18070101	40220021	19	Miles	Water Diversion	Hydromodification	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Verdugo Wash Reach 1 (LA River to Verdugo Rd.)	River & Stream	CAR4052100019990202133541	5	18070105	40521000	2	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Verdugo Wash Reach 1 (LA River to Verdugo Rd.)	River & Stream	CAR4052100019990202133541	5	18070105	40521000	2	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Verdugo Wash Reach 1 (LA River to Verdugo Rd.)	River & Stream	CAR4052100019990202133541	5	18070105	40521000	2	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Verdugo Wash Reach 2 (Above Verdugo Road)	River & Stream	CAR4052400019990202133813	5	18070105	40524000	8	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
4	Verdugo Wash Reach 2 (Above Verdugo Road)	River & Stream	CAR4052400019990202133813	5	18070105	40524000	8	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Jul-08	
4	Walnut Creek Wash (Drains from Puddingstone Res)	River & Stream	CAR4053100019980918112433	5	18070106	40531000	12	Miles	Benthic-Macroinvertebrate Bioassessments	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
4	Walnut Creek Wash (Drains from Puddingstone Res)	River & Stream	CAR4053100019980918112433	5	18070106	40531000	12	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
4	Walnut Creek Wash (Drains from Puddingstone Res)	River & Stream	CAR4053100019980918112433	5	18070106	40531000	12	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Westlake Lake	Lake & Reservoir	CAL4042500019990201153000	5	18070104	40425000	119	Acres	Algae	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Westlake Lake	Lake & Reservoir	CAL4042500019990201153000	5	18070104	40425000	119	Acres	Ammonia	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Westlake Lake	Lake & Reservoir	CAL4042500019990201153000	5	18070104	40425000	119	Acres	Eutrophic	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Westlake Lake	Lake & Reservoir	CAL4042500019990201153000	5	18070104	40425000	119	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Westlake Lake	Lake & Reservoir	CAL4042500019990201153000	5	18070104	40425000	119	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Mar-03	
4	Wheeler Canyon/Todd Barranca	River & Stream	CAR4032100019990202154046	5	18070102	40321000	10	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			18-Mar-04	
4	Wheeler Canyon/Todd Barranca	River & Stream	CAR4032100019990202154046	5	18070102	40321000	10	Miles	Sulfates	Other Inorganics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Wheeler Canyon/Todd Barranca	River & Stream	CAR4032100019990202154046	5	18070102	40321000	10	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Whites Point Beach	Coastal & Bay Shoreline	CAX4051100019990924085839	5	18070104	40511000	1	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Whites Point Beach	Coastal & Bay Shoreline	CAX4051100019990924085839	5	18070104	40511000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Whites Point Beach	Coastal & Bay Shoreline	CAX4051100019990924085839	5	18070104	40511000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
4	Will Rogers Beach	Coastal & Bay Shoreline	CAX4051300019990924091258	4a	18070104	40513000	3	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Wilmington Drain	River & Stream	CAR4051200020020307110435	5	18070104	40342000	1	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
4	Wilmington Drain	River & Stream	CAR4051200020020307110435	5	18070104	40342000	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Wilmington Drain	River & Stream	CAR4051200020020307110435	5	18070104	40342000	1	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
4	Zuma Beach (Westward Beach)	Coastal & Bay Shoreline	CAX4043600019990924091850	5	18070104	40436000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for DDT.
4	Zuma Beach (Westward Beach)	Coastal & Bay Shoreline	CAX4043600019990924091850	5	18070104	40436000	2	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			19-Jun-03	
4	Zuma Beach (Westward Beach)	Coastal & Bay Shoreline	CAX4043600019990924091850	5	18070104	40436000	2	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Fish Consumption Advisory for PCBs.
5	Agatha Canal (Merced County)	River & Stream	CAR5412000020090110150509	5	18040001	54120000	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-May-00	
5	Agatha Canal (Merced County)	River & Stream	CAR5412000020090110150509	5	18040001	54120000	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Almanor Lake	Lake & Reservoir	CAL5184100020020418094956	5	18020121	51841000	25314	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Amador Lake	Lake & Reservoir	CAL5324004120020418095324	5	18040012	53240041	299	Acres	pH (high)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	American River, Lower (Nimbus Dam to confluence with Sacramento River)	River & Stream	CAR5192100019980813142021	5	18020109	51921000	27	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			All resource extraction sources are abandoned mines.
5	American River, Lower (Nimbus Dam to confluence with Sacramento River)	River & Stream	CAR5192100019980813142021	5	18020109	51921000	27	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	American River, Lower (Nimbus Dam to confluence with Sacramento River)	River & Stream	CAR5192100019980813142021	5	18020109	51921000	27	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
5	American River, North Fork	River & Stream	CAR5145501020020610125753	5	18020128	51421010	71	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is from North Fork Dam to Folsom Lake.
5	American River, South Fork (below Slab Creek Reservoir to Folsom Lake)	River & Stream	CAR5143206020060808153403	5	18020129	51432060	37	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Anderson Creek (Shasta County)	River & Stream	CAR5081000020080623162543	5	18020101	50810000	16	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Arcade Creek	River & Stream	CAR5192100019980813113546	5	18020111	51921000	10	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Nov-04	
5	Arcade Creek	River & Stream	CAR5192100019980813113546	5	18020111	51921000	10	Miles	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Arcade Creek	River & Stream	CAR5192100019980813113546	5	18020111	51921000	10	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Nov-04	The agricultural source of diazinon for these waterbodies is from aerial deposition.
5	Arcade Creek	River & Stream	CAR5192100019980813113546	5	18020111	51921000	10	Miles	Malathion	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Arcade Creek	River & Stream	CAR5192100019980813113546	5	18020111	51921000	10	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Arcade Creek	River & Stream	CAR5192100019980813113546	5	18020111	51921000	10	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ash Creek, Upper	River & Stream	CAR5266402420080822223246	5	18020002	52664024	19	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ash Creek, Upper	River & Stream	CAR5266402420080822223246	5	18020002	52664024	19	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ash Slough (Madera County)	River & Stream	CAR5452000020081113235605	5	18040001	54520000	27	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Avena Drain	River & Stream	CAR5314000020011128155819	5	18040002	53140000	6	Miles	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Avena Drain	River & Stream	CAR5314000020011128155819	5	18040002	53140000	6	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Bates Slough (from Avenue 200 to Deep Creek, Tulare County)	River & Stream	CAR5581000020080623164620	5	18030012	55810000	8	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Beach Lake	Lake & Reservoir	CAL5100000020020730132558	5	18020109	51000000	96	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear Creek (Colusa County)	River & Stream	CAR5132002320011128111020	4a	18020116	51320023	15	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			07-Feb-07	
5	Bear Creek (San Joaquin and Calaveras Counties; partly in Delta Waterways, eastern portion)	River & Stream	CAR5312000020080709162556	5	18040005	53120000	43	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear Creek (San Joaquin and Calaveras Counties; partly in Delta Waterways, eastern portion)	River & Stream	CAR5312000020080709162556	5	18040005	53120000	43	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear Creek (San Joaquin and Calaveras Counties; partly in Delta Waterways, eastern portion)	River & Stream	CAR5312000020080709162556	5	18040005	53120000	43	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear Creek (San Joaquin and Calaveras Counties; partly in Delta Waterways, eastern portion)	River & Stream	CAR5312000020080709162556	5	18040005	53120000	43	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear Creek (from Bear Valley to San Joaquin River, Mariposa and Merced Counties)	River & Stream	CAR5380001020080709164456	5	18040001	53800010	84	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear Creek (from Bear Valley to San Joaquin River, Mariposa and Merced Counties)	River & Stream	CAR5380001020080709164456	5	18040001	53800010	84	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear River (Amador Co, Lower Bear River Reservoir to Mokelumne River, N Fork)	River & Stream	CAR5326005020041209160741	5	18040012	53260050	5	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear River (from Allen to Upper Bear River Reservoir, Amador County)	River & Stream	CAR5326004020080623165216	5	18040012	53260040	8	Miles	pH (low)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear River, Lower (below Camp Far West Reservoir)	River & Stream	CAR5151000020000208113114	5	18020126	51510000	21	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear River, Lower (below Camp Far West Reservoir)	River & Stream	CAR5151000020000208113114	5	18020126	51510000	21	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Bear River, Lower (below Camp Far West Reservoir)	River & Stream	CAR5151000020000208113114	5	18020126	51510000	21	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
5	Bear River, Lower (below Camp Far West Reservoir)	River & Stream	CAR5151000020000208113114	5	18020126	51510000	21	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-15			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Bear River, Upper (from Combie Lake to Camp Far West Reservoir, Nevada and Placer Counties)	River & Stream	CAR5163301020011128161810	5	18020126	51633010	10	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
5	Beaver Creek	River & Stream	CAR5264101120080823112052	5	18020003	52641011	23	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Berenda Creek (Madera County)	River & Stream	CAR5453002020081113235146	5	18040001	54530020	21	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Berenda Creek (Madera County)	River & Stream	CAR5453002020081113235146	5	18040001	54530020	21	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Berenda Slough (Madera County)	River & Stream	CAR5452000020081113234637	5	18040001	54520000	23	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Berryessa, Lake	Lake & Reservoir	CAL5122101019980814115052	5	18020117	51221010	19083	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-17			
5	Big Chico Creek (Butte and Tehama Counties)	River & Stream	CAR5204000020020610133629	5	18020103	52040000	45	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Black Butte Reservoir	Lake & Reservoir	CAL5043200020011128135130	5	18020115	50432000	4507	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Britton Lake	Lake & Reservoir	CAL5263101220020418104706	5	18020003	52631012	1100	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Burch Creek (Tehama County)	River & Stream	CAR5042007020080708163738	5	18020103	50420070	24	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Butte Creek (Butte County)	River & Stream	CAR5204000020020610131525	5	18020104	52040000	94	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Butte Creek (Butte County)	River & Stream	CAR5204000020020610131525	5	18020104	52040000	94	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Butte Slough	River & Stream	CAR5203000020011128163228	5	18020104	52030000	9	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
5	Butte Slough	River & Stream	CAR5203000020011128163228	5	18020104	52030000	9	Miles	Dichlorvos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Butte Slough	River & Stream	CAR5203000020011128163228	5	18020104	52030000	9	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Butte Slough	River & Stream	CAR5203000020011128163228	5	18020104	52030000	9	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cache Creek, Lower (Clear Lake Dam to Cache Creek Settling Basin near Yolo Bypass)	River & Stream	CAR5133202219980813161630	5	18020109	51120000	96	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cache Creek, Lower (Clear Lake Dam to Cache Creek Settling Basin near Yolo Bypass)	River & Stream	CAR5133202219980813161630	5	18020109	51120000	96	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			07-Feb-07	All resource extraction sources are abandoned mines.
5	Cache Creek, Lower (Clear Lake Dam to Cache Creek Settling Basin near Yolo Bypass)	River & Stream	CAR5133202219980813161630	5	18020109	51120000	96	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Cache Creek, North Fork (below Indian Valley Reservoir, Lake County)	River & Stream	CAR5134004020080731215753	4a	18020116	51340040	14	Miles	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			07-Feb-07	
5	Calaveras River, Lower (from Bellota Weir to Stockton Diverting Canal)	Coastal & Bay Shoreline	CAR5313000020090428173156	5	18040004	53130000	21	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Calaveras River, Lower (from Stockton Diverting Canal to the San Joaquin River; partly in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011128144534	5	18040004	54400000	8	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Calaveras River, Lower (from Stockton Diverting Canal to the San Joaquin River; partly in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011128144534	5	18040004	54400000	8	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B	01-Jan-21			
5	Calaveras River, Lower (from Stockton Diverting Canal to the San Joaquin River; partly in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011128144534	5	18040004	54400000	8	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Calaveras River, Lower (from Stockton Diverting Canal to the San Joaquin River; partly in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011128144534	5	18040004	54400000	8	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	Calaveras River, Lower (from Stockton Diverting Canal to the San Joaquin River; partly in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011128144534	5	18040004	54400000	8	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-May-08	
5	Camanche Reservoir	Lake & Reservoir	CAL5312000020000208145300	5	18040005	53120000	7389	Acres	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Camanche Reservoir	Lake & Reservoir	CAL5312000020000208145300	5	18040005	53120000	7389	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Camanche Reservoir	Lake & Reservoir	CAL5312000020000208145300	5	18040005	53120000	7389	Acres	Zinc	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Camp Far West Reservoir	Lake & Reservoir	CAL5163101320011120170021	5	18020126	51631013	1945	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
5	Canyon Creek (Modoc County)	River & Stream	CAR5265103220080823165955	5	18020002	52651032	18	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Carson Creek (from WWTP to Deer Creek)	River & Stream	CAR5322201320041109091641	5	18040005	53222013	12	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Carson Creek (from WWTP to Deer Creek)	River & Stream	CAR5322201320041109091641	5	18040005	53222013	12	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Chicken Ranch Slough	River & Stream	CAR5192100019980817094238	5	18020111	51921000	8	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Nov-04	
5	Chicken Ranch Slough	River & Stream	CAR5192100019980817094238	5	18020111	51921000	8	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Nov-04	The agricultural source of diazinon for these waterbodies is from aerial deposition.
5	Chicken Ranch Slough	River & Stream	CAR5192100019980817094238	5	18020111	51921000	8	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Chicken Ranch Slough	River & Stream	CAR5192100019980817094238	5	18020111	51921000	8	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	China Slough (from Leininger Road to Sacramento River, Tehama County)	River & Stream	CAR5042007020080623172507	5	18020103	50420070	5	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Clear Creek (below Whiskeytown Lake, Shasta County)	River & Stream	CAR5081000020020610135706	5	18020112	50810000	18	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Clear Lake	Lake & Reservoir	CAL5135200019980814115549	4a	18020116	51352000	40070	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Oct-03	
5	Clear Lake	Lake & Reservoir	CAL5135200019980814115549	4a	18020116	51352000	40070	Acres	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			21-Sep-07	
5	Clover Creek	River & Stream	CAR5073200020011212115720	5	18020118	50732000	11	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Azinphos-methyl (Guthion)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Carbofuran	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Malathion	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Colusa Basin Drain	River & Stream	CAR5202100019980813170249	5	18020104	52010000	49	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Comanche Creek (from Little Chico Creek to Angel Slough, Butte and Glenn Counties)	River & Stream	CAR5204000020080623163527	5	18020105	52040000	15	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Combie, Lake	Lake & Reservoir	CAL5163301120020111100904	5	18020126	51633011	362	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			All resource extraction sources are abandoned mines.
5	Concow Creek (tributary to West Branch Feather River, Butte County)	River & Stream	CAR5186003120080623173308	5	18020121	51860031	10	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Coon Creek, Lower (from Pacific Avenue to Main Canal, Sutter County)	River & Stream	CAR5192200020080623174531	5	18020109	51922000	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Coon Creek, Lower (from Pacific Avenue to Main Canal, Sutter County)	River & Stream	CAR5192200020080623174531	5	18020109	51922000	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Coon Creek, Lower (from Pacific Avenue to Main Canal, Sutter County)	River & Stream	CAR5192200020080623174531	5	18020109	51922000	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cosumnes River, Lower (below Michigan Bar; partly in Delta Waterways, eastern portion)	River & Stream	CAR5311100020080909191017	5	18040003	53111000	36	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cosumnes River, Lower (below Michigan Bar; partly in Delta Waterways, eastern portion)	River & Stream	CAR5311100020080909191017	5	18040003	53111000	36	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Cosumnes River, Lower (below Michigan Bar; partly in Delta Waterways, eastern portion)	River & Stream	CAR5311100020080909191017	5	18040003	53111000	36	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cosumnes River, Upper (above Michigan Bar)	River & Stream	CAR5322308020080909185601	5	18040005	53223080	17	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Cottonwood Creek (S Madera County)	River & Stream	CAR5452000020080623175030	5	18040001	54520000	29	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cottonwood Creek (S Madera County)	River & Stream	CAR5452000020080623175030	5	18040001	54520000	29	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Cross Creek (Kings and Tulare Counties)	River & Stream	CAR5581000020080808211103	5	18030012	55810000	32	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Curry Creek (Placer and Sutter Counties)	River & Stream	CAR5192200020070510155010	5	18020111	51922000	12	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Curry Creek (Placer and Sutter Counties)	River & Stream	CAR5192200020070510155010	5	18020111	51922000	12	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Curtis Creek (Tuolumne County)	River & Stream	CAR5363102120080808180808	5	18040009	53631021	12	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Davis Creek (downstream from Davis Creek Reservoir, Yolo County)	River & Stream	CAR5133201020080623175316	5	18020116	51332010	6	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-17			
5	Davis Creek (upstream from Davis Creek Reservoir, Yolo County)	River & Stream	CAR5133201020080623175452	5	18020116	51332010	5	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-17			
5	Davis Creek Reservoir	Lake & Reservoir	CAL5133201020000307114628	5	18020116	51332010	163	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-17			
5	Deadman Creek (Merced County)	River & Stream	CAR5357000020080806144342	5	18040001	53570000	11	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Deadman Creek (Merced County)	River & Stream	CAR5357000020080806144342	5	18040001	53570000	11	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Deep Slough (Merced County)	River & Stream	CAR5357000020080824181506	5	18040001	53570000	5	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Deer Creek (Sacramento County)	River & Stream	CAR5322201220020625110936	5	18040013	53222012	12	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Deer Creek (Tulare County)	River & Stream	CAR5581000020020502134236	5	18030005	55810000	58	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Deer Creek (Tulare County)	River & Stream	CAR5581000020020502134236	5	18030005	55810000	58	Miles	pH (high)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Deer Creek (Yuba County)	River & Stream	CAR5171201420021125141605	5	18020125	51712014	4	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Deer Creek (from Deer Creek Reservoir to Lake Wildwood, Nevada County)	River & Stream	CAR5172001220080623175736	5	18020125	51720012	16	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-16			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Bifenthrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-10			The pyrethroids of concern for this listing are bifenthrin, lamdba cyhalothrin, efenvalerate/fedvalerate, and permethrin.
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Del Puerto Creek	River & Stream	CAR5411000020011212111305	5	18040002	54110000	6	Miles	pH (high)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Dioxin	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The areas of the ship channel impacted by dioxin contamination in sportfish encompass Old Mormon Slough, New Mormon Slough, McLeod Lake, Turning Basin, Morrelli Boat Ramp, and Louis Park Boat Ramp (California Department of Health Services 1998 warning). This listing was made by USEPA in 1998 and was under the Stockton Turning Basin, upper (Port Turning Basin) on previous lists. In order to consolidate listings for same areas, all listings for Stockton Turning Basin are now under the Delta Waterways (Stockton Ship Channel).
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Furan Compounds	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was previously under Stockton Turning Basin, upper (Port Turning Basin). In order to consolidate listings for same areas, all listings for Stockton Turning Basin are now under the Delta Waterways (Stockton Ship Channel).
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Feb-07	
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The areas of the ship channel impacted by PCB contamination in sportfish encompass Old Mormon Slough, New Mormon Slough, McLeod Lake, Turning Basin, Morrelli Boat Ramp, and Louis Park Boat Ramp (California Department of Health Services 1998 warning). This listing was made by USEPA in 1998 and was under the Stockton Turning Basin, upper (Port Turning Basin) on previous lists. In order to consolidate listings for same areas, all listings for Stockton Turning Basin are now under the Delta Waterways (Stockton Ship Channel).
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-May-08	This listing was previously under Stockton Turning Basin, upper (Port Turning Basin). In order to consolidate listings for same areas, all listings for Stockton Turning Basin are now under the Delta Waterways (Stockton Ship Channel).
5	Delta Waterways (Stockton Ship Channel)	Estuary	CAE5440000020021115141407	5	18040004	54400000	1603	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (central portion)	Estuary	CAE5440000020041014185830	5	18040003	54400000	11425	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (eastern portion)	Estuary	CAE5100000020021115112329	5	18040005	54400000	2972	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (export area)	Estuary	CAE5440000020041005165433	5	18040003	54400000	583	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Group A Pesticides	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Delta Waterways (northern portion)	Estuary	CAE5100000020041005163014	5	18020109	51000000	6795	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (northwestern portion)	Estuary	CAE5100000020041005161826	5	18020109	51000000	2587	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (southern portion)	Estuary	CAE5440000020041005161347	5	18040002	54400000	3125	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B	01-Jan-06			
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Delta Waterways (western portion)	Estuary	CAE5100000020021115122549	5	18040003	54400000	14524	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Dolly Creek	River & Stream	CAR5185403019980813174029	5	18020122	51854030	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	Dolly Creek	River & Stream	CAR5185403019980813174029	5	18020122	51854030	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	Don Pedro Lake	Lake & Reservoir	CAL5363201020011203130844	5	18040009	53632010	11056	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	River & Stream	CAR5354001120080623180014	5	18040002	53540011	34	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	River & Stream	CAR5354001120080623180014	5	18040002	53540011	34	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	River & Stream	CAR5354001120080623180014	5	18040002	53540011	34	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	River & Stream	CAR5354001120080623180014	5	18040002	53540011	34	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Creek (San Joaquin County)	River & Stream	CAR5314000020080803214539	5	18040002	53140000	33	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Creek (San Joaquin County)	River & Stream	CAR5314000020080803214539	5	18040002	53140000	33	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Creek (San Joaquin County)	River & Stream	CAR5314000020080803214539	5	18040002	53140000	33	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Duck Slough (Merced County)	River & Stream	CAR5357000020080808202452	5	18040001	53570000	27	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Slough (Merced County)	River & Stream	CAR5357000020080808202452	5	18040001	53570000	27	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Slough (Merced County)	River & Stream	CAR5357000020080808202452	5	18040001	53570000	27	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Slough (Merced County)	River & Stream	CAR5357000020080808202452	5	18040001	53570000	27	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Duck Slough (in Delta Waterways, northern portion)	River & Stream	CAR5100000020080623183037	5	18020109	51000000	3	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Dunn Creek (Mt Diablo Mine to Marsh Creek)	River & Stream	CAR5362000019980813174632	5	18040003	54300021	1	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			All resource extraction sources are abandoned mines.
5	Dunn Creek (Mt Diablo Mine to Marsh Creek)	River & Stream	CAR5362000019980813174632	5	18040003	54300021	1	Miles	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	East Park Reservoir	Lake & Reservoir	CAL5223300020020418140610	5	18020115	52233000	1698	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Eastman Lake (Shasta County)	Lake & Reservoir	CAL5264105320090114085030	5	18020003	52641053	19	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elbow Creek (from Mathews Ditch to Cottonwood Creek, Tulare County)	River & Stream	CAR5581000020070511151618	5	18030012	55810000	11	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elder Creek	River & Stream	CAR5191100019980817124745	5	18020109	51911000	11	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Nov-04	
5	Elder Creek	River & Stream	CAR5191100019980817124745	5	18020109	51911000	11	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Nov-04	The agricultural source of diazinon for these waterbodies is from aerial deposition.
5	Elder Creek	River & Stream	CAR5191100019980817124745	5	18020109	51911000	11	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elder Creek	River & Stream	CAR5191100019980817124745	5	18020109	51911000	11	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elk Bayou (Tulare County)	River & Stream	CAR5581000020080808204645	5	18030012	55810000	11	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elk Bayou (Tulare County)	River & Stream	CAR5581000020080808204645	5	18030012	55810000	11	Miles	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elk Bayou (Tulare County)	River & Stream	CAR5581000020080808204645	5	18030012	55810000	11	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elk Bayou (Tulare County)	River & Stream	CAR5581000020080808204645	5	18030012	55810000	11	Miles	pH (high)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Elk Grove Creek	River & Stream	CAR5191100019980817130203	4a	18020109	51911000	7	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Nov-04	
5	Elk Grove Creek	River & Stream	CAR5191100019980817130203	4a	18020109	51911000	7	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Nov-04	
5	Englebright Lake	Lake & Reservoir	CAL5171401320020111103938	5	18020125	51714013	754	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-16			All resource extraction sources are abandoned mines.
5	Fall River (Pit)	River & Stream	CAR5264103119980813175731	5	18020003	52641031	9	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The sedimentation is accumulated sand size sediment in the upper Fall River. The historic land management activities include logging, grazing, channelization, roads, and railroads.
5	Fall River, tributary to Feather River, Middle Fork (Butte and Plumas Counties)	River & Stream	CAR5183206220080915143905	5	18020123	51832062	22	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	River & Stream	CAR5192200019980817161057	5	18020109	51540000	42	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	River & Stream	CAR5192200019980817161057	5	18020109	51540000	42	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	River & Stream	CAR5192200019980817161057	5	18020109	51540000	42	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			All resource extraction sources are abandoned mines.
5	Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	River & Stream	CAR5192200019980817161057	5	18020109	51540000	42	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	River & Stream	CAR5192200019980817161057	5	18020109	51540000	42	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Feather River, Middle Fork (Sierra Valley to Lake Oroville, Butte and Plumas Counties)	River & Stream	CAR5183305020020610143011	5	18020123	51833050	77	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing apples to the reach from Long Valley Creek to Lake Oroville.
5	Feather River, North Fork (below Lake Almanor)	River & Stream	CAR5181200020020610144132	5	18020121	51812000	54	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			This listing is from Poe Reservoir Dam to Lake Oroville.
5	Feather River, North Fork (below Lake Almanor)	River & Stream	CAR5181200020020610144132	5	18020121	51812000	54	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Feather River, North Fork (below Lake Almanor)	River & Stream	CAR5181200020020610144132	5	18020121	51812000	54	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Feather River, North Fork (below Lake Almanor)	River & Stream	CAR5181200020020610144132	5	18020121	51812000	54	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This lisitng is for Invertibrate Toxicity. This listing is from Poe Reservoir Dam to Lake Oroville.
5	Feather River, South Fork (from Little Grass Valley Reservoir to Lake Oroville, Butte and Plumas Counties)	River & Stream	CAR5181105020020502143718	5	18020123	51811050	33	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Feather River, South Fork (from Little Grass Valley Reservoir to Lake Oroville, Butte and Plumas Counties)	River & Stream	CAR5181105020020502143718	5	18020123	51811050	33	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Feather River, West Branch (from Griffin Gulch to Lake Oroville)	River & Stream	CAR5186003120041214145753	5	18020121	51860031	37	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Five Mile Slough (Alexandria Place to Fourteen Mile Slough; in Delta Waterways, eastern portion)	River & Stream	CAR5440000019990127160243	5	18040003	54400000	2	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B	01-Jan-06			
5	Five Mile Slough (Alexandria Place to Fourteen Mile Slough; in Delta Waterways, eastern portion)	River & Stream	CAR5440000019990127160243	5	18040003	54400000	2	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B	01-Jan-06			The agricultural source of diazinon for this waterbody is from aerial deposition.
5	Five Mile Slough (Alexandria Place to Fourteen Mile Slough; in Delta Waterways, eastern portion)	River & Stream	CAR5440000019990127160243	5	18040003	54400000	2	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Five Mile Slough (Alexandria Place to Fourteen Mile Slough; in Delta Waterways, eastern portion)	River & Stream	CAR5440000019990127160243	5	18040003	54400000	2	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-May-08	
5	Folsom Lake	Lake & Reservoir	CAL5142301020080702152603	5	18020128	51423010	11064	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co.; partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020702142222	5	18040002	53140000	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co.; partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020702142222	5	18040002	53140000	6	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co.; partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020702142222	5	18040002	53140000	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co.; partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020702142222	5	18040002	53140000	6	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co.; partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020702142222	5	18040002	53140000	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co.; partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020702142222	5	18040002	53140000	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	French Ravine	River & Stream	CAR5163201119990127161329	5	18020126	51632011	2	Miles	Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Fresno River (Above Hensley Reservoir to confl w Nelder Creek and Lewis Fork)	River & Stream	CAR5393103120050607101604	5	18040007	53931030	30	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Fresno Slough (from Graham Road to James Bypass, Fresno County)	Bay & Harbor	CAR5518000020080623182154	5	18030012	55180000	15	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Fresno Slough (from Graham Road to James Bypass, Fresno County)	Bay & Harbor	CAR5518000020080623182154	5	18030012	55180000	15	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	River & Stream	CAR5203000020080702172323	5	18020106	52030000	11	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	River & Stream	CAR5203000020080702172323	5	18020106	52030000	11	Miles	Oxyfluorfen	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	River & Stream	CAR5203000020080702172323	5	18020106	52030000	11	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Gold Run (Nevada County)	River & Stream	CAR5172001220081113234051	5	18020126	51720012	2	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Gordon Slough (from headwaters and Goodnow Slough to Adams Canal, Yolo County)	River & Stream	CAR5113001220080702171951	5	18020110	51130012	8	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Grasslands Marshes	Wetland, Freshwater	CAW5412000019990127152712	5	18040001	54120000	7962	Acres	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Grasslands Marshes	Wetland, Freshwater	CAW5412000019990127152712	5	18040001	54120000	7962	Acres	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			26-May-00	
5	Grayson Drain (at outfall)	River & Stream	CAR5411000020050919204400	5	18040002	54110000	0	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Grayson Drain (at outfall)	River & Stream	CAR5411000020050919204400	5	18040002	54110000	0	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Grayson Drain (at outfall)	River & Stream	CAR5411000020050919204400	5	18040002	54110000	0	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hamilton Slough (from south of Thermalito Afterbay to south of Biggs, Butte County)	River & Stream	CAR5204000020080702171637	5	18020106	52040000	8	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Harding Drain	River & Stream	CAR5355000019980813181351	5	18040002	53550000	8	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Harding Drain	River & Stream	CAR5355000019980813181351	5	18040002	53550000	8	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Harding Drain	River & Stream	CAR5355000019980813181351	5	18040002	53550000	8	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Harding Drain	River & Stream	CAR5355000019980813181351	5	18040002	53550000	8	Miles	Hexachlorobenzene/ HCB	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Harding Drain	River & Stream	CAR5355000019980813181351	5	18040002	53550000	8	Miles	Lindane/gamma Hexachlorocyclohexane (gamma-HCH)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Harding Drain	River & Stream	CAR5355000019980813181351	5	18040002	53550000	8	Miles	alpha.-BHC (Benzenehexachloride or alpha-HCH)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Harley Gulch	River & Stream	CAR5133202219980814100614	4a	18020116	51332022	6	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			07-Feb-07	All resource extraction sources are abandoned mines.
5	Hell Hole Reservoir	Lake & Reservoir	CAL5144501320020418144044	5	18020128	51445013	1370	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hensley Lake	Lake & Reservoir	CAL5393201020020702142618	5	18040007	53932010	1669	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hensley Lake	Lake & Reservoir	CAL5393201020020702142618	5	18040007	53932010	1669	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hensley Lake	Lake & Reservoir	CAL5393201020020702142618	5	18040007	53932010	1669	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hetch Hetchy Reservoir	Lake & Reservoir	CAL5366009120020418144307	5	18040009	53660091	1840	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	River & Stream	CAR5356000020080707125417	5	18040001	53560000	14	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	River & Stream	CAR5356000020080707125417	5	18040001	53560000	14	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	River & Stream	CAR5356000020080707125417	5	18040001	53560000	14	Miles	Simazine	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	River & Stream	CAR5356000020080707125417	5	18040001	53560000	14	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Honcut Creek (Butte and Yuba Counties)	River & Stream	CAR5154000020080707105944	5	18020106	51540000	10	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Horse Creek (Rising Star Mine to Shasta Lake)	River & Stream	CAR5062001019980814101128	5	18020005	50610000	1	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Horse Creek (Rising Star Mine to Shasta Lake)	River & Stream	CAR5062001019980814101128	5	18020005	50610000	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Horse Creek (Rising Star Mine to Shasta Lake)	River & Stream	CAR5062001019980814101128	5	18020005	50610000	1	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Horse Creek (Rising Star Mine to Shasta Lake)	River & Stream	CAR5062001019980814101128	5	18020005	50610000	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Horse Creek (Rising Star Mine to Shasta Lake)	River & Stream	CAR5062001019980814101128	5	18020005	50610000	1	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Trifluralin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Hospital Creek (San Joaquin and Stanislaus Counties)	River & Stream	CAR5411000020070511113812	5	18040002	54110000	20	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Humbug Creek	River & Stream	CAR5173203019980814102308	5	18020125	51732030	2	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Humbug Creek	River & Stream	CAR5173203019980814102308	5	18020125	51732030	2	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			All resource extraction sources are abandoned mines.
5	Humbug Creek	River & Stream	CAR5173203019980814102308	5	18020125	51732030	2	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-12			All resource extraction sources are abandoned mines.
5	Humbug Creek	River & Stream	CAR5173203019980814102308	5	18020125	51732030	2	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Hume Lake	Lake & Reservoir	CAL5523428120020418144415	5	18030010	55234281	87	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Indian Valley Reservoir (Lake County)	Lake & Reservoir	CAL5134002020000209140532	5	18020116	51340020	3469	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingalsbe Slough (tributary to Merced River, Merced County)	River & Stream	CAR5356000020080707130803	5	18040001	53560000	10	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with Hospital Creek to Hwy 33 crossing)	River & Stream	CAR5411000020050920172409	5	18040002	54110000	3	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The pyrethroids of concern for this listing are bifenthrin, lamdba cyhalothrin, efenvalerate/fedvalerate, and permethrin.
5	Ingram Creek (from confluence with Hospital Creek to Hwy 33 crossing)	River & Stream	CAR5411000020050920172409	5	18040002	54110000	3	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The pyrethroids of concern for this listing are bifenthrin, lamdba cyhalothrin, efenvalerate/fedvalerate, and permethrin.
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	River & Stream	CAR5411000020011211113332	5	18040002	54110000	2	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Isabella Lake	Lake & Reservoir	CAL5542101020020418145333	5	18030003	55421010	7710	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Isabella Lake	Lake & Reservoir	CAL5542101020020418145333	5	18030003	55421010	7710	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Jack Slough	River & Stream	CAR5154000020011211114128	5	18020106	51540000	14	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Jack Slough	River & Stream	CAR5154000020011211114128	5	18020106	51540000	14	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	James Creek	River & Stream	CAR5122401019980814103109	5	18020117	51224010	6	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-17			Resource extraction sources are abandoned mines.
5	James Creek	River & Stream	CAR5122401019980814103109	5	18020117	51224010	6	Miles	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			Resource extraction sources are abandoned mines.
5	Kanaka Creek	River & Stream	CAR5174202219980814103946	5	18020125	51742022	10	Miles	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Kaseberg Creek (tributary to Pleasant Grove Creek, Placer County)	River & Stream	CAR5192200020070510154406	5	18020111	51922000	6	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kaseberg Creek (tributary to Pleasant Grove Creek, Placer County)	River & Stream	CAR5192200020070510154406	5	18020111	51922000	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kaweah Lake	Lake & Reservoir	CAL5534401020020418150015	5	18030007	55344010	1702	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Kaweah River (below Terminus Dam, Tulare County)	River & Stream	CAR5581000020080707132829	5	18030012	55810000	9	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kaweah River (below Terminus Dam, Tulare County)	River & Stream	CAR5581000020080707132829	5	18030012	55810000	9	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kaweah River, Lower (includes St Johns River)	River & Stream	CAR5581000020020627102603	5	18030012	55810000	27	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kellogg Creek (Los Vaqueros Reservoir to Discovery Bay; partly in Delta Waterways, western portion)	River & Stream	CAR5430003120080707113548	5	18040003	54300031	14	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kellogg Creek (Los Vaqueros Reservoir to Discovery Bay; partly in Delta Waterways, western portion)	River & Stream	CAR5430003120080707113548	5	18040003	54300031	14	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kellogg Creek (Los Vaqueros Reservoir to Discovery Bay; partly in Delta Waterways, western portion)	River & Stream	CAR5430003120080707113548	5	18040003	54300031	14	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kellogg Creek (Los Vaqueros Reservoir to Discovery Bay; partly in Delta Waterways, western portion)	River & Stream	CAR5430003120080707113548	5	18040003	54300031	14	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Kellogg Creek (Los Vaqueros Reservoir to Discovery Bay; partly in Delta Waterways, western portion)	River & Stream	CAR5430003120080707113548	5	18040003	54300031	14	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Keswick Reservoir (portion downstream from Spring Creek)	Lake & Reservoir	CAL5244001220020730101915	5	18020112	52440013	135	Acres	Cadmium	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Keswick Reservoir (portion downstream from Spring Creek)	Lake & Reservoir	CAL5244001220020730101915	5	18020112	52440013	135	Acres	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Keswick Reservoir (portion downstream from Spring Creek)	Lake & Reservoir	CAL5244001220020730101915	5	18020112	52440013	135	Acres	Zinc	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Kings River, Lower (Island Weir to Stinson and Empire Weirs)	River & Stream	CAR5519000019990127164206	5	18030012	55190000	36	Miles	Electrical Conductivity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
5	Kings River, Lower (Island Weir to Stinson and Empire Weirs)	River & Stream	CAR5519000019990127164206	5	18030012	55190000	36	Miles	Molybdenum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
5	Kings River, Lower (Island Weir to Stinson and Empire Weirs)	River & Stream	CAR5519000019990127164206	5	18030012	55190000	36	Miles	Toxaphene	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-15			
5	Kings River, Lower (Pine Flat Reservoir to Island Weir)	River & Stream	CAR5518000020090112105219	5	18030012	55180000	76	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Kings River, Lower (Pine Flat Reservoir to Island Weir)	River & Stream	CAR5518000020090112105219	5	18030012	55180000	76	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Knights Landing Ridge Cut (Yolo County)	River & Stream	CAR5202100020080708170311	5	18020109	52021000	13	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Knights Landing Ridge Cut (Yolo County)	River & Stream	CAR5202100020080708170311	5	18020109	52021000	13	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Knights Landing Ridge Cut (Yolo County)	River & Stream	CAR5202100020080708170311	5	18020109	52021000	13	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Little Backbone Creek, Lower	River & Stream	CAR5062001019980818101339	5	18020005	50620010	1	Miles	Acid Mine Drainage	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Little Backbone Creek, Lower	River & Stream	CAR5062001019980818101339	5	18020005	50620010	1	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Little Backbone Creek, Lower	River & Stream	CAR5062001019980818101339	5	18020005	50620010	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Little Backbone Creek, Lower	River & Stream	CAR5062001019980818101339	5	18020005	50620010	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Little Cow Creek (downstream from Afterthought Mine)	River & Stream	CAR5073301019990126112551	5	18020118	50733023	1	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			Resource extraction sources are abandoned mines.
5	Little Cow Creek (downstream from Afterthought Mine)	River & Stream	CAR5073301019990126112551	5	18020118	50733023	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			Resource extraction sources are abandoned mines.
5	Little Cow Creek (downstream from Afterthought Mine)	River & Stream	CAR5073301019990126112551	5	18020118	50733023	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			Resource extraction sources are abandoned mines.
5	Little Deer Creek	River & Stream	CAR5172001220011211134726	5	18020126	51720012	4	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-16			
5	Little Grizzly Creek	River & Stream	CAR5185403119980814104512	5	18020122	51854031	9	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Little Grizzly Creek	River & Stream	CAR5185403119980814104512	5	18020122	51854031	9	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Littlejohns Creek	River & Stream	CAR5314000020070511145114	5	18040002	53140000	68	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Littlejohns Creek	River & Stream	CAR5314000020070511145114	5	18040002	53140000	68	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Live Oak Slough	River & Stream	CAR5203000020070511150326	5	18020106	52030000	8	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Live Oak Slough	River & Stream	CAR5203000020070511150326	5	18020106	52030000	8	Miles	Oxyfluorfen	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Live Oak Slough	River & Stream	CAR5203000020070511150326	5	18020106	52030000	8	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	BOD, Biochemical oxygen demand	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Lone Tree Creek	River & Stream	CAR5314000019980814105503	5	18040002	53140000	15	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Los Banos Creek (below Los Banos Reservoir, Merced County)	River & Stream	CAR5412000020080808200529	5	18040001	54120000	31	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Los Banos Creek (below Los Banos Reservoir, Merced County)	River & Stream	CAR5412000020080808200529	5	18040001	54120000	31	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Los Banos Creek (below Los Banos Reservoir, Merced County)	River & Stream	CAR5412000020080808200529	5	18040001	54120000	31	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Main Drainage Canal	River & Stream	CAR5204000020041130180509	5	18020105	52040000	9	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Main Drainage Canal	River & Stream	CAR5204000020041130180509	5	18020105	52040000	9	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Main Drainage Canal	River & Stream	CAR5204000020041130180509	5	18020105	52040000	9	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Marsh Creek (Dunn Creek to Marsh Creek Reservoir)	River & Stream	CAR5430002320021209140332	5	18040003	54300023	11	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-15			All resource extraction sources are abandoned mines.
5	Marsh Creek (Dunn Creek to Marsh Creek Reservoir)	River & Stream	CAR5430002320021209140332	5	18040003	54300023	11	Miles	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Marsh Creek (Marsh Creek Reservoir to San Joaquin River; partly in Delta Waterways, western portion)	River & Stream	CAR5430002019980814110539	5	18040003	54400000	10	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Marsh Creek (Marsh Creek Reservoir to San Joaquin River; partly in Delta Waterways, western portion)	River & Stream	CAR5430002019980814110539	5	18040003	54400000	10	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Marsh Creek (Marsh Creek Reservoir to San Joaquin River; partly in Delta Waterways, western portion)	River & Stream	CAR5430002019980814110539	5	18040003	54400000	10	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-15			All resource extraction sources are abandoned mines.
5	Marsh Creek (Marsh Creek Reservoir to San Joaquin River; partly in Delta Waterways, western portion)	River & Stream	CAR5430002019980814110539	5	18040003	54400000	10	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Marsh Creek (Marsh Creek Reservoir to San Joaquin River; partly in Delta Waterways, western portion)	River & Stream	CAR5430002019980814110539	5	18040003	54400000	10	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Marsh Creek Reservoir	Lake & Reservoir	CAL5430002219980814120535	5	18040003	54300023	278	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
5	McClure Reservoir (Mariposa County)	Lake & Reservoir	CAL5372200020020430110127	5	18040008	53722000	5605	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mendota Pool	Wetland, Freshwater	CAW5512000020021001113547	5	18030012	55120000	3045	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mendota Pool	Wetland, Freshwater	CAW5512000020021001113547	5	18030012	55120000	3045	Acres	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			For 2006, selenium was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
5	Merced River, Lower (McSwain Reservoir to San Joaquin River)	River & Stream	CAR5357000019980817154245	5	18040001	53550000	50	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Merced River, Lower (McSwain Reservoir to San Joaquin River)	River & Stream	CAR5357000019980817154245	5	18040001	53550000	50	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Merced River, Lower (McSwain Reservoir to San Joaquin River)	River & Stream	CAR5357000019980817154245	5	18040001	53550000	50	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Merced River, Lower (McSwain Reservoir to San Joaquin River)	River & Stream	CAR5357000019980817154245	5	18040001	53550000	50	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Merced River, Lower (McSwain Reservoir to San Joaquin River)	River & Stream	CAR5357000019980817154245	5	18040001	53550000	50	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Merced River, Lower (McSwain Reservoir to San Joaquin River)	River & Stream	CAR5357000019980817154245	5	18040001	53550000	50	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Middle River (in Delta Waterways, southern portion)	River & Stream	CAR5440000020021001092442	5	18040003	54400000	10	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mile Long Pond (Butte County)	Lake & Reservoir	CAL5154000020080810182808	5	18020106	51540000	84	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mile Long Pond (Butte County)	Lake & Reservoir	CAL5154000020080810182808	5	18020106	51540000	84	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Miles Creek (Merced County)	River & Stream	CAR5358000020080808201956	5	18040001	53580000	13	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mill Creek (Tulare County)	River & Stream	CAR5581000020081030155033	5	18030012	55810000	27	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Millerton Lake	Lake & Reservoir	CAL5401200020020430134218	5	18040006	54012000	4366	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Miners Ravine (Placer County)	River & Stream	CAR5142401020090105144715	5	18020111	51424010	9	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Modesto Reservoir	Lake & Reservoir	CAL5354001120091208193024	5	18040002	53540011	1964	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	Mokelumne River, Lower (in Delta Waterways, eastern portion)	River & Stream	CAR5440000019980818095133	5	18040005	54400000	34	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mokelumne River, Lower (in Delta Waterways, eastern portion)	River & Stream	CAR5440000019980818095133	5	18040005	54400000	34	Miles	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Mokelumne River, Lower (in Delta Waterways, eastern portion)	River & Stream	CAR5440000019980818095133	5	18040005	54400000	34	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mokelumne River, Lower (in Delta Waterways, eastern portion)	River & Stream	CAR5440000019980818095133	5	18040005	54400000	34	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mokelumne River, Lower (in Delta Waterways, eastern portion)	River & Stream	CAR5440000019980818095133	5	18040005	54400000	34	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mokelumne River, Lower (in Delta Waterways, eastern portion)	River & Stream	CAR5440000019980818095133	5	18040005	54400000	34	Miles	Zinc	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Mormon Slough (Commerce Street to Stockton Deep Water Channel; partly in Delta Waterways, eastern portion)	River & Stream	CAR5313000020000209130407	5	18040002	54400000	1	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Mormon Slough (Commerce Street to Stockton Deep Water Channel; partly in Delta Waterways, eastern portion)	River & Stream	CAR5313000020000209130407	5	18040002	54400000	1	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Mormon Slough (Stockton Diverting Canal to Commerce Street)	River & Stream	CAR5313000020021209142456	5	18040002	53130000	5	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Mormon Slough (from Stockton Diverting Canal to Bellota Weir--Calaveras River)	River & Stream	CAR5313000020050622171527	5	18040002	53130000	11	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mormon Slough (from Stockton Diverting Canal to Bellota Weir--Calaveras River)	River & Stream	CAR5313000020050622171527	5	18040002	53130000	11	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Morrison Creek	River & Stream	CAR5191100019980817123042	5	18020109	51911000	26	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-03	
5	Morrison Creek	River & Stream	CAR5191100019980817123042	5	18020109	51911000	26	Miles	Pentachlorophenol (PCP)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Morrison Creek	River & Stream	CAR5191100019980817123042	5	18020109	51911000	26	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Morrison Creek	River & Stream	CAR5191100019980817123042	5	18020109	51911000	26	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Morrison Slough	River & Stream	CAR5203000020070511132905	5	18020106	52030000	13	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mosher Slough (downstream of I-5; in Delta Waterways, eastern portion)	River & Stream	CAR5312000019990127153844	5	18040005	54400000	1	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B	01-Jan-06			
5	Mosher Slough (downstream of I-5; in Delta Waterways, eastern portion)	River & Stream	CAR5312000019990127153844	5	18040005	54400000	1	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B	01-Jan-06			The agricultural source of diazinon for this waterbody is from aerial deposition.
5	Mosher Slough (downstream of I-5; in Delta Waterways, eastern portion)	River & Stream	CAR5312000019990127153844	5	18040005	54400000	1	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mosher Slough (downstream of I-5; in Delta Waterways, eastern portion)	River & Stream	CAR5312000019990127153844	5	18040005	54400000	1	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Mosher Slough (downstream of I-5; in Delta Waterways, eastern portion)	River & Stream	CAR5312000019990127153844	5	18040005	54400000	1	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Mosher Slough (upstream of I-5; partly in Delta Waterways, eastern portion)	River & Stream	CAR5440000020021209144512	5	18040005	54400000	3	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Mountain House Creek (from Altamont Pass to Old River, Alameda and San Joaquin Counties; partly in Delta Waterways, southern portion)	River & Stream	CAR5440000020080702173527	5	18040003	54400000	11	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mountain House Creek (from Altamont Pass to Old River, Alameda and San Joaquin Counties; partly in Delta Waterways, southern portion)	River & Stream	CAR5440000020080702173527	5	18040003	54400000	11	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mud Creek (Butte County)	River & Stream	CAR5042007020080724092148	5	18020103	50420070	15	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mud Slough, North (downstream of San Luis Drain)	River & Stream	CAR5412000020080820161412	5	18040001	54120000	13	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mud Slough, North (downstream of San Luis Drain)	River & Stream	CAR5412000020080820161412	5	18040001	54120000	13	Miles	Electrical Conductivity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mud Slough, North (downstream of San Luis Drain)	River & Stream	CAR5412000020080820161412	5	18040001	54120000	13	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mud Slough, North (downstream of San Luis Drain)	River & Stream	CAR5412000020080820161412	5	18040001	54120000	13	Miles	Selenium	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Mar-02	
5	Mud Slough, North (downstream of San Luis Drain)	River & Stream	CAR5412000020080820161412	5	18040001	54120000	13	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mud Slough, North (upstream of San Luis Drain)	River & Stream	CAR5412000020080820163230	5	18040001	54120000	22	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mud Slough, North (upstream of San Luis Drain)	River & Stream	CAR5412000020080820163230	5	18040001	54120000	22	Miles	Electrical Conductivity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mud Slough, North (upstream of San Luis Drain)	River & Stream	CAR5412000020080820163230	5	18040001	54120000	22	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mud Slough, North (upstream of San Luis Drain)	River & Stream	CAR5412000020080820163230	5	18040001	54120000	22	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Mud Slough, North (upstream of San Luis Drain)	River & Stream	CAR5412000020080820163230	5	18040001	54120000	22	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mustang Creek (Merced County)	River & Stream	CAR5356000020080808193633	5	18040002	53560000	4	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mustang Creek (Merced County)	River & Stream	CAR5356000020080808193633	5	18040002	53560000	4	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mustang Creek (Merced County)	River & Stream	CAR5356000020080808193633	5	18040002	53560000	4	Miles	Simazine	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Mustang Creek (Merced County)	River & Stream	CAR5356000020080808193633	5	18040002	53560000	4	Miles	cis-permethrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Natoma, Lake	Lake & Reservoir	CAL5192100020020430135321	5	18020111	51921000	485	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Natomas Cross Canal (Sutter County)	River & Stream	CAR5192200020080731222408	5	18020109	51922000	6	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Natomas East Main Drainage Canal (aka Steelhead Creek, downstream of confluence with Arcade Creek)	River & Stream	CAR5192100020021209150207	5	18020109	51921000	4	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			.
5	Natomas East Main Drainage Canal (aka Steelhead Creek, downstream of confluence with Arcade Creek)	River & Stream	CAR5192100020021209150207	5	18020109	51921000	4	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Natomas East Main Drainage Canal (aka Steelhead Creek, downstream of confluence with Arcade Creek)	River & Stream	CAR5192100020021209150207	5	18020109	51921000	4	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-20			The agricultural source is from aerial deposition.
5	Natomas East Main Drainage Canal (aka Steelhead Creek, upstream of confluence with Arcade Creek)	River & Stream	CAR5192100019980817101740	5	18020111	51921000	12	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	New Bullards Bar Reservoir	Lake & Reservoir	CAL5175101120020418111348	5	18020125	51751011	3864	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	New Hogan Lake (Calaveras County)	Lake & Reservoir	CAL5331001120080810181802	5	18040011	53310011	3180	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	New Melones Reservoir	Lake & Reservoir	CAL5342101020020430113521	5	18040010	53421010	1654	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Newman Wasteway	River & Stream	CAR5412000020011211151440	5	18040001	54120000	8	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Newman Wasteway	River & Stream	CAR5412000020011211151440	5	18040001	54120000	8	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Newman Wasteway	River & Stream	CAR5412000020011211151440	5	18040001	54120000	8	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Newman Wasteway	River & Stream	CAR5412000020011211151440	5	18040001	54120000	8	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Newman Wasteway	River & Stream	CAR5412000020011211151440	5	18040001	54120000	8	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Newman Wasteway	River & Stream	CAR5412000020011211151440	5	18040001	54120000	8	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Newman Wasteway	River & Stream	CAR54120000020011211151440	5	18040001	54120000	8	Miles	Simazine	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	ONeill Forebay	Lake & Reservoir	CAL54231032200000209134612	5	18040001	54231032	2254	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	Oak Run Creek	River & Stream	CAR50733000020011212121326	5	18020101	50733000	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	Old River (San Joaquin River to Delta-Mendota Canal; in Delta Waterways, southern portion)	River & Stream	CAR54400000020021001091129	5	18040003	54400000	15	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			10-Oct-07	
5	Old River (San Joaquin River to Delta-Mendota Canal; in Delta Waterways, southern portion)	River & Stream	CAR54400000020021001091129	5	18040003	54400000	15	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Old River (San Joaquin River to Delta-Mendota Canal; in Delta Waterways, southern portion)	River & Stream	CAR54400000020021001091129	5	18040003	54400000	15	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Azinphos-methyl (Guthion)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (above Kilburn Road)	River & Stream	CAR5422003219990126113826	5	18040002	54110000	9	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Azinphos-methyl (Guthion)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			20-Dec-06	
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	DDD (Dichlorodiphenyldichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Malathion	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Orestimba Creek (below Kilburn Road)	River & Stream	CAR53550000020021209154446	5	18040002	54110000	3	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Oroville Wildlife Area Fishing Pond (Butte County)	Lake & Reservoir	CAL51540000020080810191013	5	18020106	51540000	2	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Oroville, Lake	Lake & Reservoir	CAL51812000020020430135809	5	18020124	51812000	15400	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Oroville, Lake	Lake & Reservoir	CAL51812000020020430135809	5	18020124	51812000	15400	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Outside Creek (Tulare County)	River & Stream	CAR55810000020080820134604	5	18030012	55810000	15	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Oxbow Reservoir (Ralston Afterbay, El Dorado and Placer Counties)	Lake & Reservoir	CAL51441010020080922153913	5	18020128	51441010	65	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pacific Heights Pond, Lower (Butte County)	Lake & Reservoir	CAL51540000020080810191305	5	18020106	51540000	10	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Packwood Creek (Tulare County)	River & Stream	CAR55810000020080808203922	5	18030012	55810000	19	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Panoche Creek (Silver Creek to Belmont Avenue)	River & Stream	CAR5591106019990126154446	5	18040001	55112000	18	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Panoche Creek (Silver Creek to Belmont Avenue)	River & Stream	CAR5591106019990126154446	5	18040001	55112000	18	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Panoche Creek (Silver Creek to Belmont Avenue)	River & Stream	CAR5591106019990126154446	5	18040001	55112000	18	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
5	Panoche Creek (Silver Creek to Belmont Avenue)	River & Stream	CAR5591106019990126154446	5	18040001	55112000	18	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Pardee Reservoir	Lake & Reservoir	CAL53260091200000208163748	5	18040005	53260091	2185	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pine Flat Reservoir	Lake & Reservoir	CAL55232010020020430145454	5	18030010	55232010	5770	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pit River (from confluence of N and S forks to Shasta Lake)	River & Stream	CAR5266108019990126150509	5	18020003	52661080	123	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
5	Pit River (from confluence of N and S forks to Shasta Lake)	River & Stream	CAR5266108019990126150509	5	18020003	52661080	123	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
5	Pit River (from confluence of N and S forks to Shasta Lake)	River & Stream	CAR5266108019990126150509	5	18020003	52661080	123	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-13			
5	Pit River, North Fork	River & Stream	CAR5265201620080909193959	5	18020002	52652016	21	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pit River, South Fork	River & Stream	CAR5265208020080909194359	5	18020002	52652080	34	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pit River, South Fork	River & Stream	CAR5265208020080909194359	5	18020002	52652080	34	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	River & Stream	CAR53120000020080803212723	5	18040005	53120000	13	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	River & Stream	CAR53120000020080803212723	5	18040005	53120000	13	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-22			
5	Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	River & Stream	CAR53120000020080803212723	5	18040005	53120000	13	Miles	Disulfoton	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	River & Stream	CAR53120000020080803212723	5	18040005	53120000	13	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	River & Stream	CAR53120000020080803212723	5	18040005	53120000	13	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	River & Stream	CAR53120000020080803212723	5	18040005	53120000	13	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pleasant Grove Creek	River & Stream	CAR51922000020070510150258	5	18020111	51922000	20	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pleasant Grove Creek	River & Stream	CAR51922000020070510150258	5	18020111	51922000	20	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pleasant Grove Creek	River & Stream	CAR51922000020070510150258	5	18020111	51922000	20	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing is for Pleasant Grove Creek upstream of Fiddyment Road.
5	Pleasant Grove Creek, South Branch	River & Stream	CAR51922000020070510153551	5	18020111	51922000	7	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pleasant Grove Creek, South Branch	River & Stream	CAR51922000020070510153551	5	18020111	51922000	7	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Pleasant Grove Creek, South Branch	River & Stream	CAR51922000020070510153551	5	18020111	51922000	7	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Poso Slough	River & Stream	CAR54120000020070511112656	5	18040001	54120000	14	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Putah Creek (Solano Lake to Putah Creek Sinks; partly in Delta Waterways, northwestern portion)	River & Stream	CAR51120000020000208170214	5	18020109	51120000	27	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Putah Creek (Solano Lake to Putah Creek Sinks; partly in Delta Waterways, northwestern portion)	River & Stream	CAR51120000020000208170214	5	18020109	51120000	27	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-17			All resource extraction sources are abandoned mines.
5	Ramona Lake (Fresno County)	Lake & Reservoir	CAL5404001820080810192411	5	18040006	54040018	28	Acres	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ramona Lake (Fresno County)	Lake & Reservoir	CAL5404001820080810192411	5	18040006	54040018	28	Acres	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ramona Lake (Fresno County)	Lake & Reservoir	CAL5404001820080810192411	5	18040006	54040018	28	Acres	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ramona Lake (Fresno County)	Lake & Reservoir	CAL5404001820080810192411	5	18040006	54040018	28	Acres	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Rattlesnake Creek (at confluence w Mokelumne River, N Fork)	River & Stream	CAR5326005020041214084636	5	18040012	53260050	1	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Robinsons Riffle Pond (Butte County)	Lake & Reservoir	CAL51540000020080810185534	5	18020106	51540000	8	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Robinsons Riffle Pond (Butte County)	Lake & Reservoir	CAL51540000020080810185534	5	18020106	51540000	8	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Rollins Reservoir	Lake & Reservoir	CAL5163403320011212084035	5	18020126	51634033	774	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-16			
5	Rush Creek (Modoc County)	River & Stream	CAR5266403120090105142803	5	18020002	52664031	10	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Keswick Dam to Cottonwood Creek)	River & Stream	CAR5081000019990126144739	5	18020102	52440014	15	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Sacramento River (Cottonwood Creek to Red Bluff)	River & Stream	CAR5042007020021209153351	5	18020103	50810000	16	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Cottonwood Creek to Red Bluff)	River & Stream	CAR5042007020021209153351	5	18020103	50810000	16	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Sacramento River (Red Bluff to Knights Landing)	River & Stream	CAR5201000019990126140752	5	18020104	50420070	82	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Red Bluff to Knights Landing)	River & Stream	CAR5201000019990126140752	5	18020104	50420070	82	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Red Bluff to Knights Landing)	River & Stream	CAR5201000019990126140752	5	18020104	50420070	82	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Red Bluff to Knights Landing)	River & Stream	CAR5201000019990126140752	5	18020104	50420070	82	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Red Bluff to Knights Landing)	River & Stream	CAR5201000019990126140752	5	18020104	50420070	82	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Sacramento River (Knights Landing to the Delta)	River & Stream	CAR5100000020021210114330	5	18020109	51000000	16	Miles	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Knights Landing to the Delta)	River & Stream	CAR5100000020021210114330	5	18020109	51000000	16	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Knights Landing to the Delta)	River & Stream	CAR5100000020021210114330	5	18020109	51000000	16	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-22			
5	Sacramento River (Knights Landing to the Delta)	River & Stream	CAR5100000020021210114330	5	18020109	51000000	16	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			All resource extraction sources are abandoned mines.
5	Sacramento River (Knights Landing to the Delta)	River & Stream	CAR5100000020021210114330	5	18020109	51000000	16	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento River (Knights Landing to the Delta)	River & Stream	CAR5100000020021210114330	5	18020109	51000000	16	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Sacramento Slough	River & Stream	CAR5192200019980814113208	5	18020106	51922000	2	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento Slough	River & Stream	CAR5192200019980814113208	5	18020106	51922000	2	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Sacramento Slough	River & Stream	CAR5192200019980814113208	5	18020106	51922000	2	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento Slough	River & Stream	CAR5192200019980814113208	5	18020106	51922000	2	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sacramento Slough	River & Stream	CAR5192200019980814113208	5	18020106	51922000	2	Miles	pH (low)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Salado Creek (Stanislaus County)	River & Stream	CAR5421003120080808192723	5	18040014	54210031	9	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Salado Creek (Stanislaus County)	River & Stream	CAR5421003120080808192723	5	18040014	54210031	9	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			20-Dec-08	
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Prometryn	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Salt Slough (upstream from confluence with San Joaquin River)	River & Stream	CAR5412000019990126155034	5	18040001	54120000	10	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Carlos Creek (downstream of New Idria Mine)	River & Stream	CAR5591108519980814113911	5	18040014	55911085	5	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Mendota Pool to Bear Creek)	River & Stream	CAR5357000019990126152905	5	18040001	54110000	88	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
5	San Joaquin River (Bear Creek to Mud Slough)	River & Stream	CAR5357000020021002093226	5	18040001	54120000	14	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-22			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Selenium	Metals/Metalloids	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			28-Mar-02	

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	San Joaquin River (Mud Slough to Merced River)	River & Stream	CAR5357000020021002094621	5	18040001	54110000	3	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	Boron	Metals/Metalloids	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			08-Feb-07	
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	Electrical Conductivity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A			08-Feb-07	
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Merced River to Tuolumne River)	River & Stream	CAR5440000020021002100850	5	18040001	54110000	29	Miles	alpha.-BHC (Benzenehexachloride or alpha-HCH)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-22			
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	Electrical Conductivity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A			08-Feb-07	
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	San Joaquin River (Tuolumne River to Stanislaus River)	River & Stream	CAR5353000020041020143854	5	18040002	53530000	8	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Friant Dam to Mendota Pool)	River & Stream	CAR5453001020050602140817	5	18040006	54510000	70	Miles	Invasive Species	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-07	
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Electrical Conductivity	Salinity	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			08-Feb-07	
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Joaquin River (Stanislaus River to Delta Boundary)	River & Stream	CAR5440000020041020140348	5	18040002	54400000	3	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	San Luis Reservoir	Lake & Reservoir	CAL5423201020020430153652	5	18040014	54232010	13007	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (Colusa County)	River & Stream	CAR5202100020070511143646	5	18020104	52021000	20	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	River & Stream	CAR5430001120080808191800	5	18040003	54300011	10	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Scotts Flat Reservoir	Lake & Reservoir	CAL5172001120011212085852	5	18020125	51720011	660	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-16			
5	Shasta Lake	Lake & Reservoir	CAL5061000020080922152749	5	18020005	50610000	27335	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Shasta Lake (area where West Squaw Creek enters)	Lake & Reservoir	CAL5061000020020730101829	5	18020005	50620010	20	Acres	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Shasta Lake (area where West Squaw Creek enters)	Lake & Reservoir	CAL5061000020020730101829	5	18020005	50620010	20	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Shasta Lake (area where West Squaw Creek enters)	Lake & Reservoir	CAL5061000020020730101829	5	18020005	50620010	20	Acres	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Simmerly Slough (Yuba County)	River & Stream	CAR5154000020080731221221	5	18020106	51540000	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Slab Creek Reservoir (El Dorado County)	Lake & Reservoir	CAL5143201320080922153345	5	18020129	51432013	242	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Smith Canal (in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011212090303	5	18040003	54400000	2	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Smith Canal (in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011212090303	5	18040003	54400000	2	Miles	Organophosphorus Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
5	Smith Canal (in Delta Waterways, eastern portion)	River & Stream	CAR5440000020011212090303	5	18040003	54400000	2	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Solano, Lake	Lake & Reservoir	CAL5112000020020501144846	5	18020109	51120000	15	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-17			
5	South Cow Creek	River & Stream	CAR5073100020011212122645	5	18020118	50731000	8	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Aldicarb	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Spring Creek (Colusa County)	River & Stream	CAR5612002020070510165737	5	18020104	56120020	13	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Spring Creek, Lower (Iron Mountain Mine to Keswick Reservoir)	River & Stream	CAR5244001019980818103919	5	18020112	52440010	3	Miles	Acid Mine Drainage	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Spring Creek, Lower (Iron Mountain Mine to Keswick Reservoir)	River & Stream	CAR5244001019980818103919	5	18020112	52440010	3	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Spring Creek, Lower (Iron Mountain Mine to Keswick Reservoir)	River & Stream	CAR5244001019980818103919	5	18020112	52440010	3	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Spring Creek, Lower (Iron Mountain Mine to Keswick Reservoir)	River & Stream	CAR5244001019980818103919	5	18020112	52440010	3	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Stanislaus River, Lower	River & Stream	CAR5353000019980817151834	5	18040002	53530000	59	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stanislaus River, Lower	River & Stream	CAR5353000019980817151834	5	18040002	53530000	59	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
5	Stanislaus River, Lower	River & Stream	CAR5353000019980817151834	5	18040002	53530000	59	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Stanislaus River, Lower	River & Stream	CAR5353000019980817151834	5	18040002	53530000	59	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Stanislaus River, Lower	River & Stream	CAR5353000019980817151834	5	18040002	53530000	59	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Stone Corral Creek	River & Stream	CAR5613003020070511135450	5	18020104	56130030	22	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stony Creek	River & Stream	CAR5202100020020701133119	5	18020115	52021000	42	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stony Creek	River & Stream	CAR5202100020020701133119	5	18020115	52021000	42	Miles	Diuron	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stony Creek	River & Stream	CAR5202100020020701133119	5	18020115	52021000	42	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stony Creek	River & Stream	CAR5202100020020701133119	5	18020115	52021000	42	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stony Creek	River & Stream	CAR5202100020020701133119	5	18020115	52021000	42	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Stony Gorge Reservoir	Lake & Reservoir	CAL5222200020000209112836	5	18020115	52222000	1411	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Strong Ranch Slough	River & Stream	CAR5192100019980817095051	5	18020111	51921000	6	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Nov-04	
5	Strong Ranch Slough	River & Stream	CAR5192100019980817095051	5	18020111	51921000	6	Miles	Diazinon	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Nov-04	The agricultural source of diazinon for these waterbodies is from aerial deposition.
5	Strong Ranch Slough	River & Stream	CAR5192100019980817095051	5	18020111	51921000	6	Miles	Pyrethroids	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Strong Ranch Slough	River & Stream	CAR5192100019980817095051	5	18020111	51921000	6	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Success Lake	Lake & Reservoir	CAL5551205820020520110057	5	18030012	55512058	2486	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sucker Run (Butte County)	River & Stream	CAR5182202320080731220413	5	18020123	51822023	11	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sullivan Creek (from Phoenix Reservoir to Don Pedro Lake, Tuolumne County)	River & Stream	CAR5363102220080808181306	5	18040009	53631022	11	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sulphur Creek (Colusa County)	River & Stream	CAR5132002420021209115923	5	18020116	51320024	14	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-09			All resource extraction sources are abandoned mines.
5	Sutter Bypass	River & Stream	CAR5203000020000210152322	5	18020109	52030000	19	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Sycamore Slough (Yolo County)	River & Stream	CAR5201000020081113232951	5	18020104	52010000	17	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Temple Creek	River & Stream	CAR5314000019990127162616	5	18040002	53140000	10	Miles	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Temple Creek	River & Stream	CAR5314000019990127162616	5	18040002	53140000	10	Miles	Electrical Conductivity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-20			
5	Thermalito Afterbay	Lake & Reservoir	CAL5154000020000209142817	5	18020106	51540000	3863	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Thermalito Afterbay	Lake & Reservoir	CAL5154000020000209142817	5	18020106	51540000	3863	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Thermalito Forebay	Lake & Reservoir	CAL5154000020000209143205	5	18020106	51540000	538	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tom Paine Slough (in Delta Waterways, southern portion)	River & Stream	CAR5440000020080803215847	5	18040003	54400000	14	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tom Paine Slough (in Delta Waterways, southern portion)	River & Stream	CAR5440000020080803215847	5	18040003	54400000	14	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tom Paine Slough (in Delta Waterways, southern portion)	River & Stream	CAR5440000020080803215847	5	18040003	54400000	14	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Town Creek	River & Stream	CAR5062001019980818104951	5	18020005	50620010	1	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Town Creek	River & Stream	CAR5062001019980818104951	5	18020005	50620010	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Town Creek	River & Stream	CAR5062001019980818104951	5	18020005	50620010	1	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Town Creek	River & Stream	CAR5062001019980818104951	5	18020005	50620010	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	Tule Canal (Yolo County)	River & Stream	CAR5112000020080731222809	5	18020109	51120000	11	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tule Canal (Yolo County)	River & Stream	CAR5112000020080731222809	5	18020109	51120000	11	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tule Canal (Yolo County)	River & Stream	CAR5112000020080731222809	5	18020109	51120000	11	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tule Canal (Yolo County)	River & Stream	CAR5112000020080731222809	5	18020109	51120000	11	Miles	Salinity	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tulloch Reservoir	Lake & Reservoir	CAL5342206320020501145743	5	18040010	53422063	992	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	River & Stream	CAR5355000019980817143435	5	18040002	53550000	60	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	River & Stream	CAR5355000019980817143435	5	18040002	53550000	60	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
5	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	River & Stream	CAR5355000019980817143435	5	18040002	53550000	60	Miles	Group A Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-11			
5	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	River & Stream	CAR5355000019980817143435	5	18040002	53550000	60	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	River & Stream	CAR5355000019980817143435	5	18040002	53550000	60	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-22			
5	Turlock Lake	Lake & Reservoir	CAL5356000020091208202721	5	18040002	53560000	3180	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Turner Slough (Merced County)	River & Stream	CAR5357000020080703103135	5	18040001	53570000	3	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ulatis Creek (Solano County)	River & Stream	CAR5601001220080801154307	5	18020109	51110000	17	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Ulatis Creek (Solano County)	River & Stream	CAR5601001220080801154307	5	18020109	51110000	17	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Wadsworth Canal	River & Stream	CAR5203000020041130173733	5	18020106	52030000	16	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Wadsworth Canal	River & Stream	CAR5203000020041130173733	5	18020106	52030000	16	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Walker Slough (partly in Delta Waterways, eastern portion)	River & Stream	CAR5314000020020111134652	4a	18040002	53140000	2	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-May-08	
5	West Squaw Creek (below Balaklala Mine)	River & Stream	CAR5062004219980818112334	5	18020005	50620010	2	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	West Squaw Creek (below Balaklala Mine)	River & Stream	CAR5062004219980818112334	5	18020005	50620010	2	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-20			All resource extraction sources are abandoned mines.
5	West Squaw Creek (below Balaklala Mine)	River & Stream	CAR5062004219980818112334	5	18020005	50620010	2	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	West Squaw Creek (below Balaklala Mine)	River & Stream	CAR5062004219980818112334	5	18020005	50620010	2	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	Westley Wasteway (Stanislaus County)	Lake & Reservoir	CAR5411000020080808192151	5	18040002	54110000	4	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Westley Wasteway (Stanislaus County)	Lake & Reservoir	CAR5411000020080808192151	5	18040002	54110000	4	Acres	Dimethoate	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Westley Wasteway (Stanislaus County)	Lake & Reservoir	CAR5411000020080808192151	5	18040002	54110000	4	Acres	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Westley Wasteway (Stanislaus County)	Lake & Reservoir	CAR5411000020080808192151	5	18040002	54110000	4	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Whiskeytown Lake (areas near Oak Bottom, Brandy Creek Campgrounds and Whiskeytown)	Lake & Reservoir	CAL5246100019980814123354	5	18020112	52463010	98	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Wildwood, Lake (Nevada County)	Lake & Reservoir	CAL5172002020080810191901	5	18020125	51720020	289	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Willow Creek (Lassen County, Central Valley)	River & Stream	CAR5266107220090110153757	5	18020002	52661072	23	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Willow Creek (Lassen County, Central Valley)	River & Stream	CAR5266107220090110153757	5	18020002	52661072	23	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Willow Creek (Madera County)	River & Stream	CAR5402105120000216112815	5	18040006	54021051	6	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Willow Creek (Shasta County, below Greenhorn Mine to Clear Creek)	River & Stream	CAR5246301119980818110732	5	18020112	52463010	4	Miles	Acid Mine Drainage	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	Willow Creek (Shasta County, below Greenhorn Mine to Clear Creek)	River & Stream	CAR5246301119980818110732	5	18020112	52463010	4	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	Willow Creek (Shasta County, below Greenhorn Mine to Clear Creek)	River & Stream	CAR5246301119980818110732	5	18020112	52463010	4	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			All resource extraction sources are abandoned mines.
5	Willow Slough (Yolo County)	River & Stream	CAR5112000020080801153727	5	18020109	51120000	10	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Willow Slough Bypass (Yolo County)	River & Stream	CAR5112000020080801152942	5	18020109	51120000	6	Miles	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Willow Slough Bypass (Yolo County)	River & Stream	CAR5112000020080801152942	5	18020109	51120000	6	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Willow Slough Bypass (Yolo County)	River & Stream	CAR5112000020080801152942	5	18020109	51120000	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
5	Winters Canal (Yolo County)	River & Stream	CAR5112000020080801150313	5	18020109	51120000	15	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Wolf Creek (Nevada County)	River & Stream	CAR5163201020011212113551	5	18020126	51632010	23	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
5	Woods Creek (Tuolumne County)	River & Stream	CAR5363104120080808175556	5	18040009	53631041	15	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Woodward Reservoir	Lake & Reservoir	CAL5354001120091208203448	5	18040002	53540011	1775	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Yankee Slough (Placer and Sutter Counties)	River & Stream	CAR5151000020080731221832	5	18020108	51510000	13	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Yankee Slough (Placer and Sutter Counties)	River & Stream	CAR5151000020080731221832	5	18020108	51510000	13	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Yuba River, Lower	River & Stream	CAR5153000020020702135622	5	18020106	51530000	10	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
5	Yuba River, Middle Fork	River & Stream	CAR5174102220020702105502	5	18020125	51751011	45	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing is from Bear Creek to the North Yuba River.
5	Yuba River, North Fork	River & Stream	CAR5175101120020702103628	5	18020125	51751011	37	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing is from New Bullards Bar Reservoir dam to Lake Englebright.
5	Yuba River, South Fork (Spaulding Reservoir to Englebright Reservoir)	River & Stream	CAR5173203120020710160332	5	18020126	51732031	48	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing is from Rucker Creek to Lake Englebright.
5	Yuba River, South Fork (Spaulding Reservoir to Englebright Reservoir)	River & Stream	CAR5173203120020710160332	5	18020126	51732031	48	Miles	Temperature, water	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Amargosa River (Nevada border to Tecopa)	River & Stream	CAR6094200020080815123246	5	18090202	60942000	62	Miles	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Amargosa River (Tecopa to Upper Canyon)	River & Stream	CAR6094200020080816182154	5	18090202	60942000	2	Miles	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
6	Amargosa River (Upper Canyon to Willow Creek confluence)	River & Stream	CAR6094200020080816182930	5	18090202	60942000	3	Miles	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
6	Aspen Creek	River & Stream	CAR6321008019980803133950	4b	1.60502e	63210080	1	Miles	Metals	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		This listing is being addressed through a CERCLA remediation program and through ongoing work by Lahontan Water Board staff.
6	Bidwell Creek	River & Stream	CAR6413004020020603153934	5	18080001	64130040	12	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Blackwood Creek	River & Stream	CAR6342002119990128133830	5	16050101	63420021	6	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-22			This listing may be addressed through revision of the water quality objective rather than a TMDL.
6	Blackwood Creek	River & Stream	CAR6342002119990128133830	5	16050101	63420021	6	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-22			
6	Blackwood Creek	River & Stream	CAR6342002119990128133830	5	16050101	63420021	6	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-22			
6	Blackwood Creek	River & Stream	CAR6342002119990128133830	5	16050101	63420021	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			11-Jul-08	
6	Bodie Creek	River & Stream	CAR6302003119980803161248	5	18090101	63020031	11	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Bridgeport Reservoir	Lake & Reservoir	CAL6303005019980806102128	5	1.60503e	63030050	2614	Acres	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
6	Bridgeport Reservoir	Lake & Reservoir	CAL6303005019980806102128	5	1.60503e	63030050	2614	Acres	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
6	Bridgeport Reservoir	Lake & Reservoir	CAL6303005019980806102128	5	1.60503e	63030050	2614	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
6	Bronco Creek	River & Stream	CAR6352005319980803162636	4a	16050102	63520053	1	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Sep-09	
6	Bryant Creek	River & Stream	CAR6321008019981015135122	4b	1.60502e	63210080	5	Miles	Metals	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		This listing is being addressed through a CERCLA remediation program and through ongoing work by Lahontan Water Board staff.
6	Buckeye Creek	River & Stream	CAR6304002220011130114903	4b	16050301	63040022	17	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-27		This listing is being addressed through the implementation of management practices for livestock grazing under Lahontan RWQCB Resolution R6T-2007-0019, Waiver of Waste Discharge Requirements for Grazing Operations in the East Walker River Watershed (Bridgeport Valley and Tributaries) of the Lahontan Region.
6	Carson River, West Fork (Headwaters to Woodfords)	River & Stream	CAR6332001420000207111737	5	1.60502e	63320014	18	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Carson River, West Fork (Headwaters to Woodfords)	River & Stream	CAR6332001420000207111737	5	1.60502e	63320014	18	Miles	Nitrogen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Carson River, West Fork (Headwaters to Woodfords)	River & Stream	CAR6332001420000207111737	5	1.60502e	63320014	18	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Carson River, West Fork (Paynesville to State Line)	River & Stream	CAR6331001320011213144544	5	16050201	63310013	3	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Carson River, West Fork (Woodfords to Paynesville)	River & Stream	CAR6331001320011213134239	5	16050201	63310012	4	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Carson River, West Fork (Woodfords to Paynesville)	River & Stream	CAR6331001320011213134239	5	16050201	63310012	4	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Clearwater Creek	River & Stream	CAR6304005019990128140848	5	1.60503e	63040051	12	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-06			Listed on basis of limited information; additional monitoring may support delisting.
6	Cold Creek	River & Stream	CAR6341003020000207114402	4b	16050101	63410030	7	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-28		This listing is being addressed through a U.S. Forest Service restoration project.
6	Crab Creek	River & Stream	CAR6282000020070828155012	5	18090208	62820000	6	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Crowley Lake	Lake & Reservoir	CAL6031009019980806103521	5	1.80901e	60310090	4861	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Crowley Lake	Lake & Reservoir	CAL6031009019980806103521	5	1.80901e	60310090	4861	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Donner Lake	Lake & Reservoir	CAL6352002119980806104900	5	1.60501e	63520021	819	Acres	Priority Organics	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Eagle Lake (Lassen County)	Lake & Reservoir	CAL6373200019980806111117	5	18080003	63732000	20704	Acres	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Eagle Lake (Lassen County)	Lake & Reservoir	CAL6373200019980806111117	5	18080003	63732000	20704	Acres	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	East Walker River, above Bridgeport Reservoir	River & Stream	CAR6303005020011214105850	4b	16050301	63030050	7	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-27		This listing is being addressed through the implementation of management practices for livestock grazing under Lahontan RWQCB Resolution R6T-2007-0019, Waiver of Waste Discharge Requirements for Grazing Operations in the East Walker River Watershed (Bridgeport Valley and Tributaries) of the Lahontan Region.
6	East Walker River, below Bridgeport Reservoir	River & Stream	CAR6301001020011204100242	5	16050301	63030050	8	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	East Walker River, below Bridgeport Reservoir	River & Stream	CAR6301001020011204100242	5	16050301	63030050	8	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	East Walker River, below Bridgeport Reservoir	River & Stream	CAR6301001020011204100242	5	16050301	63030050	8	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	General Creek	River & Stream	CAR6342003020020116105709	5	1.60501e	63420030	9	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	General Creek	River & Stream	CAR6342003020020116105709	5	1.60501e	63420030	9	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Gray Creek (Nevada County)	River & Stream	CAR6352005219980804105702	4a	16050102	63520052	3	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Sep-09	
6	Haiwee Reservoir	Lake & Reservoir	CAL6241007119980806113450	5	1.80901e	62410071	1703	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-04			
6	Heavenly Valley Creek (USFS boundary to Trout Creek)	River & Stream	CAR6341003120021219154348	5	16050101	63410031	1	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed by revision of the water quality objective rather than through a TMDL.
6	Heavenly Valley Creek (USFS boundary to Trout Creek)	River & Stream	CAR6341003120021219154348	5	16050101	63410031	1	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Heavenly Valley Creek (source to USFS boundary)	River & Stream	CAR6341003119980804122742	5	16050101	63410031	2	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Heavenly Valley Creek (source to USFS boundary)	River & Stream	CAR6341003119980804122742	5	16050101	63410031	2	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Heavenly Valley Creek (source to USFS boundary)	River & Stream	CAR6341003119980804122742	5	16050101	63410031	2	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Sep-02	
6	Hilton Creek	River & Stream	CAR6031008020070824170247	5	18090102	60310080	9	Miles	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Holcomb Creek	River & Stream	CAR6282000020000215160943	5	18090208	62820000	19	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Honey Lake	Saline Lake	CAL6371006019980805165100	5	1.808e+0	63710060	57756	Acres	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Arsenic in Honey Lake is ultimately from natural sources, but the lake is affected by geothermal discharges. Further study is needed to determine whether a TMDL is needed.
6	Honey Lake	Saline Lake	CAL6371006019980805165100	5	1.808e+0	63710060	57756	Acres	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Honey Lake has naturally high salinity but is affected by low flows and geothermal discharges. Further study is needed to verify whether impairment occurs and whether a TMDL is needed.
6	Honey Lake Area Wetlands	Wetland, Freshwater	CAW6372009519990129141727	5	1.808e+0	63710060	62590	Acres	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The wetlands adjacent to Honey Lake are affected by salts and trace elements from natural sources, which may be concentrated by evaporation during dry years. Additional study is needed to verify whether impairment exists and whether a TMDL is needed.
6	Honey Lake Wildfowl Management Ponds	Saline Lake	CAL6372009519980806091131	5	1.808e+0	63720095	665	Acres	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The ponds are affected by salts and trace elements from natural sources, which may be concentrated by evaporation during dry years. Additional study is needed to verify whether impairment exists and whether a TMDL is needed.
6	Honey Lake Wildfowl Management Ponds	Saline Lake	CAL6372009519980806091131	5	1.808e+0	63720095	665	Acres	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			The ponds are affected by salts and trace elements from natural sources, which may be concentrated by evaporation during dry years. Additional study is needed to verify whether impairment exists and whether a TMDL is needed.

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
6	Honey Lake Wildfowl Management Ponds	Saline Lake	CAL6372009519980806091131	5	1.808e+0	63720095	665	Acres	Trace Elements	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Indian Creek (Alpine County)	River & Stream	CAR6322001020011213104836	5	16050201	63220010	13	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Indian Creek Reservoir	Lake & Reservoir	CAL6322001019980805154816	4a	1.60502e	63220010	164	Acres	Phosphorus	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jul-03	Reservoir is eutrophic. Most significant source of nutrient loading is release of phosphorus from sediment. The USEPA approved the TMDL in 2003. Reductions in internal phosphorus loading from the sediment are expected to ameliorate other problems associated with eutrophication.
6	Leviathan Creek	River & Stream	CAR6321008019980803122747	4b	1.60502e	63210080	3	Miles	Metals	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		This listing is being addressed through a CERCLA remediation program and through ongoing work by Lahontan Water Board staff.
6	Littlerock Reservoir	Lake & Reservoir	CAL6268000020020529143312	5	18090206	62680000	100	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mammoth Creek (Old Mammoth Road to Highway 395)	River & Stream	CAR6031005320080816102036	5	18090102	60310053	6	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mammoth Creek (Old Mammoth Road to Highway 395)	River & Stream	CAR6031005320080816102036	5	18090102	60310053	6	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Mammoth Creek (Old Mammoth Road to Highway 395)	River & Stream	CAR6031005320080816102036	5	18090102	60310053	6	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mammoth Creek (Twin Lakes outlet to Old Mammoth Road)	River & Stream	CAR6031005120080816102743	5	18090102	60310051	2	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mammoth Creek (Twin Lakes outlet to Old Mammoth Road)	River & Stream	CAR6031005120080816102743	5	18090102	60310051	2	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Mammoth Creek, unamed tributary (confluence is near Old Mammoth Rd)	River & Stream	CAR6031005120080630162428	5	18090102	60310051	2	Miles	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-12			
6	Mammoth Creek, unamed tributary (confluence is near Old Mammoth Rd)	River & Stream	CAR6031005120080630162428	5	18090102	60310051	2	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mesquite Springs (Inyo County)	Wetland, Freshwater	CAW6091100020080825153033	5	18090203	60911000	0	Acres	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mesquite Springs (Inyo County)	Wetland, Freshwater	CAW6091100020080825153033	5	18090203	60911000	0	Acres	Boron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mill Creek (Modoc County)	River & Stream	CAR6413001119980804160434	5	18080001	64130011	4	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mojave River (Mojave Forks Reservoir outlet to Upper Narrows)	River & Stream	CAR6282000020080816195148	5	18090208	62820000	15	Miles	Fluoride	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mojave River (Upper Narrows to Lower Narrows)	River & Stream	CAR6282000020080817142158	5	18090208	62820000	4	Miles	Fluoride	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mojave River (Upper Narrows to Lower Narrows)	River & Stream	CAR6282000020080817142158	5	18090208	62820000	4	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Mojave River (Upper Narrows to Lower Narrows)	River & Stream	CAR6282000020080817142158	5	18090208	62820000	4	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Monitor Creek	River & Stream	CAR6321007019990128145913	5	1.60502e	63210070	4	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is expected to be addressed through the CERCLA remediation process.
6	Monitor Creek	River & Stream	CAR6321007019990128145913	5	1.60502e	63210070	4	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is expected to be addressed through the CERCLA remediation process..
6	Monitor Creek	River & Stream	CAR6321007019990128145913	5	1.60502e	63210070	4	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is expected to be addressed through the CERCLA remediation process.
6	Monitor Creek	River & Stream	CAR6321007019990128145913	5	1.60502e	63210070	4	Miles	Silver	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is expected to be addressed through the CERCLA remediation process.
6	Monitor Creek	River & Stream	CAR6321007019990128145913	5	1.60502e	63210070	4	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is expected to be addressed through the CERCLA remediation process.
6	Monitor Creek	River & Stream	CAR6321007019990128145913	5	1.60502e	63210070	4	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing is expected to be addressed through the CERCLA remediation process.
6	Mono Lake	Saline Lake	CAL6010008019980806094326	4b	1.80901e	60100080	39743	Acres	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		This listing is being addressed through State Water Resources Control Board Water Rights Decision 1631.
6	Pleasant Valley Reservoir	Lake & Reservoir	CAL6032000019980806124123	5	1.80901e	60320000	99	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Robinson Creek (Hwy 395 to Bridgeport Res)	River & Stream	CAR6303005020011214081721	4b	16050301	63030050	2	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-27		This listing is being addressed through the implementation of management practices for livestock grazing under Lahontan RWQCB Resolution R6T-2007-0019, Waiver of Waste Discharge Requirements for Grazing Operations in the East Walker River Watershed (Bridgeport Valley and Tributaries) of the Lahontan Region.
6	Robinson Creek (Twin Lakes to Hwy 395)	River & Stream	CAR6303005020020117085757	4b	16050301	63030050	9	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-27		This listing is being addressed through the implementation of management practices for livestock grazing under Lahontan RWQCB Resolution R6T-2007-0019, Waiver of Waste Discharge Requirements for Grazing Operations in the East Walker River Watershed (Bridgeport Valley and Tributaries) of the Lahontan Region.
6	Rock Creek (tributary to Owens River)	River & Stream	CAR6032014020070824170608	5	18090102	60320140	33	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Searles Lake	Saline Lake	CAL6211000019990129093321	4b	1.80902e	62110000	30211	Acres	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		This listing is being addressed through Lahontan Water Board Cleanup and Abatement Orders 6-00-64, 6-00-64A1 and 6-00-64A2.
6	Searles Lake	Saline Lake	CAL6211000019990129093321	4b	1.80902e	62110000	30211	Acres	Total Petroleum Hydrocarbons	Other Organics	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-19		This listing is being addressed through Lahontan Water Board Cleanup and Abatement Orders 6-00-64, 6-00-64A1 and 6-00-64A2.
6	Sheep Creek	River & Stream	CAR6282000020070828155444	5	18090208	62820000	2	Miles	Nitrate	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Sheep Creek	River & Stream	CAR6282000020070828155444	5	18090208	62820000	2	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Squaw Creek	River & Stream	CAR6352001119980805095744	4a	16050102	63520011	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			27-Jul-07	
6	Susan River (Headwaters to Susanville)	River & Stream	CAR6372001020080815005311	5	18080003	63720010	36	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Susan River (Headwaters to Susanville)	River & Stream	CAR6372001020080815005311	5	18080003	63720010	36	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Susan River (Headwaters to Susanville)	River & Stream	CAR6372001020080815005311	5	18080003	63720010	36	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Susan River (Headwaters to Susanville)	River & Stream	CAR6372001020080815005311	5	18080003	63720010	36	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Susan River (Litchfield to Honey Lake)	River & Stream	CAR6372005020080815011611	5	18080003	63720050	8	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Susan River (Litchfield to Honey Lake)	River & Stream	CAR6372005020080815011611	5	18080003	63720050	8	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Susan River (Susanville to Litchfield)	River & Stream	CAR6372005020080815013207	5	18080003	63720050	16	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Susan River (Susanville to Litchfield)	River & Stream	CAR6372005020080815013207	5	18080003	63720050	16	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Susan River (Susanville to Litchfield)	River & Stream	CAR6372005020080815013207	5	18080003	63720050	16	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
6	Susan River (Susanville to Litchfield)	River & Stream	CAR6372005020080815013207	5	18080003	63720050	16	Miles	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Swauger Creek	River & Stream	CAR6304001220011130122006	5	1.60503e	63040012	14	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-27		This listing is being addressed through the implementation of management practices for livestock grazing under Lahontan RWQCB Resolution R6T-2007-0019, Waiver of Waste Discharge Requirements for Grazing Operations in the East Walker River Watershed (Bridgeport Valley and Tributaries) of the Lahontan Region.
6	Swauger Creek	River & Stream	CAR6304001220011130122006	5	1.60503e	63040012	14	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Tahoe, Lake	Lake & Reservoir	CAL6343001019980806120257	5	1.60501e	63430010	85364	Acres	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
6	Tahoe, Lake	Lake & Reservoir	CAL6343001019980806120257	5	1.60501e	63430010	85364	Acres	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
6	Tahoe, Lake	Lake & Reservoir	CAL6343001019980806120257	5	1.60501e	63430010	85364	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
6	Tallac Creek (below Hwy 89)	River & Stream	CAR6341004120020116164425	5	16050101	63410041	1	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Trout Creek (above Hwy 50)	River & Stream	CAR6341003120000220171341	5	1.60501e	63410020	10	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This issue may be addressed through revision of the water quality objective rather than through a TMDL.
6	Trout Creek (above Hwy 50)	River & Stream	CAR6341003120000220171341	5	1.60501e	63410020	10	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Trout Creek (above Hwy 50)	River & Stream	CAR6341003120000220171341	5	1.60501e	63410020	10	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Trout Creek (above Hwy 50)	River & Stream	CAR6341003120000220171341	5	1.60501e	63410020	10	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Trout Creek (below Hwy 50)	River & Stream	CAR6341003120020117091520	5	1.60501e	63410042	1	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Trout Creek (below Hwy 50)	River & Stream	CAR6341003120020117091520	5	1.60501e	63410042	1	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Trout Creek (below Hwy 50)	River & Stream	CAR6341003120020117091520	5	1.60501e	63410042	1	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Trout Creek (below Hwy 50)	River & Stream	CAR6341003120020117091520	5	1.60501e	63410042	1	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Truckee River	River & Stream	CAR6351001019980805112246	4a	16050101	63510010	39	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-Sep-09	
6	Truckee River, Upper (above Christmas Valley)	River & Stream	CAR6341001020020116165645	5	16050101	63410010	4	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Truckee River, Upper (above Christmas Valley)	River & Stream	CAR6341001020020116165645	5	16050101	63410010	4	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
6	Truckee River, Upper (below Christmas Valley)	River & Stream	CAR6341004220000220174338	5	1.60501e	63410042	11	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Truckee River, Upper (below Christmas Valley)	River & Stream	CAR6341004220000220174338	5	1.60501e	63410042	11	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
6	Ward Creek	River & Stream	CAR6342002019980805120910	5	1.60501e	63420020	6	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-15			This listing may be addressed through revision of the water quality objective rather than through a TMDL.
6	Ward Creek	River & Stream	CAR6342002019980805120910	5	1.60501e	63420020	6	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
6	Ward Creek	River & Stream	CAR6342002019980805120910	5	1.60501e	63420020	6	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
6	Ward Creek	River & Stream	CAR6342002019980805120910	5	1.60501e	63420020	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
6	Wolf Creek (Alpine County)	River & Stream	CAR6321003019980805163307	5	16050201	63210031	12	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Endosulfan	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			28-Jun-02	
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Selenium	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Selenium originates from Upper Basin Portion of Colorado River. Elevated fish tissue levels. For 2006, selenium was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
7	Alamo River	River & Stream	CAR7231000019990205093023	5	18100200	72310000	57	Miles	Toxaphene	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Coachella Valley Storm Water Channel	River & Stream	CAR7194700019990205111415	5	18100200	71947000	24	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing for DDT only applies to a 2 mile area of the Coachella Valley Storm Water Channel from Lincoln Street to the Salton Sea.
7	Coachella Valley Storm Water Channel	River & Stream	CAR7194700019990205111415	5	18100200	71947000	24	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing for Dieldrin only applies to a 2 mile area of the Coachella Valley Storm Water Channel from Lincoln Street to the Salton Sea.
7	Coachella Valley Storm Water Channel	River & Stream	CAR7194700019990205111415	5	18100200	71947000	24	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing for PCBs only applies to a 2 mile area of the Coachella Valley Storm Water Channel from Lincoln Street to the Salton Sea.
7	Coachella Valley Storm Water Channel	River & Stream	CAR7194700019990205111415	5	18100200	71947000	24	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			This listing for pathogens only applies to a 17 mile area of the Coachella Valley Storm Water Channel from Dillon Road to the Salton Sea.
7	Coachella Valley Storm Water Channel	River & Stream	CAR7194700019990205111415	5	18100200	71947000	24	Miles	Toxaphene	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing for toxaphene only applies to a 2 mile area of the Coachella Valley Storm Water Channel from Lincoln Street to the Salton Sea.
7	Colorado River (Imperial Reservoir to California-Mexico Border)	River & Stream	CAR7270000020050815175128	5	15030107	72700000	11	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			This listing for Chlordane only applies to the Barbara Worth Drain, Peach Drain, Greeson Drain, South Central Drain, and Holtville Main Drain areas of the Imperial Valley drains.
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The listing for DDT only applies to the Barbara Worth Drain, Peach Drain, and Rice Drain areas of the Imperial Valley drains.
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The listing for dieldrin only applies to the Barbara Worth Drain and Fig Drain areas of the Imperial Valley drains.
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	Endosulfan	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The listing for endosulfan only applies to the Peach Drain area of the Imperial Valley drains.
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The listing for PCBs only applies to the Central Drain area of the Imperial Valley drains, from Meloland Road to the outlet into the Alamo River.
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	Sedimentation/Siltation	Sediment	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			30-Sep-05	
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	Selenium	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Selenium originates from Upper Basin Portion of Colorado River. Elevated fish tissue levels.
7	Imperial Valley Drains	River & Stream	CAR7231000019990205150323	5	18100200	72310000	1225	Miles	Toxaphene	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing for toxaphene only applies to the Barbara Worth Drain, Peach Drain, and Rice Drain of the Imperial Valley drains.
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Chlordane	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Chlorpyrifos	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			In the final decision for the 2006 303(d) list, USEPA determined that this pollutant water body combination should be listed on the 303(d) (TMDL required list).This listing was made by USEPA for 2006.
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Dieldrin	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Hexachlorobenzene/ HCB	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Regional Board proposes to establish TMDL in cooperation with U.S. EPA and Mexico.
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Organic Enrichment/Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			14-Aug-02	
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Sediment	Sediment	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			31-Mar-03	
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Selenium	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Toxaphene	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Trash	Trash	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			24-Sep-07	
7	New River (Imperial County)	River & Stream	CAR7231000019990205102948	5	18100200	72800000	66	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Palo Verde Outfall Drain and Lagoon	River & Stream	CAR7154000019990205131951	5	15030104	71540000	19	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Palo Verde Outfall Drain and Lagoon	River & Stream	CAR7154000019990205131951	5	15030104	71540000	19	Miles	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
7	Palo Verde Outfall Drain and Lagoon	River & Stream	CAR7154000019990205131951	5	15030104	71540000	19	Miles	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	Arsenic	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	Salinity	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			TMDL development will not be effective in addressing this problem, which will require an engineering solution with federal, local, and state cooperation.
7	Salton Sea	Saline Lake	CAS7280000019990205133504	5	18100200	72800000	233340	Acres	Selenium	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
7	Wiest Lake	Lake & Reservoir	CAL7231000020000127135508	5	18100200	72310000	42	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Anaheim Bay	Bay & Harbor	CAB8011100019990308101956	5	18070201	80111000	402	Acres	Dieldrin (tissue)	Pesticides	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Anaheim Bay	Bay & Harbor	CAB8011100019990308101956	5	18070201	80111000	402	Acres	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Anaheim Bay	Bay & Harbor	CAB8011100019990308101956	5	18070201	80111000	402	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Anaheim Bay	Bay & Harbor	CAB8011100019990308101956	5	18070201	80111000	402	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Balboa Beach	Coastal & Bay Shoreline	CAX8011400020021003083908	5	18070201	80114000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Balboa Beach	Coastal & Bay Shoreline	CAX8011400020021003083908	5	18070201	80114000	2	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Balboa Beach	Coastal & Bay Shoreline	CAX8011400020021003083908	5	18070201	80114000	2	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Big Bear Lake	Lake & Reservoir	CAL8017100019990208151909	5	18070203	80171000	2865	Acres	Mercury	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-07			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
8	Big Bear Lake	Lake & Reservoir	CAL8017100019990208151909	5	18070203	80171000	2865	Acres	Noxious aquatic plants	Miscellaneous	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			25-Sep-07	
8	Big Bear Lake	Lake & Reservoir	CAL8017100019990208151909	5	18070203	80171000	2865	Acres	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			25-Sep-07	
8	Big Bear Lake	Lake & Reservoir	CAL8017100019990208151909	5	18070203	80171000	2865	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Bolsa Chica Channel	River & Stream	CAR8011100020080921212001	5	18070201	80111000	5	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Bolsa Chica Channel	River & Stream	CAR8011100020080921212001	5	18070201	80111000	5	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Bolsa Chica State Beach	Coastal & Bay Shoreline	CAX8011100019991012170142	5	18070201	80111000	3	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Bolsa Chica State Beach	Coastal & Bay Shoreline	CAX8011100019991012170142	5	18070201	80111000	3	Miles	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Borrego Creek (from Irvine Blvd to San Diego Creek Reach 2)	River & Stream	CAR8011100020080924030547	5	18070203	80111000	3	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Buck Gully Creek	River & Stream	CAR8011100020011005142440	5	18070201	80111000	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Listing is downstream of Pacific Coast Highway.
8	Buck Gully Creek	River & Stream	CAR8011100020011005142440	5	18070201	80111000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Listing is downstream of Pacific Coast Highway.
8	Canyon Lake (Railroad Canyon Reservoir)	Lake & Reservoir	CAL8021100019990208151525	5	18070202	80211000	453	Acres	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Sep-05	
8	Canyon Lake (Railroad Canyon Reservoir)	Lake & Reservoir	CAL8021100019990208151525	5	18070202	80211000	453	Acres	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
8	Chino Creek Reach 1A (Santa Ana River R5 confl to just downstream of confl with Mill Creek)	River & Stream	CAR8012100020080715125447	5	18070203	80121000	1	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Chino Creek Reach 1A (Santa Ana River R5 confl to just downstream of confl with Mill Creek)	River & Stream	CAR8012100020080715125447	5	18070203	80121000	1	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Chino Creek Reach 1B (Mill Creek confl to start of concrete lined channel)	River & Stream	CAR8012100020080715104015	5	18070203	80121000	7	Miles	Chemical oxygen demand (COD)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Chino Creek Reach 1B (Mill Creek confl to start of concrete lined channel)	River & Stream	CAR8012100020080715104015	5	18070203	80121000	7	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Chino Creek Reach 1B (Mill Creek confl to start of concrete lined channel)	River & Stream	CAR8012100020080715104015	5	18070203	80121000	7	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Chino Creek Reach 2 (Beginning of concrete channel to confl w San Antonio Creek)	River & Stream	CAR8012100019990211094451	5	18070203	80121000	3	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Chino Creek Reach 2 (Beginning of concrete channel to confl w San Antonio Creek)	River & Stream	CAR8012100019990211094451	5	18070203	80121000	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Cucamonga Creek Reach 1 (Valley Reach)	River & Stream	CAR8012100019990211101136	5	18070203	80121000	10	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Cucamonga Creek Reach 1 (Valley Reach)	River & Stream	CAR8012100019990211101136	5	18070203	80121000	10	Miles	Coliform Bacteria	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Cucamonga Creek Reach 1 (Valley Reach)	River & Stream	CAR8012100019990211101136	5	18070203	80121000	10	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Cucamonga Creek Reach 1 (Valley Reach)	River & Stream	CAR8012100019990211101136	5	18070203	80121000	10	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Cucamonga Creek Reach 2 (Mountain Reach)	River & Stream	CAR8012402019991013163906	5	18070203	80124020	13	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	East Garden Grove Wintersburg Channel	River & Stream	CAR8011100020080924142217	5	18070201	80111000	3	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Elsinore, Lake	Lake & Reservoir	CAL8023100019990208151100	5	18070202	80231000	2431	Acres	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Sep-05	
8	Elsinore, Lake	Lake & Reservoir	CAL8023100019990208151100	5	18070202	80231000	2431	Acres	Organic Enrichment/Low Dissolved Oxygen	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			30-Sep-05	
8	Elsinore, Lake	Lake & Reservoir	CAL8023100019990208151100	5	18070202	80231000	2431	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Elsinore, Lake	Lake & Reservoir	CAL8023100019990208151100	5	18070202	80231000	2431	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Elsinore, Lake	Lake & Reservoir	CAL8023100019990208151100	5	18070202	80231000	2431	Acres	Unknown Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-07			
8	Fulmor, Lake	Lake & Reservoir	CAL8022100019990211085555	5	18070202	80221000	4	Acres	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Grout Creek	River & Stream	CAR8017100019990208145402	5	18070203	80171000	4	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
8	Huntington Beach State Park	Coastal & Bay Shoreline	CAX8011100019991013153527	5	18070201	80111000	6	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	PCBs (Polychlorinated biphenyls) (tissue)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA.
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	Pathogens	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			The data shows that the impairment is focused at the 11th Street, Anderson Street Marina, Clubhouse Marina and Sunset Aquatic Park locations. These locations exceed mainly the enterococcus standard.
8	Huntington Harbour	Bay & Harbor	CAB8011100019990323095254	5	18070201	80111000	221	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Knickerbocker Creek	River & Stream	CAR8017100019990211102535	5	18070203	80171000	2	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-05			For 2006, pathogens was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
8	Los Trancos Creek (Crystal Cove Creek)	River & Stream	CAR8011100020021009083737	5	18070201	80111000	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Listing is downstream of Pacific Coast Highway.
8	Los Trancos Creek (Crystal Cove Creek)	River & Stream	CAR8011100020021009083737	5	18070201	80111000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Listing is downstream of Pacific Coast Highway.
8	Lytle Creek	River & Stream	CAR8014100019990211103501	5	18070203	80141000	41	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Mill Creek (Prado Area)	River & Stream	CAR8012100019990211144540	5	18070203	80121000	2	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Mill Creek (Prado Area)	River & Stream	CAR8012100019990211144540	5	18070203	80121000	2	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Mill Creek (Prado Area)	River & Stream	CAR8012100019990211144540	5	18070203	80121000	2	Miles	Total Suspended Solids (TSS)	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Mill Creek Reach 1	River & Stream	CAR8015600019990211105628	5	18070203	80156000	12	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Mill Creek Reach 2	River & Stream	CAR8015800019990211110827	5	18070203	80158000	12	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Mountain Home Creek	River & Stream	CAR8015800019990211111513	5	18070203	80158000	4	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Mountain Home Creek, East Fork	River & Stream	CAR8015800019990211111904	5	18070203	80158000	5	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	Copper	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-07			
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			28-Feb-00	
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	Pesticides	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-04	
8	Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Bay & Harbor	CAB8011400019990322141859	5	18070201	80114000	767	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			01-Jan-00	
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Metals	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Pesticides	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-Feb-04	
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Newport Bay, Upper (Ecological Reserve)	Estuary	CAE8011400019990323090803	5	18070201	80111000	653	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	Newport Slough	River & Stream	CAR8011100020011107123409	5	18070201	80111000	1	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Newport Slough	River & Stream	CAR8011100020011107123409	5	18070201	80111000	1	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Newport Slough	River & Stream	CAR8011100020011107123409	5	18070201	80111000	1	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Peters Canyon Channel	River & Stream	CAR8011100020050602204221	5	18070201	80111000	3	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Peters Canyon Channel	River & Stream	CAR8011100020050602204221	5	18070201	80111000	3	Miles	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Peters Canyon Channel	River & Stream	CAR8011100020050602204221	5	18070201	80111000	3	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Prado Park Lake	Lake & Reservoir	CAL8012100019991013112737	5	18070203	80121000	90	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Prado Park Lake	Lake & Reservoir	CAL8012100019991013112737	5	18070203	80121000	90	Acres	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Rathbone (Rathbun) Creek	River & Stream	CAR8017100019990211112232	5	18070203	80171000	5	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Rathbone (Rathbun) Creek	River & Stream	CAR8017100019990211112232	5	18070203	80171000	5	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Rathbone (Rathbun) Creek	River & Stream	CAR8017100019990211112232	5	18070203	80171000	5	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
8	Rathbone (Rathbun) Creek	River & Stream	CAR8017100019990211112232	5	18070203	80171000	5	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-06			
8	Rhine Channel	Bay & Harbor	CAB8011400020050201172510	5	18070201	80114000	20	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Rhine Channel	Bay & Harbor	CAB8011400020050201172510	5	18070201	80114000	20	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Rhine Channel	Bay & Harbor	CAB8011400020050201172510	5	18070201	80114000	20	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Rhine Channel	Bay & Harbor	CAB8011400020050201172510	5	18070201	80114000	20	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Rhine Channel	Bay & Harbor	CAB8011400020050201172510	5	18070201	80114000	20	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Rhine Channel	Bay & Harbor	CAB8011400020050201172510	5	18070201	80114000	20	Acres	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	San Antonio Creek	River & Stream	CAR8012100019991013144655	5	18070203	80121000	23	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	San Diego Creek Reach 1	River & Stream	CAR8011100019990211131732	5	18070201	80111000	8	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	San Diego Creek Reach 1	River & Stream	CAR8011100019990211131732	5	18070201	80111000	8	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	San Diego Creek Reach 1	River & Stream	CAR8011100019990211131732	5	18070201	80111000	8	Miles	Pesticides	Pesticides	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-Feb-04	
8	San Diego Creek Reach 1	River & Stream	CAR8011100019990211131732	5	18070201	80111000	8	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	San Diego Creek Reach 1	River & Stream	CAR8011100019990211131732	5	18070201	80111000	8	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-07			
8	San Diego Creek Reach 1	River & Stream	CAR8011100019990211131732	5	18070201	80111000	8	Miles	Toxaphene	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	San Diego Creek Reach 2	River & Stream	CAR8011100019990211130358	4a	18070201	80111000	6	Miles	Nutrients	Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	San Diego Creek Reach 2	River & Stream	CAR8011100019990211130358	4a	18070201	80111000	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-99	
8	San Diego Creek Reach 2	River & Stream	CAR8011100019990211130358	4a	18070201	80111000	6	Miles	Unknown Toxicity	Toxicity	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			13-Feb-04	
8	Santa Ana River Reach 6	River & Stream	CAR8015700020080921214849	5	18070203	80157000	27	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Santa Ana River, Reach 3	River & Stream	CAR8012100019990211140353	5	18070203	80121000	26	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			The impairment is during the wet season only.
8	Santa Ana River, Reach 3	River & Stream	CAR8012100019990211140353	5	18070203	80121000	26	Miles	Pathogens	Pathogens	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			16-May-07	
8	Santa Ana River, Reach 4	River & Stream	CAR8012700019990211142130	5	18070203	80127000	14	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Santiago Creek, Reach 4	River & Stream	CAR8011200019990211143745	5	18070203	80112000	10	Miles	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Seal Beach	Coastal & Bay Shoreline	CAX8011100019991013160405	5	18070201	80111000	1	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Impaired 50 yards around drain at 1st Street.
8	Seal Beach	Coastal & Bay Shoreline	CAX8011100019991013160405	5	18070201	80111000	1	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Serrano Creek	River & Stream	CAR8011100020080921203908	5	18070201	80111000	7	Miles	Ammonia (Unionized)	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Serrano Creek	River & Stream	CAR8011100020080921203908	5	18070201	80111000	7	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
8	Silverado Creek	River & Stream	CAR8011200019990211132556	5	18070203	80112000	11	Miles	Pathogens	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Silverado Creek	River & Stream	CAR8011200019990211132556	5	18070203	80112000	11	Miles	Salinity/TDS/Chlorides	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
8	Summit Creek	River & Stream	CAR8017100020000410115433	5	18070203	80171000	2	Miles	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
8	Temescal Creek, Reach 1	River & Stream	CAR8012500019991014110146	5	18070203	80125000	2	Miles	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Agua Hedionda Creek	River & Stream	CAR9043100020010924145051	5	18070303	90431000	7	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Aliso Creek	River & Stream	CAR9011300019990208093130	5	18070301	90113000	19	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-05			This listing for indicator bacteria applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.
9	Aliso Creek	River & Stream	CAR9011300019990208093130	5	18070301	90113000	19	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing for phosphorus applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.
9	Aliso Creek	River & Stream	CAR9011300019990208093130	5	18070301	90113000	19	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Aliso Creek	River & Stream	CAR9011300019990208093130	5	18070301	90113000	19	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Aliso Creek	River & Stream	CAR9011300019990208093130	5	18070301	90113000	19	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing for toxicity applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.
9	Aliso Creek (mouth)	Estuary	CAE9011300019990208095945	5	18070301	90113000	0	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Alvarado Creek	River & Stream	CAR9071100020011025125514	5	18070304	90711000	5	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Arroyo Trabuco Creek	River & Stream	CAR9012000020011025103603	5	18070202	90120000	23	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Arroyo Trabuco Creek	River & Stream	CAR9012000020011025103603	5	18070202	90120000	23	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Arroyo Trabuco Creek	River & Stream	CAR9012000020011025103603	5	18070202	90120000	23	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Arroyo Trabuco Creek	River & Stream	CAR9012000020011025103603	5	18070202	90120000	23	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Barrett Lake	Lake & Reservoir	CAL9113000019980803101540	5	18070305	91130000	125	Acres	Color	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
9	Barrett Lake	Lake & Reservoir	CAL9113000019980803101540	5	18070305	91130000	125	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Barrett Lake	Lake & Reservoir	CAL9113000019980803101540	5	18070305	91130000	125	Acres	Perchlorate	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Barrett Lake	Lake & Reservoir	CAL9113000019980803101540	5	18070305	91130000	125	Acres	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Barrett Lake	Lake & Reservoir	CAL9113000019980803101540	5	18070305	91130000	125	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Buena Creek	River & Stream	CAR9043200020050630113820	5	18070303	90432000	5	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Buena Creek	River & Stream	CAR9043200020050630113820	5	18070303	90432000	5	Miles	Nitrate and Nitrite	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Buena Vista Creek	River & Stream	CAR9042100020011025103123	5	18070303	90421000	11	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Buena Vista Creek	River & Stream	CAR9042100020011025103123	5	18070303	90421000	11	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Buena Vista Lagoon	Estuary	CAE9042100019990209090045	5	18070303	90421000	202	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
9	Buena Vista Lagoon	Estuary	CAE9042100019990209090045	5	18070303	90421000	202	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 150 acres located in upper portion of lagoon.
9	Buena Vista Lagoon	Estuary	CAE9042100019990209090045	5	18070303	90421000	202	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-04			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Diazinon	Pesticides	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			03-Nov-03	
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-05			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-04			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Chollas Creek	River & Stream	CAR9082200019990208140725	5	18070304	90822000	4	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-04			
9	Cloverdale Creek	River & Stream	CAR9053200020010926112758	5	18070304	90532000	1	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Cloverdale Creek	River & Stream	CAR9053200020010926112758	5	18070304	90532000	1	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Cottonwood Creek (San Marcos Creek watershed)	River & Stream	CAR9045100020011009142248	5	18070303	90451000	2	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Cottonwood Creek (San Marcos Creek watershed)	River & Stream	CAR9045100020011009142248	5	18070303	90451000	2	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Cottonwood Creek (San Marcos Creek watershed)	River & Stream	CAR9045100020011009142248	5	18070303	90451000	2	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Cottonwood Creek (Tijuana River watershed)	River & Stream	CAR9116000020020306143545	5	18070305	91160000	53	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Dana Point Harbor	Bay & Harbor	CAB9011400020010831141600	5	18070301	90114000	119	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Dana Point Harbor	Bay & Harbor	CAB9011400020010831141600	5	18070301	90114000	119	Acres	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Dana Point Harbor	Bay & Harbor	CAB9011400020010831141600	5	18070301	90114000	119	Acres	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	De Luz Creek	River & Stream	CAR9022100020010924135442	5	18070302	90221000	14	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	De Luz Creek	River & Stream	CAR9022100020010924135442	5	18070302	90221000	14	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	De Luz Creek	River & Stream	CAR9022100020010924135442	5	18070302	90221000	14	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	De Luz Creek	River & Stream	CAR9022100020010924135442	5	18070302	90221000	14	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	El Capitan Lake	Lake & Reservoir	CAL9073100020011025093211	5	18070304	90731000	1454	Acres	Color	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	El Capitan Lake	Lake & Reservoir	CAL9073100020011025093211	5	18070304	90731000	1454	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	El Capitan Lake	Lake & Reservoir	CAL9073100020011025093211	5	18070304	90731000	1454	Acres	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	El Capitan Lake	Lake & Reservoir	CAL9073100020011025093211	5	18070304	90731000	1454	Acres	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	El Capitan Lake	Lake & Reservoir	CAL9073100020011025093211	5	18070304	90731000	1454	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Encinitas Creek	River & Stream	CAR9045100019991117144759	5	18070303	90451000	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Encinitas Creek	River & Stream	CAR9045100019991117144759	5	18070303	90451000	3	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	English Canyon	River & Stream	CAR9011300020050602203953	5	18070301	90113000	4	Miles	Benzo[b]fluoranthene	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	English Canyon	River & Stream	CAR9011300020050602203953	5	18070301	90113000	4	Miles	Dieldrin	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	English Canyon	River & Stream	CAR9011300020050602203953	5	18070301	90113000	4	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	English Canyon	River & Stream	CAR9011300020050602203953	5	18070301	90113000	4	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Manganese	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Phosphate	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Escondido Creek	River & Stream	CAR9046200020011005134542	5	18070303	90462000	26	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Famosa Slough and Channel	Estuary	CAE9071100019990209122340	5	18070304	90711000	32	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Felicita Creek	River & Stream	CAR9052300020010925131049	5	18070304	90523000	1	Miles	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Felicita Creek	River & Stream	CAR9052300020010925131049	5	18070304	90523000	1	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Forester Creek	River & Stream	CAR9071300020010924120240	5	18070304	90712000	6	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-05			Impairment Located at lower 1 mile.
9	Forester Creek	River & Stream	CAR9071300020010924120240	5	18070304	90712000	6	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Forester Creek	River & Stream	CAR9071300020010924120240	5	18070304	90712000	6	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Impairment Located at lower 1 mile.
9	Forester Creek	River & Stream	CAR9071300020010924120240	5	18070304	90712000	6	Miles	pH	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			Impairment Located at upper 3 miles.
9	Green Valley Creek	River & Stream	CAR9052200020010926130745	5	18070304	90521000	1	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Green Valley Creek	River & Stream	CAR9052200020010926130745	5	18070304	90521000	1	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Green Valley Creek	River & Stream	CAR9052200020010926130745	5	18070304	90521000	1	Miles	Pentachlorophenol (PCP)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Green Valley Creek	River & Stream	CAR9052200020010926130745	5	18070304	90521000	1	Miles	Sulfates	Other Inorganics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Guajome Lake	Lake & Reservoir	CAL9031100019990208142145	5	18070303	90311000	33	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	Color	Nuisance	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	Mercury	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	Nitrogen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-13			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Hodges, Lake	Lake & Reservoir	CAL9052100020010925094906	5	18070304	90521000	1104	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Jamul Creek	River & Stream	CAR9103300020081031153832	5	18070304	91033000	10	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Keys Creek	River & Stream	CAR9031200020081210153438	5	18070303	90312000	13	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Kit Carson Creek	River & Stream	CAR9052100020010926132824	5	18070304	90521000	1	Miles	Pentachlorophenol (PCP)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Kit Carson Creek	River & Stream	CAR9052100020010926132824	5	18070304	90521000	1	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Laguna Canyon Channel	River & Stream	CAR9011200020011025105029	5	18070301	90112000	2	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Laguna Canyon Channel	River & Stream	CAR9011200020011025105029	5	18070301	90112000	2	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loma Alta Creek	River & Stream	CAR9041000019991117145300	5	18070303	90410000	8	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loma Alta Creek	River & Stream	CAR9041000019991117145300	5	18070303	90410000	8	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loma Alta Slough	Estuary	CAE9041000019991117150520	5	18070303	90410000	8	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
9	Loma Alta Slough	Estuary	CAE9041000019991117150520	5	18070303	90410000	8	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-15			
9	Long Canyon Creek (tributary to Murrieta Creek)	River & Stream	CAR9028300020011025112509	5	18070302	90232000	8	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Long Canyon Creek (tributary to Murrieta Creek)	River & Stream	CAR9028300020011025112509	5	18070302	90232000	8	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Long Canyon Creek (tributary to Murrieta Creek)	River & Stream	CAR9028300020011025112509	5	18070302	90232000	8	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Long Canyon Creek (tributary to Murrieta Creek)	River & Stream	CAR9028300020011025112509	5	18070302	90232000	8	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Los Coches Creek	River & Stream	CAR9071400020081210155144	5	18070304	90714000	9	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Los Penasquitos Creek	River & Stream	CAR9061000020011025112826	5	18070304	90610000	12	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Los Penasquitos Creek	River & Stream	CAR9061000020011025112826	5	18070304	90610000	12	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Los Penasquitos Creek	River & Stream	CAR9061000020011025112826	5	18070304	90610000	12	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Los Penasquitos Creek	River & Stream	CAR9061000020011025112826	5	18070304	90610000	12	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Los Penasquitos Creek	River & Stream	CAR9061000020011025112826	5	18070304	90610000	12	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
9	Los Penasquitos Creek	River & Stream	CAR9061000020011025112826	5	18070304	90610000	12	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Los Penasquitos Lagoon	Estuary	CAE9061000019990209152610	5	18070304	90610000	469	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loveland Reservoir	Lake & Reservoir	CAL9093100020011025093606	5	18070304	90931000	420	Acres	Aluminum	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loveland Reservoir	Lake & Reservoir	CAL9093100020011025093606	5	18070304	90931000	420	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loveland Reservoir	Lake & Reservoir	CAL9093100020011025093606	5	18070304	90931000	420	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Loveland Reservoir	Lake & Reservoir	CAL9093100020011025093606	5	18070304	90931000	420	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
9	Miramar Reservoir	Lake & Reservoir	CAL9061000020011005142514	5	18070304	90610000	138	Acres	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay (area at mouth of Rose Creek only)	Bay & Harbor	CAB9064000020050104185659	5	18070304	90640000	9	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay (area at mouth of Rose Creek only)	Bay & Harbor	CAB9064000020050104185659	5	18070304	90640000	9	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay (area at mouth of Tecolote Creek only)	Bay & Harbor	CAB9065000020050104190651	5	18070304	90650000	3	Acres	Eutrophic	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay (area at mouth of Tecolote Creek only)	Bay & Harbor	CAB9065000020050104190651	5	18070304	90650000	3	Acres	Lead	Metals/Metalloids	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Bahia Point	Coastal & Bay Shoreline	CAC9075100020090422203910	5	18070304	90751000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Bahia Point	Coastal & Bay Shoreline	CAC9075100020090422203910	5	18070304	90751000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Bahia Point	Coastal & Bay Shoreline	CAC9075100020090422203910	5	18070304	90751000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Bonita Cove	Coastal & Bay Shoreline	CAC9075200020090422202127	5	18070304	90751000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Bonita Cove	Coastal & Bay Shoreline	CAC9075200020090422202127	5	18070304	90751000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Mission Bay Shoreline, at Bonita Cove	Coastal & Bay Shoreline	CAC9075200020090422202127	5	18070304	90751000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Campland	Coastal & Bay Shoreline	CAC9064000020090422205328	5	18070304	90640000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Campland	Coastal & Bay Shoreline	CAC9064000020090422205328	5	18070304	90640000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Campland	Coastal & Bay Shoreline	CAC9064000020090422205328	5	18070304	90640000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at De Anza Cove	Coastal & Bay Shoreline	CAC9064000020090422210612	5	18070304	90640000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at De Anza Cove	Coastal & Bay Shoreline	CAC9064000020090422210612	5	18070304	90640000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at De Anza Cove	Coastal & Bay Shoreline	CAC9064000020090422210612	5	18070304	90640000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Fanual Park	Coastal & Bay Shoreline	CAC9075100020090422204836	5	18070304	90751000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Mission Bay Shoreline, at Fanual Park	Coastal & Bay Shoreline	CAC9075100020090422204836	5	18070304	90751000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Leisure Lagoon	Coastal & Bay Shoreline	CAC9064000020090422211717	5	18070304	90640000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Leisure Lagoon	Coastal & Bay Shoreline	CAC9064000020090422211717	5	18070304	90640000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at North Crown Point	Coastal & Bay Shoreline	CAC9064000020090422205921	5	18070304	90640000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at North Crown Point	Coastal & Bay Shoreline	CAC9064000020090422205921	5	18070304	90640000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Tecolote Shores	Coastal & Bay Shoreline	CAC9065000020090428092025	5	18070304	90650000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Tecolote Shores	Coastal & Bay Shoreline	CAC9065000020090428092025	5	18070304	90650000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Visitors Center	Coastal & Bay Shoreline	CAC9064000020090422211309	5	18070304	90640000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Visitors Center	Coastal & Bay Shoreline	CAC9064000020090422211309	5	18070304	90640000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay Shoreline, at Visitors Center	Coastal & Bay Shoreline	CAC9064000020090422211309	5	18070304	90640000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Mission Bay at Quivira Basin	Bay & Harbor	CAB9075200020090712233945	5	18070304	90752000	65	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Morena Reservoir	Lake & Reservoir	CAL9115000020011025092811	5	18070305	91150000	104	Acres	Ammonia as Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Morena Reservoir	Lake & Reservoir	CAL9115000020011025092811	5	18070305	91150000	104	Acres	Color	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Morena Reservoir	Lake & Reservoir	CAL9115000020011025092811	5	18070305	91150000	104	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Morena Reservoir	Lake & Reservoir	CAL9115000020011025092811	5	18070305	91150000	104	Acres	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Morena Reservoir	Lake & Reservoir	CAL9115000020011025092811	5	18070305	91150000	104	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Moro Canyon Creek	River & Stream	CAR9011100020081210154547	5	18070301	90111000	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Moro Canyon Creek	River & Stream	CAR9011100020081210154547	5	18070301	90111000	3	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Murray Reservoir	Lake & Reservoir	CAL9071100020011005142858	5	18070304	90711000	119	Acres	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Murray Reservoir	Lake & Reservoir	CAL9071100020011005142858	5	18070304	90711000	119	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Murrieta Creek	River & Stream	CAR9023200020010924152136	5	18070302	90252000	12	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Oceanside Harbor	Bay & Harbor	CAB9021100019991117130531	5	18070302	90211000	52	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Oso Creek (at Mission Viejo Golf Course)	River & Stream	CAR9012000020010831150708	5	18070301	90120000	1	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Oso Creek (at Mission Viejo Golf Course)	River & Stream	CAR9012000020010831150708	5	18070301	90120000	1	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Oso Creek (at Mission Viejo Golf Course)	River & Stream	CAR9012000020010831150708	5	18070301	90120000	1	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Oso Creek (lower)	River & Stream	CAR9012000020010831154628	5	18070301	90120000	4	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Oso Creek (lower)	River & Stream	CAR9012000020010831154628	5	18070301	90120000	4	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Otay Reservoir, Lower	Lake & Reservoir	CAL9103100019991117155943	5	18070304	91031000	1050	Acres	Ammonia	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Otay Reservoir, Lower	Lake & Reservoir	CAL9103100019991117155943	5	18070304	91031000	1050	Acres	Color	Nuisance	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Otay Reservoir, Lower	Lake & Reservoir	CAL9103100019991117155943	5	18070304	91031000	1050	Acres	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Otay Reservoir, Lower	Lake & Reservoir	CAL9103100019991117155943	5	18070304	91031000	1050	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Otay Reservoir, Lower	Lake & Reservoir	CAL9103100019991117155943	5	18070304	91031000	1050	Acres	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Otay Reservoir, Lower	Lake & Reservoir	CAL9103100019991117155943	5	18070304	91031000	1050	Acres	pH (high)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Aliso HSA, at Aliso Beach - middle	Coastal & Bay Shoreline	CAC9011300020090525212958	5	18070301	90113000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Aliso HSA, at Aliso Beach - middle	Coastal & Bay Shoreline	CAC9011300020090525212958	5	18070301	90113000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Aliso HSA, at Aliso Creek mouth	Coastal & Bay Shoreline	CAC9011300020090525212513	5	18070301	90113000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Aliso HSA, at Aliso Creek mouth	Coastal & Bay Shoreline	CAC9011300020090525212513	5	18070301	90113000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Aliso HSA, at Aliso Creek mouth	Coastal & Bay Shoreline	CAC9011300020090525212513	5	18070301	90113000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			

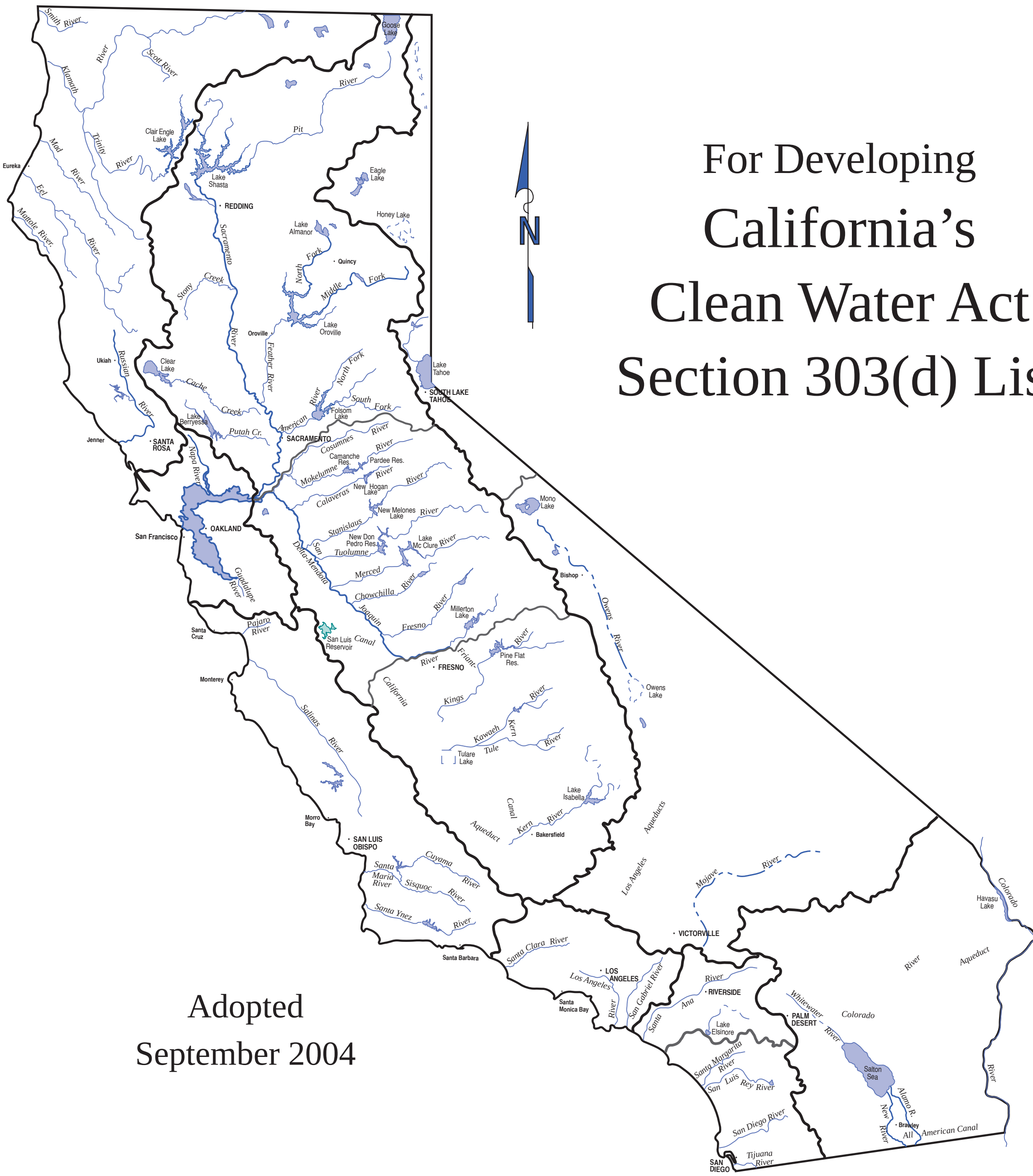
REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
9	Pacific Ocean Shoreline, Batiquitos HSA, at Moonlight State Beach (Cottonwood Creek outlet)	Coastal & Bay Shoreline	9020	5	1807303	90451000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Coronado HA, at Silver Strand (north end, Oceanside)	Coastal & Bay Shoreline	9008	5	18070304	91010000	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Dana Point HSA, at Aliso Beach at West Street	Coastal & Bay Shoreline	CAC90114000020090725220259	5	18070301	90114000	0	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-05			
9	Pacific Ocean Shoreline, Dana Point HSA, at Dana Point Harbor at Baby Beach	Coastal & Bay Shoreline	CAC90114000020091116103327	5	18070301	90114000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
9	Pacific Ocean Shoreline, Dana Point HSA, at Dana Point Harbor at Baby Beach	Coastal & Bay Shoreline	CAC90114000020091116103327	5	18070301	90114000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
9	Pacific Ocean Shoreline, Dana Point HSA, at Salt Creek outlet at Monarch Beach	Coastal & Bay Shoreline	CAC90114000020090505125551	5	18070301	90114000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Imperial Beach Pier	Coastal & Bay Shoreline	CAC91010000020050918172745	5	18070305	91010000	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Imperial Beach Pier	Coastal & Bay Shoreline	CAC91010000020050918172745	5	18070305	91010000	0	Miles	PCBs (Polychlorinated biphenyls)	Other Organics	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Imperial Beach Pier	Coastal & Bay Shoreline	CAC91010000020050918172745	5	18070305	91010000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Laguna Beach HSA, at Main Beach	Coastal & Bay Shoreline	CAC90112000020090505104552	5	18070301	90112000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Loma Alta HSA, at Loma Alta Creek mouth	Coastal & Bay Shoreline	9019	5	18070303	90410000	0	Miles	Indicator Bacteria	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at North Beach Creek	Coastal & Bay Shoreline	CAC90120000020090505154613	5	18070301	90120000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at North Beach Creek	Coastal & Bay Shoreline	CAC90120000020090505154613	5	18070301	90120000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at North Beach Creek	Coastal & Bay Shoreline	CAC90120000020090505154613	5	18070301	90120000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at North Doheny State Park Campground	Coastal & Bay Shoreline	CAC90130000020090505155824	5	18070301	90130000	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at North Doheny State Park Campground	Coastal & Bay Shoreline	CAC90130000020090505155824	5	18070301	90130000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at San Juan Creek	Coastal & Bay Shoreline	CAC90120000020090505155231	5	18070301	90120000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at San Juan Creek	Coastal & Bay Shoreline	CAC90120000020090505155231	5	18070301	90120000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at San Juan Creek	Coastal & Bay Shoreline	CAC90120000020090505155231	5	18070301	90120000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Lower San Juan HSA, at South Doheny State Park Campground	Coastal & Bay Shoreline	CAC90130000020090505162035	5	18070301	90130000	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Miramar Reservoir HA, at Los Penasquitos River mouth	Coastal & Bay Shoreline	CAX90610000020021127155300	5	18070304	90610000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Otay Valley HA, at Carnation Ave and Camp Surf Jetty	Coastal & Bay Shoreline	9001	5	18070305	91010000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Point Loma HA, at Bermuda Ave	Coastal & Bay Shoreline	2005	5	18070304	90810000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, San Clemente HA, at Poche Beach	Coastal & Bay Shoreline	CAC90130000020090418220913	5	18070301	90130000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, San Clemente HA, at Poche Beach	Coastal & Bay Shoreline	CAC90130000020090418220913	5	18070301	90130000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach at Pier	Coastal & Bay Shoreline	CAC90130000020090419001811	5	18070301	90130000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach, North Beach	Coastal & Bay Shoreline	CAC90130000020090418232344	5	18070301	90130000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, San Clemente HA, at South Capistrano Beach at Beach Road	Coastal & Bay Shoreline	CAC90130000020090505160142	5	18070301	90130000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, San Clemente HA, at South Capistrano County Beach	Coastal & Bay Shoreline	CAC90130000020090526120147	5	18070301	90130000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-12			
9	Pacific Ocean Shoreline, San Clemente HA, at South Capistrano County Beach	Coastal & Bay Shoreline	CAC90130000020090526120147	5	18070301	90130000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, San Diego HU, at the San Diego River outlet, at Dog Beach	Coastal & Bay Shoreline	9014	5	18070304	90711000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, San Diego HU, at the San Diego River outlet, at Dog Beach	Coastal & Bay Shoreline	9014	5	18070304	90711000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
9	Pacific Ocean Shoreline, San Dieguito HU, at San Dieguito Lagoon Mouth at San Dieguito River Beach	Coastal & Bay Shoreline	9016	5	18070304	90511000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-10			
9	Pacific Ocean Shoreline, San Elijo HSA, at Cardiff State Beach at San Elijo Lagoon	Coastal & Bay Shoreline	CAX9046100019991116164230	5	18070303	90461000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-08			
9	Pacific Ocean Shoreline, San Luis Rey HU, at San Luis Rey River mouth	Coastal & Bay Shoreline	CAC90311000020090626115722	5	18070302	90311000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, San Luis Rey HU, at San Luis Rey River mouth	Coastal & Bay Shoreline	CAC90311000020090626115722	5	18070302	90311000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, San Mateo Canyon HA, at San Mateo Creek outlet	Coastal & Bay Shoreline	CAC90140000020090218165222	5	18070301	90140000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Avenida de la Playa at La Jolla Shores Beach	Coastal & Bay Shoreline	CAC90630000020090422160501	5	18070304	90630000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Childrens Pool	Coastal & Bay Shoreline	CAC90630000020090626111813	5	18070304	90630000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Scripps HA, at Childrens Pool	Coastal & Bay Shoreline	CAC90630000020090626111813	5	18070304	90630000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Scripps HA, at Childrens Pool	Coastal & Bay Shoreline	CAC90630000020090626111813	5	18070304	90630000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Scripps HA, at La Jolla Cove	Coastal & Bay Shoreline	CAC90630000020090422162520	5	18070304	90630000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Pacific Beach Point , Pacific Beach	Coastal & Bay Shoreline	CAC90630000020090422171057	5	18070304	90630000	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Pacific Beach Point , Pacific Beach	Coastal & Bay Shoreline	CAC90630000020090422171057	5	18070304	90630000	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Pacific Beach Point , Pacific Beach	Coastal & Bay Shoreline	CAC90630000020090422171057	5	18070304	90630000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Ravina	Coastal & Bay Shoreline	CAC90630000020090422164430	5	18070304	90630000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Scripps HA, at Vallecitos Court at La Jolla Shores Beach	Coastal & Bay Shoreline	CAC90630000020090520165643	5	18070304	90630000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
9	Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River	Coastal & Bay Shoreline	CAC9111100020090505134454	5	18070305	91111000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River	Coastal & Bay Shoreline	CAC9111100020090505134454	5	18070305	91111000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River	Coastal & Bay Shoreline	CAC9111100020090505134454	5	18070305	91111000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at Monument Road	Coastal & Bay Shoreline	CAC9111100020090505135322	5	18070305	91111000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at Monument Road	Coastal & Bay Shoreline	CAC9111100020090505135322	5	18070305	91111000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth	Coastal & Bay Shoreline	CAC9111100020090505134951	5	18070305	91111000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth	Coastal & Bay Shoreline	CAC9111100020090505134951	5	18070305	91111000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth	Coastal & Bay Shoreline	CAC9111100020090505134951	5	18070305	91111000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive	Coastal & Bay Shoreline	CAC9111100020090505131259	5	18070305	91111000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive	Coastal & Bay Shoreline	CAC9111100020090505131259	5	18070305	91111000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive	Coastal & Bay Shoreline	CAC9111100020090505131259	5	18070305	91111000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Pacific Ocean Shoreline, Tijuana HU, at the US Border	Coastal & Bay Shoreline	CAC9111100020090505135528	5	18070305	91111000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at the US Border	Coastal & Bay Shoreline	CAC9111100020090505135528	5	18070305	91111000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pacific Ocean Shoreline, Tijuana HU, at the US Border	Coastal & Bay Shoreline	CAC9111100020090505135528	5	18070305	91111000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Paleta Creek	River & Stream	CAR9083100020080825092823	5	18070304	90831000	4	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Paleta Creek	River & Stream	CAR9083100020080825092823	5	18070304	90831000	4	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Paradise Creek, HSA 908.320	River & Stream	CAR9091200019991117092131	5	18070304	90912000	3	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Pine Valley Creek (Upper)	River & Stream	CAR9114100020010924113027	5	18070305	91141000	3	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Poggi Canyon Creek	River & Stream	CAR9102000020050630122106	5	18070304	91020000	8	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Poway Creek	River & Stream	CAR9062000020080904172636	5	18070304	90620000	7	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Poway Creek	River & Stream	CAR9062000020080904172636	5	18070304	90620000	7	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Prima Deshecha Creek	River & Stream	CAR9013000020010924090843	5	18070301	90130000	1	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Prima Deshecha Creek	River & Stream	CAR9013000020010924090843	5	18070301	90130000	1	Miles	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Prima Deshecha Creek	River & Stream	CAR9013000020010924090843	5	18070301	90130000	1	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Prima Deshecha Creek	River & Stream	CAR9013000020010924090843	5	18070301	90130000	1	Miles	Turbidity	Sediment	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Rainbow Creek	River & Stream	CAR9022200019980803102333	5	18070302	90222000	5	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Rainbow Creek	River & Stream	CAR9022200019980803102333	5	18070302	90222000	5	Miles	Nitrogen	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			22-Mar-06	
9	Rainbow Creek	River & Stream	CAR9022200019980803102333	5	18070302	90222000	5	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (being addressed with USEPA approved TMDL)	5B			22-Mar-06	
9	Rainbow Creek	River & Stream	CAR9022200019980803102333	5	18070302	90222000	5	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Rainbow Creek	River & Stream	CAR9022200019980803102333	5	18070302	90222000	5	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Diazinon	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Redhawk Channel	River & Stream	CAR9025100020080904171327	5	18070302	90251000	0	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Rose Creek	River & Stream	CAR9064000020011025132732	5	18070304	90640000	13	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Rose Creek	River & Stream	CAR9064000020011025132732	5	18070304	90640000	13	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego Bay	Bay & Harbor	CAB9101000019990210132422	5	18070304	91010000	10783	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, 32nd St San Diego Naval Station	Bay & Harbor	CAB9083100019990210105121	5	18070304	90822000	103	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, 32nd St San Diego Naval Station	Bay & Harbor	CAB9083100019990210105121	5	18070304	90822000	103	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Chula Vista Marina	Coastal & Bay Shoreline	CAX9091200020021206085938	5	18070304	90912000	0	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Downtown Anchorage	Bay & Harbor	CAB9082100019990210091816	5	18070304	90821000	7	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Downtown Anchorage	Bay & Harbor	CAB9082100019990210091816	5	18070304	90821000	7	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, G Street Pier	Coastal & Bay Shoreline	CAX9082100020021202130542	5	18070304	90821000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, North of 24th Street Marine Terminal	Bay & Harbor	CAB9083200019990210110421	5	18070304	90832000	9	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, North of 24th Street Marine Terminal	Bay & Harbor	CAB9083200019990210110421	5	18070304	90832000	9	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Seventh Street Channel	Bay & Harbor	CAB9083200019990210105829	5	18070304	90831000	9	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
9	San Diego Bay Shoreline, Seventh Street Channel	Bay & Harbor	CAB9083200019990210105829	5	18070304	90831000	9	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
9	San Diego Bay Shoreline, Shelter Island Shoreline Park	Coastal & Bay Shoreline	CAX9081000020020805135647	5	18070304	90810000	0	Miles	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
9	San Diego Bay Shoreline, Shelter Island Shoreline Park	Coastal & Bay Shoreline	CAX9081000020020805135647	5	18070304	90810000	0	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
9	San Diego Bay Shoreline, Shelter Island Shoreline Park	Coastal & Bay Shoreline	CAX9081000020020805135647	5	18070304	90810000	0	Miles	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-11			
9	San Diego Bay Shoreline, Tidelands Park	Coastal & Bay Shoreline	CAX9101000020020805140653	5	18070304	91010000	0	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego Bay Shoreline, Tidelands Park	Coastal & Bay Shoreline	CAX9101000020020805140653	5	18070304	91010000	0	Miles	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Vicinity of B St and Broadway Piers	Bay & Harbor	CAB9082100019990210092640	5	18070304	90821000	10	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Vicinity of B St and Broadway Piers	Bay & Harbor	CAB9082100019990210092640	5	18070304	90821000	10	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, Vicinity of B St and Broadway Piers	Bay & Harbor	CAB9082100019990210092640	5	18070304	90821000	10	Acres	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Americas Cup Harbor	Bay & Harbor	CAB9081000020020307124500	5	18070304	90810000	88	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Bayside Park (J Street)	Bay & Harbor	CAB9091100020041209205208	5	18070304	90911000	50	Acres	Enterococcus	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
9	San Diego Bay Shoreline, at Bayside Park (J Street)	Bay & Harbor	CAB9091100020041209205208	5	18070304	90911000	50	Acres	Total Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			This listing was made by USEPA for 2006.
9	San Diego Bay Shoreline, at Coronado Cays	Bay & Harbor	CAB9101000020041209191852	5	18070304	91010000	47	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Glorietta Bay	Bay & Harbor	CAB9101000020041209185339	5	18070304	91010000	52	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Harbor Island (East Basin)	Bay & Harbor	CAB9082100020021230112926	5	18070304	90821000	73	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Harbor Island (West Basin)	Bay & Harbor	CAB9081000020020306104110	5	18070304	90810000	132	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Marriott Marina	Bay & Harbor	CAB9082100020020307102410	5	18070304	90821000	24	Acres	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, at Spanish Landing	Bay & Harbor	CAB9082100020041209181254	5	18070304	90821000	47	Acres	Total Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego Bay Shoreline, between Sampson and 28th Streets	Bay & Harbor	CAB9082200020021015082916	4b	18070304	90822000	53	Acres	Copper	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-15		
9	San Diego Bay Shoreline, between Sampson and 28th Streets	Bay & Harbor	CAB9082200020021015082916	4b	18070304	90822000	53	Acres	Mercury	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-13		
9	San Diego Bay Shoreline, between Sampson and 28th Streets	Bay & Harbor	CAB9082200020021015082916	4b	18070304	90822000	53	Acres	PAHs (Polycyclic Aromatic Hydrocarbons)	Other Organics	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-13		
9	San Diego Bay Shoreline, between Sampson and 28th Streets	Bay & Harbor	CAB9082200020021015082916	4b	18070304	90822000	53	Acres	PCBs (Polychlorinated biphenyls)	Other Organics	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-13		
9	San Diego Bay Shoreline, between Sampson and 28th Streets	Bay & Harbor	CAB9082200020021015082916	4b	18070304	90822000	53	Acres	Zinc	Metals/Metalloids	List on 303(d) list (being addressed by action other than TMDL)	5C		01-Jan-13		
9	San Diego Bay Shoreline, near Chollas Creek	Bay & Harbor	CAB9082200019990210102831	5	18070304	90822000	15	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
9	San Diego Bay Shoreline, near Chollas Creek	Bay & Harbor	CAB9082200019990210102831	5	18070304	90822000	15	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
9	San Diego Bay Shoreline, near Coronado Bridge	Bay & Harbor	CAB9082200020021015082223	5	18070304	90822000	37	Acres	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, near Coronado Bridge	Bay & Harbor	CAB9082200020021015082223	5	18070304	90822000	37	Acres	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Includes Crosby Street/Cesar Chavez Park area, that will receive additional monitoring.
9	San Diego Bay Shoreline, near Switzer Creek	Bay & Harbor	CAB9082100019990210093822	5	18070304	90821000	6	Acres	Chlordane	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, near Switzer Creek	Bay & Harbor	CAB9082100019990210093822	5	18070304	90821000	6	Acres	PAHs (Polycyclic Aromatic Hydrocarbons)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, near sub base	Bay & Harbor	CAB9081000019990210085507	5	18070304	90810000	16	Acres	Benthic Community Effects	Miscellaneous	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			There is not an expected TMDL completion date because the TMDL is for the waterbody and pollutant and the TMDL can not be completed for benthic community effects alone.
9	San Diego Bay Shoreline, near sub base	Bay & Harbor	CAB9081000019990210085507	5	18070304	90810000	16	Acres	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Diego Bay Shoreline, near sub base	Bay & Harbor	CAB9081000019990210085507	5	18070304	90810000	16	Acres	Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego Bay, Shelter Island Yacht Basin	Bay & Harbor	CAB9081000019990210091034	4a	18070304	90810000	154	Acres	Copper, Dissolved	Metals/Metalloids	List on 303(d) list (being addressed by USEPA approved TMDL)	5B			01-Jan-03	
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Fecal Coliform	Pathogens	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-09			Lower 6 miles.
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Impairment transcends adjacent Calwater watershed 90712.
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Impairment transcends adjacent Calwater watershed 90712.
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Impairment transcends adjacent Calwater watershed 90712.
9	San Diego River (Lower)	River & Stream	CAR9071100020011025101606	5	18070304	90711000	16	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Dieguito River	River & Stream	CAR9051100020080825090830	5	18070304	90511000	19	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Dieguito River	River & Stream	CAR9051100020080825090830	5	18070304	90511000	19	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Dieguito River	River & Stream	CAR9051100020080825090830	5	18070304	90511000	19	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Dieguito River	River & Stream	CAR9051100020080825090830	5	18070304	90511000	19	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Dieguito River	River & Stream	CAR9051100020080825090830	5	18070304	90511000	19	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Dieguito River	River & Stream	CAR9051100020080825090830	5	18070304	90511000	19	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Elijo Lagoon	Estuary	CAE9046100019990209161927	5	18070303	90461000	566	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 330 acres.
9	San Elijo Lagoon	Estuary	CAE9046100019990209161927	5	18070303	90461000	566	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-15			Estimated size of impairment is 150 acres.
9	San Elijo Lagoon	Estuary	CAE9046100019990209161927	5	18070303	90461000	566	Acres	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 150 acres.
9	San Juan Creek	River & Stream	CAR9012000020011025103828	5	18070301	90120000	1	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Juan Creek	River & Stream	CAR9012000020011025103828	5	18070301	90120000	1	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Juan Creek	River & Stream	CAR9012000020011025103828	5	18070301	90120000	1	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Juan Creek	River & Stream	CAR9012000020011025103828	5	18070301	90120000	1	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Juan Creek	River & Stream	CAR9012000020011025103828	5	18070301	90120000	1	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Juan Creek	River & Stream	CAR9012000020011025103828	5	18070301	90120000	1	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Juan Creek (mouth)	Estuary	CAE9012000019990208150457	5	18070301	90120000	6	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-08			
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Impairment located at lower 13 miles.
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Luis Rey River, Lower (west of Interstate 15)	River & Stream	CAR9031100020011005104327	5	18070303	90311000	19	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Luis Rey River, Upper (east of Interstate 15)	River & Stream	CAR9031200020091029163808	5	18070303	90312000	35	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Marcos Creek	River & Stream	CAR9045100020011025132925	5	18070303	90451000	19	Miles	DDE (Dichlorodiphenyldichloroethylene)	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Marcos Creek	River & Stream	CAR9045100020011025132925	5	18070303	90451000	19	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Marcos Creek	River & Stream	CAR9045100020011025132925	5	18070303	90451000	19	Miles	Sediment Toxicity	Toxicity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Marcos Creek	River & Stream	CAR9045100020011025132925	5	18070303	90451000	19	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Marcos Lake	Lake & Reservoir	CAL9045200019991117152408	5	18070303	90452000	17	Acres	Ammonia as Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Marcos Lake	Lake & Reservoir	CAL9045200019991117152408	5	18070303	90452000	17	Acres	Nutrients	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Vicente Creek (San Diego County)	River & Stream	CAR9072200020081210155551	5	18070304	90722000	16	Miles	Ammonia as Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Vicente Creek (San Diego County)	River & Stream	CAR9072200020081210155551	5	18070304	90722000	16	Miles	Benthic Community Effects	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Vicente Creek (San Diego County)	River & Stream	CAR9072200020081210155551	5	18070304	90722000	16	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Vicente Creek (San Diego County)	River & Stream	CAR9072200020081210155551	5	18070304	90722000	16	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Vicente Reservoir	Lake & Reservoir	CAL9072100020011025093029	5	18070304	90721000	1058	Acres	Chloride	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Vicente Reservoir	Lake & Reservoir	CAL9072100020011025093029	5	18070304	90721000	1058	Acres	Color	Nuisance	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Vicente Reservoir	Lake & Reservoir	CAL9072100020011025093029	5	18070304	90721000	1058	Acres	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	San Vicente Reservoir	Lake & Reservoir	CAL9072100020011025093029	5	18070304	90721000	1058	Acres	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	San Vicente Reservoir	Lake & Reservoir	CAL9072100020011025093029	5	18070304	90721000	1058	Acres	pH (high)	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sandia Creek	River & Stream	CAR9022200019991117132333	5	18070302	90222000	1	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sandia Creek	River & Stream	CAR9022200019991117132333	5	18070302	90222000	1	Miles	Sulfates	Other Inorganics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sandia Creek	River & Stream	CAR9022200019991117132333	5	18070302	90222000	1	Miles	Total Dissolved Solids	Salinity	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

REGION	WATER BODY NAME	WATER BODY TYPE	WBID	INTEGRATED REPORT CATEGORY	USGS CATALOGING UNIT*	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT	POLLUTANT	POLLUTANT CATEGORY	FINAL LISTING DECISION	TMDL REQUIREMENT STATUS**	EXPECTED TMDL COMPLETION DATE***	EXPECTED ATTAINMENT DATE***	USEPA TMDL APPROVED DATE***	COMMENTS INCLUDED ON 303(d) LIST
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Gertrudis Creek	River & Stream	CAR9024200020080825001546	5	18070302	90242000	12	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Margarita Lagoon	Estuary	CAE9021100019990209155924	5	18070302	90211000	28	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Santa Margarita River (Lower)	River & Stream	CAR9021100019980911161346	5	18070302	90211000	19	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Margarita River (Lower)	River & Stream	CAR9021100019980911161346	5	18070302	90211000	19	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Margarita River (Lower)	River & Stream	CAR9021100019980911161346	5	18070302	90211000	19	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Margarita River (Lower)	River & Stream	CAR9021100019980911161346	5	18070302	90211000	19	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Margarita River (Upper)	River & Stream	CAR9022200020011001141050	5	18070302	90222000	18	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Santa Margarita River (Upper)	River & Stream	CAR9022200020011001141050	5	18070302	90222000	18	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Santa Ysabel Creek (above Sutherland Reservoir)	River & Stream	CAR9055300020091030161135	5	18070304	90553000	12	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Segunda Deshecha Creek	River & Stream	CAR9013000020010924101553	5	18070301	90130000	1	Miles	Phosphorus	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Segunda Deshecha Creek	River & Stream	CAR9013000020010924101553	5	18070301	90130000	1	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Segunda Deshecha Creek	River & Stream	CAR9013000020010924101553	5	18070301	90130000	1	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Soledad Canyon	River & Stream	CAR9061000020011026104908	5	18070304	90610000	2	Miles	Sediment Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Soledad Canyon	River & Stream	CAR9061000020011026104908	5	18070304	90610000	2	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sutherland Reservoir	Lake & Reservoir	CAL9055300020010925095919	5	18070304	90553000	561	Acres	Color	Nuisance	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sutherland Reservoir	Lake & Reservoir	CAL9055300020010925095919	5	18070304	90553000	561	Acres	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sutherland Reservoir	Lake & Reservoir	CAL9055300020010925095919	5	18070304	90553000	561	Acres	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sutherland Reservoir	Lake & Reservoir	CAL9055300020010925095919	5	18070304	90553000	561	Acres	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sutherland Reservoir	Lake & Reservoir	CAL9055300020010925095919	5	18070304	90553000	561	Acres	pH	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sweetwater Reservoir	Lake & Reservoir	CAL9092100019991117112141	5	18070304	90921000	925	Acres	Oxygen, Dissolved	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Enterococcus	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Sweetwater River, Lower (below Sweetwater Reservoir)	River & Stream	CAR9091200020091030145725	5	18070304	90912000	5	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Switzer Creek	River & Stream	CAR9082200020080825092534	5	18070304	90822000	1	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Switzer Creek	River & Stream	CAR9082200020080825092534	5	18070304	90822000	1	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Switzer Creek	River & Stream	CAR9082200020080825092534	5	18070304	90822000	1	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tecate Creek	River & Stream	CAR9112300020081210154839	5	18070305	91123000	1	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Cadmium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-09			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Nitrogen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tecolote Creek	River & Stream	CAR9065000019990208103941	5	18070304	90650000	7	Miles	Zinc	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Telegraph Canyon Creek	River & Stream	CAR9091100020081010151336	5	18070304	90911000	10	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Temecula Creek	River & Stream	CAR9025100020011025111323	5	18070302	90251000	44	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Temecula Creek	River & Stream	CAR9025100020011025111323	5	18070302	90251000	44	Miles	Copper	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Temecula Creek	River & Stream	CAR9025100020011025111323	5	18070302	90251000	44	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Temecula Creek	River & Stream	CAR9025100020011025111323	5	18070302	90251000	44	Miles	Total Dissolved Solids	Salinity	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Temecula Creek	River & Stream	CAR9025100020011025111323	5	18070302	90251000	44	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-10			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Low Dissolved Oxygen	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Sedimentation/Siltation	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Selenium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Solids	Miscellaneous	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Surfactants (MBAS)	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Synthetic Organics	Other Organics	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Toxicity	Toxicity	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Trace Elements	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River	River & Stream	CAR9111100019990208133940	5	18070305	91111000	6	Miles	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Eutrophic	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 1 acre.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Indicator Bacteria	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-10			Estimated size of impairment is 150 acres.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Lead	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 1 acre.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Low Dissolved Oxygen	Nutrients	Do Not Delist from 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Nickel	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 1 acre.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Pesticides	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 1 acre.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Thallium	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 1 acre.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Trash	Trash	List on 303(d) list (TMDL required list)	5A	01-Jan-19			Estimated size of impairment is 1 acre.
9	Tijuana River Estuary	Estuary	CAE9111100019990208143032	5	18070305	91111000	1319	Acres	Turbidity	Sediment	List on 303(d) list (TMDL required list)	5A	01-Jan-19			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Chlorpyrifos	Pesticides	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Escherichia coli (E. coli)	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Fecal Coliform	Pathogens	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Iron	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Manganese	Metals/Metalloids	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Phosphorus	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			
9	Warm Springs Creek (Riverside County)	River & Stream	CAR9023300020080825005933	5	18070302	90233000	15	Miles	Total Nitrogen as N	Nutrients	List on 303(d) list (TMDL required list)	5A	01-Jan-21			

Water Quality Control Policy



For Developing

California's

Clean Water Act

Section 303(d) List

Adopted

September 2004

CALIFORNIA

Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

STATE OF CALIFORNIA
Arnold Schwarzenegger, Governor

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
Terry Tamminen, Secretary

STATE WATER RESOURCES CONTROL BOARD
P.O. Box 100
Sacramento, CA 95812-0100
(916) 341-5250
Homepage: http://www.waterboards.ca.gov

11/03

State of California

STATE WATER RESOURCES CONTROL BOARD

WATER QUALITY CONTROL POLICY

FOR DEVELOPING

CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST

Adopted September 30, 2004

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STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2004-0063

ADOPTION OF THE WATER QUALITY CONTROL
POLICY (POLICY) FOR DEVELOPING CALIFORNIA'S
CLEAN WATER ACT SECTION 303(d) LIST

WHEREAS:

1. Section 303(d)(1) of the federal Clean Water Act (CWA) requires states to identify waters that do not meet applicable water quality standards with technology-based controls alone and prioritize such waters for the purposes of developing Total Maximum Daily Loads (TMDLs) [40 Code of Federal Regulations (CFR) 130.7(b)].

2. Section 13191.3(a) of the California Water Code (CWC) requires the State Water Resources Control Board (SWRCB) to prepare guidelines to be used by SWRCB and the Regional Water Quality Control Boards (RWQCBs) in listing, delisting, developing, and implementing TMDLs pursuant to section 303(d) of the federal CWA [33 United States Code (USC) section 1313(d)].

3. California Assembly Bill (AB) 982 Public Advisory Group (PAG) was established in 2000 to assist in the evaluation of SWRCB's water quality programs' structure and effectiveness as it relates to the implementation of section 303(d) of CWA [33 USC section 1313(d)] and applicable federal regulation.

4. CWC section 13191.3(b) also requires the SWRCB to consider the consensus recommendations on the guidelines adopted by PAG.

5. The 2001 Budget Act Supplemental Report required the use of a "weight of evidence" approach in developing the Policy for listing and delisting waters and to include criterion to ensure that data and information used are accurate and verifiable.

6. SWRCB, in compliance with CWC section 13147, held public hearings in Sacramento, California, on January 28, 2004 and in Torrance, California, on February 5, 2004 on the Water Quality Control Policy and carefully considered all testimony and comments received.

7. SWRCB has completed a scientific peer review by University of California scientists of the draft Functional Equivalent Document as required by section 57004 of the Health and Safety Code.

8. SWRCB has determined that the adoption of this Policy will not have a significant adverse effect on the environment.

9. The regulatory provisions of the Policy do not become effective until the regulatory provisions are approved by the Office of Administrative Law (OAL).

THEREFORE BE IT RESOLVED THAT:

The SWRCB:

1. Approves the final FED: Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List.

2. Adopts the Policy for Developing California's Clean Water Act Section 303(d) List (Attachment).

3. Authorizes the Executive Director or designee to submit the Policy to the Office of Administrative Law for approval.

4. Shall hold a public workshop after the approval of the 2004 section 303(d) list to assess implementation of the Policy.

CERTIFICATION

The undersigned, Clerk to the Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on September 30, 2004.

Debbie Irvin

Debbie Irvin
Clerk to the Board

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September 30, 2004

WATER QUALITY CONTROL POLICY FOR DEVELOPING CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST

1 Introduction

Pursuant to California Water Code section 13191.3(a), this State policy for water quality control (Policy) describes the process by which the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) will comply with the listing requirements of section 303(d) of the federal Clean Water Act (CWA). The objective of this Policy is to establish a standardized approach for developing California's section 303(d) list in order to achieve the overall goal of achieving water quality standards and maintaining beneficial uses in all of California's surface waters.

CWA section 303(d) requires states to identify waters that do not meet, or are not expected to meet by the next listing cycle, applicable water quality standards after the application of certain technology-based controls and schedule such waters for development of Total Maximum Daily Loads (TMDLs) [40 Code of Federal Regulations (CFR) 130.7(c) and (d)]. The states are required to assemble and evaluate all existing and readily available water quality-related data and information to develop the list [40 CFR 130.7(b)(5)] and to provide documentation for listing or not listing a state's waters [40 CFR 130.7(b)(6)]. The methodology to be used to develop the section 303(d) list [40 CFR 130.7(b)(6)(i)] is established by this Policy and includes:

- California Listing Factors and Delisting Factors;
- The process for gathering and evaluating of readily available data and information; and
- Total Maximum Daily Load (TMDL) scheduling.

This Policy applies only to the listing process methodology used to comply with CWA section 303(d). In order to make decisions regarding standards attainment, this Policy provides guidance for interpreting data and information as they are compared to beneficial uses, existing numeric and narrative water quality objectives, and antidegradation considerations. The Policy shall not be used to:

- determine compliance with any permit or waste discharge requirement provision;
- establish, revise, or refine any water quality objective or beneficial use; or
- translate narrative water quality objectives for the purposes of regulating point sources.

Data and information from water bodies shall be analyzed under the provisions of this Policy using a weight-of-evidence approach. The weight-of-evidence approach shall be used to evaluate whether the evidence is in favor of or against placing waters on or removing waters from the section 303(d) list (section 2). The following steps describe the weight-of-evidence approach:

1. Data and Information Preprocessing: All data and information for existing listings shall be solicited and assembled, as appropriate (sections 6.1.1 and 6.1.2.1). Water body fact sheets (section 6.1.2.2) describing the assessments shall be prepared. Evaluation guidelines (section 6.1.3), if needed, shall be selected and the quality of the data (section 6.1.4) and quantity of data (section 6.1.5) shall be assessed.

2. Data and Information Processing: All data and information shall be evaluated using the decision rules listed in sections 3 or 4, as appropriate, and using applicable implementation factors (including, but not limited to, sections 6.1.2.2 and 6.1.5.1 through 6.1.5.9). RWQCBs shall also develop a schedule for completion of TMDLs (section 5). All other information not addressed under sections 3, 4, 5, or 6, shall be evaluated and presented in fact sheets.

3. Data Assessment: An assessment in favor of or against a list action for a water body-pollutant combination shall be presented in fact sheets. The assessment shall identify and discuss relationships between all available lines of evidence for water bodies and pollutants. This assessment shall be made on a pollutant-by-pollutant (including toxicity) basis. RWQCBs shall approve all decisions to list or delist a water segment (section 6.2).

2 Structure of the CWA Section 303(d) List

This section describes the categories of waters that shall be included in the section 303(d) list. Sections 3 and 4 contain the factors that shall be used to add and remove waters from the list. At a minimum, the California section 303(d) list shall identify waters where standards are not met, pollutants or toxicity contributing to standards exceedance, and the TMDL completion schedule. The section 303(d) list shall contain the following categories:

2.1 Water Quality Limited Segments

Waters shall be placed in this category of the section 303(d) list if it is determined, in accordance with the California Listing Factors, that the water quality standard is not attained; the standards nonattainment is due to toxicity, a pollutant, or pollutants; and remediation of the standards attainment problem requires one or more TMDLs.

The water segment shall remain in this category of the section 303(d) list until TMDLs for all pollutants have been completed, U.S. Environmental Protection Agency (USEPA) has approved the TMDLs, and implementation plans have been adopted.

2.2 Water Quality Limited Segments Being Addressed

Water segments shall be placed in this category if the conditions for placement in the water quality limited segments category (section 3) are met and either of the following conditions is met:

1. A TMDL has been developed and approved by USEPA and the approved implementation plan is expected to result in full attainment of the standard within a specified time frame; or

2. The RWQCB has determined in fact sheets that an existing regulatory program is reasonably expected to result in the attainment of the water quality standard within a reasonable, specified time frame.

Waters shall only be removed from this category if it is demonstrated in accordance with section 4 that water quality standards are attained.

3 California Listing Factors

RWQCBs and SWRCB shall use the following factors to develop the California section 303(d) list. Waters meeting the conditions in section 3 exceed water quality standards.

In developing the list, the state shall evaluate all existing readily available water quality-related data and information. Data and information, collected during a known spill or violation of an effluent limit in a permit or waste discharge requirement (WDR), may be used in conjunction with other data to demonstrate that there is an exceedance of a water quality standard in the water body. Visual assessments or other semi-quantitative assessments shall also be considered as ancillary lines of evidence to support a section 303(d) listing.

Water segments shall be placed on the section 303(d) list if any of the following conditions are met.

3.1 Numeric Water Quality Objectives and Criteria for Toxicants in Water

Numeric water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria are exceeded as follows:

- Using the binomial distribution, waters shall be placed on the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 3.1.

3.2 Numeric Water Quality Objectives for Conventional or Other Pollutants in Water

Numeric water quality objectives for conventional pollutants are exceeded as follows:

- Using the binomial distribution, waters shall be placed on the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 3.2.

For depressed dissolved oxygen, if measurements of dissolved oxygen taken over the day (diel) show low concentrations in the morning and sufficient concentrations in the afternoon, then it shall be assumed that nutrients are responsible for the observed dissolved oxygen concentrations if riparian cover, substrate composition or other pertinent factors can be ruled out as controlling dissolved oxygen fluctuations. When continuous monitoring data are available, the seven-day average of daily minimum measurements shall be assessed. In the absence of diel measurements, concurrently collected measurements of nutrient concentration shall be assessed using applicable water quality objectives or acceptable evaluation guidelines (section 6.1.3) and using the binomial distribution as described in section 3.1.

3.3 Numerical Water Quality Objectives or Standards for Bacteria Where Recreational Uses Apply

In the absence of a site-specific exceedance frequency, a water segment shall be placed on the section 303(d) list if bacteria water quality standards in California Code of Regulations, Basin Plans, or statewide plans are exceeded using the binomial distribution as described in section 3.2.

If a site-specific exceedance frequency is available, it may be used instead of the ten percent exceedance frequency as described in Table 3.2 or four percent as described in the following paragraph. The site-specific exceedance frequency shall be the number of water quality standard exceedances in a relatively unimpacted watershed (i.e., a reference water segment). To the extent possible and allowed by water quality objectives, RWQCBs shall identify one or more reference beaches or water segments to compare the measurements.

For bacterial measurements from coastal beaches, if water quality monitoring was conducted April 1 through October 31 only, a four percent exceedance percentage shall be used. For bacterial measurements from inland waters, if water quality monitoring data were collected April 1 through October 31 only, a four percent exceedance percentage shall be used if (1) bacterial measurements are indicative of human fecal matter, and (2) there is substantial human contact in the water body. If the exceedance is due to a closure related to a sewage spill, the water segment shall not be placed on the section 303(d) list. Postings that are not backed by water quality data shall not be used to support placement of a water segment on the section 303(d) list.

3.4 Health Advisories

A water segment shall be placed on the section 303(d) list if a health advisory against the consumption of edible resident organisms, or a shellfish harvesting ban has been issued by the Office of Environmental Health Hazard Assessment (OEHHA), or Department of Health Services and there is a designated or existing fish consumption beneficial use for the segment. In addition, water segment-specific data must be available indicating the evaluation guideline for tissue is exceeded.

3.5 Bioaccumulation of Pollutants in Aquatic Life Tissue

A water segment shall be placed on the section 303(d) list if the tissue pollutant levels in organisms exceed a pollutant-specific evaluation guideline (satisfying the requirements of section 6.1.3) using the binomial distribution as described in section 3.1.

Acceptable tissue concentrations may be based on composite samples measured either as muscle tissue or whole body residues. Residues in liver tissue alone are not considered a suitable measure. Samples can be collected either from transplanted animals or from resident populations.

3.6 Water/Sediment Toxicity

A water segment shall be placed on the section 303(d) list if the water segment exhibits statistically significant water or sediment toxicity using the binomial distribution as described in section 3.1. The segment shall be listed if the observed toxicity is associated with a pollutant or pollutants. Waters may also be placed on the section 303(d) list for toxicity alone. If the pollutant causing or contributing to the toxicity is identified, the pollutant shall be included on the section 303(d) list as soon as possible (i.e., during the next listing cycle).

Reference conditions may include laboratory controls (using a t-test or other applicable statistical test), the lower confidence interval of the reference envelope, or, for sediments, response less than 90 percent of the minimum significant difference for each specific test organism.

Appropriate reference and control measures must be included in the toxicity testing. Acceptable methods include, but are not limited to, those listed in water quality control plans, the methods used by Surface Water Ambient Monitoring Program (SWAMP), the Southern California Bight Projects of the Southern California Coastal Water Research Project, American Society for Testing and Materials (ASTM), USEPA, the Regional Monitoring Program of the San Francisco Estuary Institute, and the Bay Protection and Toxic Cleanup Program (BPTCP).

Association of pollutant concentrations with toxic or other biological effects should be determined by any one of the following:

A. Sediment quality guidelines (satisfying the requirements of section 6.1.3) are exceeded using the binomial distribution as described in section 3.1. In addition, using rank correlation, the observed effects are correlated with measurements of chemical concentration in sediments. If these conditions are met, the pollutant shall be identified as "sediment pollutant(s)."

B. For sediments, an evaluation of equilibrium partitioning or other type of toxicological response that identifies the pollutant that may cause the observed impact. Comparison to reference conditions within a watershed or ecoregion may be used to establish sediment impacts.

C. Development of an evaluation (such as a toxicity identification evaluation) that identifies the pollutant that contributes to or caused the observed impact.

3.7 Nuisance

A water segment shall be placed on the section 303(d) list if qualitative assessments of the water segment for nuisance water odor, taste, excessive algae growth, foam, turbidity, oil, trash, and color are associated with numerical water quality data that meets any one of the following:

3.7.1 Nutrient-related

An acceptable nutrient-related evaluation guideline is exceeded using the binomial distribution as described in section 3.1 for excessive algae growth, unnatural foam, odor, and taste. Waters may also be placed on the section 303(d) list when a significant nuisance condition exists as compared to reference conditions, or when nutrient concentrations cause or contribute to excessive algae growth. If listing for nitrogen or phosphorus specifically, RWQCBs should consider whether the ratio of these two nutrients indicates which is the limiting agent.

3.7.2 Other Types

An acceptable evaluation guideline is exceeded using the binomial distribution as described in section 3.1 for taste, color, oil sheen, turbidity, litter, trash, and odor not related to nutrients. Water segments may also be placed on the section 303(d) list when there is significant nuisance condition compared to reference conditions.

3.8 Adverse Biological Response

A water segment shall be placed on the section 303(d) list if the water segment exhibits adverse biological response measured in resident individuals as compared to reference conditions and these impacts are associated with water or sediment concentrations of pollutants as described in section 3.6. Endpoints for this factor include reduction in growth, reduction in reproductive capacity, abnormal development, histopathological abnormalities, and other adverse conditions.

Qualitative visual assessments or other semi-qualitative assessments may be used as secondary lines of evidence to support placement on the section 303(d) list. These types of assessments include fish kills or bird kills related to water quality conditions.

For adverse biological response related to sedimentation, the water segment shall be placed on the section 303(d) list if adverse biological response is identified and effects are associated with clean sediment loads in water or with loads stored in the channel. Waters shall be placed on the section 303(d) list if evaluation guidelines (satisfying the conditions of section 6.1.3) are exceeded using the binomial distribution as described in section 3.1.

3.9 Degradation of Biological Populations and Communities

A water segment shall be placed on the section 303(d) list if the water segment exhibits significant degradation in biological populations and/or communities as compared to reference site(s) and is associated with water or sediment concentrations of pollutants including but not limited to chemical concentrations, temperature, dissolved oxygen, and trash. This condition requires diminished numbers of species or individuals of a single species or other metrics when compared to reference site(s). The analysis should rely on measurements from at least two stations. Comparisons to reference site conditions shall be made during similar season and/or hydrologic conditions.

Association of chemical concentrations, temperature, dissolved oxygen, trash, and other pollutants shall be determined using sections 3.1, 3.2, 3.6, 3.7, 6.1.5.9, or other applicable sections.

For population or community degradation related to sedimentation, the water segment shall be placed on the section 303(d) list if degraded populations or communities are identified and effects are associated with clean sediment loads in water or with loads stored in the channel when compared to evaluation guidelines (satisfying the conditions of section 6.1.3) using the binomial distribution as described in section 3.1 or as compared to reference sites.

Bioassessment data used for listing decisions shall be consistent with section 6.1.5.8. For bioassessment, measurements at one stream reach may be sufficient to warrant listing provided that the impairment is associated with a pollutant(s) as described in this section.

3.10 Trends in Water Quality

A water segment shall be placed on the section 303(d) list if the water segment exhibits concentrations of pollutants or water body conditions for any listing factor that shows a trend of declining water quality standards attainment. This section is focused on addressing the antidegradation component of water quality standards and threatened waters as defined in 40 CFR 130.2(j) by identifying trends of declining water quality. Numeric, pollutant-specific water quality objectives need not be exceeded to satisfy this listing factor. In assessing trends in water quality RWQCBs shall:

1. Use data collected for at least three years;

2. Establish specific baseline conditions;
3. Specify statistical approaches used to evaluate the declining trend in water quality measurements;
4. Specify the influence of seasonal effects, interannual effects, changes in monitoring methods, changes in analysis of samples, and other factors deemed appropriate;
5. Determine the occurrence of adverse biological response (section 3.8), degradation of biological populations and communities (section 3.9), or toxicity (section 3.6); and
6. Assess whether the declining trend in water quality is expected to not meet water quality standards by the next listing cycle.

Waters shall be placed on the section 303(d) list if the declining trend in water quality is substantiated (steps 1 through 4 above) and impacts are observed (step 5).

3.11 Situation-Specific Weight of Evidence Listing Factor

When all other Listing Factors do not result in the listing of a water segment but information indicates non-attainment of standards, a water segment shall be evaluated to determine whether the weight of evidence demonstrates that a water quality standard is not attained. If the weight of evidence indicates non-attainment, the water segment shall be placed on the section 303(d) list.

When making a listing decision based on the situation-specific weight of evidence, the RWQCB must justify its recommendation by:

- Providing any data or information including current conditions supporting the decision;
- Describing in fact sheets how the data or information affords a substantial basis in fact from which the decision can be reasonably inferred;
- Demonstrating that the weight of evidence of the data and information indicate that the water quality standard is not attained; and
- Demonstrating that the approach used is scientifically defensible and reproducible.

TABLE 3.1: MINIMUM NUMBER OF MEASURED EXCEEDANCES NEEDED TO PLACE A WATER SEGMENT ON THE SECTION 303(D) LIST FOR TOXICANTS. *Null Hypothesis: Actual exceedance proportion $\leq$ 3 percent.* *Alternate Hypothesis: Actual exceedance proportion > 18 percent.* *The minimum effect size is 15 percent.*	
Sample Size	List if the number of exceedances equal or is greater than
2 – 24	2*
25 – 36	3
37 – 47	4
48 – 59	5
60 – 71	6
72 – 82	7
83 – 94	8
95 – 106	9
107 – 117	10
118 – 129	11

*Application of the binomial test requires a minimum sample size of 16. The number of exceedances required using the binomial test at a sample size of 16 is extended to smaller sample sizes.

For sample sizes greater than 129, the minimum number of measured exceedances is established where α and $\beta \leq 0.2$ and where $|\alpha - \beta|$ is minimized.

α = Excel® Function BINOMDIST(n-k, n, 1 – 0.03, TRUE)
β = Excel® Function BINOMDIST(k-1, n, 0.18, TRUE)
where n = the number of samples,
k = minimum number of measured exceedances to place a water on the section 303(d) list,
0.03 = acceptable exceedance proportion, and
0.18 = unacceptable exceedance proportion.

TABLE 3.2: MINIMUM NUMBER OF MEASURED EXCEEDANCES NEEDED TO PLACE A WATER SEGMENT ON THE SECTION 303(D) LIST FOR CONVENTIONAL OR OTHER POLLUTANTS.

Null Hypothesis: Actual exceedance proportion ≤ 10 percent.
Alternate Hypothesis: Actual proportion > 25 percent.
The minimum effect size is 15 percent.

Sample Size	List if the number of exceedances equal or is greater than
5 – 30	5*
31 – 36	6
37 – 42	7
43 – 48	8
49 – 54	9
55 – 60	10
61 – 66	11
67 – 72	12
73 – 78	13
79 – 84	14
85 – 91	15
92 – 97	16
98 – 103	17
104 – 109	18
110 – 115	19
116 – 121	20

*Application of the binomial test requires a minimum sample size of 26. The number of exceedances required using the binomial test at a sample size of 26 is extended to smaller sample sizes.

For sample sizes greater than 121, the minimum number of measured exceedances is established where α and $\beta \leq 0.2$ and where $|\alpha - \beta|$ is minimized.

α = Excel® Function BINOMDIST(n-k, n, 1 – 0.10, TRUE)
β = Excel® Function BINOMDIST(k-1, n, 0.25, TRUE)
where n = the number of samples,
k = minimum number of measured exceedances to place a water segment on section 303(d) list,
0.10 = acceptable exceedance proportion, and
0.25 = unacceptable exceedance proportion.

4 California Delisting Factors

This section provides the methodology for removing waters from the section 303(d) list (including the Water Quality Limited Segments category and Water Quality Limited Segments Being Addressed category).

All listings of water segments shall be removed from the section 303(d) list if the listing was based on faulty data, and it is demonstrated that the listing would not have occurred in the absence of such faulty data. Faulty data include, but are not limited to, typographical errors, improper quality assurance/quality control procedures, or limitations related to the analytical methods that would lead to improper conclusions regarding the water quality status of the segment.

If objectives or standards have been revised and the site or water meets water quality standards, the water segment shall be removed from the section 303(d) list. The listing of a segment shall be reevaluated if the water quality standard has been changed.

Any interested party may request an existing listing be reassessed under the delisting factors of this Policy. In requesting the reevaluation, the interested party must, using the delisting factors: state the reason(s) the listing is inappropriate and the Policy would lead to a different outcome; and provide the data and information necessary to enable the RWQCB and SWRCB to conduct the review.

Water segments or pollutants shall be removed from the section 303(d) list if any of the following conditions are met.

4.1 Numeric Water Quality Objectives, Criteria, or Standards for Toxicants in Water

Numeric water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.1.
- The binomial distribution cannot be used to support a delisting with sample sizes less than 28.

4.2 Numeric Water Quality Objectives for Conventional or Other Pollutants in Water

Numeric water quality objectives for conventional pollutants are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.2.
- The binomial distribution cannot be used to support a delisting with sample sizes less than 26.

4.3 Numeric Water Quality Objectives for Bacteria in Water

Numeric water quality objectives or standards for bacteria are not exceeded using the binomial distribution as described in section 4.2. If a site-specific exceedance frequency was used to place the water on the section 303(d) list, then the same exceedance frequency shall be used in the assessment to remove waters from the section 303(d) list. To the extent possible and allowed by water quality objectives, RWQCBs shall identify one or more reference beaches or water segments in a relatively unimpacted watershed to compare the measurements.

4.4 Health Advisories

The health advisory used to list the water segment has been removed or the chemical or biological contaminant-specific evaluation guideline for tissue is no longer exceeded.

4.5 Bioaccumulation of Pollutants in Aquatic Life Tissue

Numeric pollutant-specific evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1.

4.6 Water/Sediment Toxicity

Water/Sediment Toxicity or associated water or sediment quality guidelines are not exceeded using the binomial distribution as described in section 4.1.

4.7 Nuisance

The water segment no longer satisfies the conditions for a nuisance listing or associated numerical water or sediment data meets any one of the following:

4.7.1 Nutrient-related

For excessive algae growth, unnatural foam, odor, taste, applicable numerical nutrient-related evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1.

4.7.2 Other Types

Acceptable numerical evaluation guidelines are not exceeded using the binomial distribution as described in sections 4.1 and 4.2 for color, oil sheen, turbidity, trash, taste, or odor not related to nutrients. These types of nuisance shall also be removed from the list when there is no significant nuisance condition when compared to reference conditions.

4.8 Adverse Biological Response

Adverse biological response is no longer evident or associated water or sediment numeric pollutant-specific evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1.

4.9 Degradation of Biological Populations and Communities

Biological populations and communities degradation in the water segment is no longer evident as compared to reference site(s) or associated water or sediment numeric pollutant-specific evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1.

4.10 Trends in Water Quality

The factors for assessing trends in water quality (section 3.10) are not substantiated (steps 1 through 4) or impacts are no longer observed (step 5).

4.11 Situation-Specific Weight of Evidence Delisting Factor

When all other Delisting Factors do not result in the delisting of a water segment but information indicates attainment of standards, a water segment shall be evaluated to determine whether the weight of evidence demonstrates that a water quality standard is attained. If the weight of evidence indicates attainment, the water segment shall be removed from the section 303(d) list. If warranted, a listing may be maintained if the weight of evidence indicates a water quality standard is not attained.

When making a delisting decision based on the situation-specific weight of evidence, the RWQCB must justify its recommendation by:

- Providing any data or information including current conditions supporting the decision;
- Describing in fact sheets how the data or information affords a substantial basis in fact from which the decision can be reasonably inferred;
- Demonstrating that the weight of evidence of the data and information indicates that the water quality standard is attained; and
- Demonstrating that the approach used is scientifically defensible and reproducible.

TABLE 4.1: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWED TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST FOR TOXICANTS. *Null Hypothesis: Actual exceedance proportion $\geq$ 18 percent.* *Alternate Hypothesis: Actual proportion < 3 percent of the samples* *The minimum effect size is 15 percent.*	
Sample Size	Delist if the number of exceedances equal or is less than
28 – 36	2
37 – 47	3
48 – 59	4
60 – 71	5
72 – 82	6
83 – 94	7
95 – 106	8
107 – 117	9
118 – 129	10

For sample sizes greater than 129, the maximum number of measured exceedances allowed is established where α and $\beta \leq 0.10$ and where $|\alpha - \beta|$ is minimized.

α = Excel® Function BINOMDIST(k, n, 0.18, TRUE)
β = Excel® Function BINOMDIST(n-k-1, n, 1 – 0.03, TRUE)
where n = the number of samples,
k = maximum number of measured exceedances allowed,
0.03 = acceptable exceedance proportion, and
0.18 = unacceptable exceedance proportion.

TABLE 4.2: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWED TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST FOR CONVENTIONAL OR OTHER POLLUTANTS. *Null Hypothesis: Actual exceedance proportion $\geq$ 25 percent.* *Alternate Hypothesis: Actual exceedance proportion < 10 percent.* *The minimum effect size is 15 percent.*	
Sample Size	Delist if the number of exceedances equal or is less than
26 – 30	4
31 – 36	5
37 – 42	6
43 – 48	7
49 – 54	8
55 – 60	9
61 – 66	10
67 – 72	11
73 – 78	12
79 – 84	13
85 – 91	14
92 – 97	15
98 – 103	16
104 – 109	17
110 – 115	18
116 – 121	19

For sample sizes greater than 121, the maximum number of exceedances allowed is established at α and $\beta \leq 0.2$ and where $|\alpha - \beta|$ is minimized.

α = Excel® Function BINOMDIST(k, n, 0.25, TRUE)
β = Excel® Function BINOMDIST(n-k-1, n, 1 – 0.1, TRUE)
where n = the number of samples,
k = maximum number of measured exceedances allowed,
0.10 = acceptable exceedance proportion, and
0.25 = unacceptable exceedance proportion.

5 TMDL Scheduling

A schedule shall be established by the RWQCBs and SWRCB for waters on the section 303(d) list that identifies the TMDLs that will be established within the current listing cycle and the number of TMDLs scheduled to be developed thereafter.

For water quality limited segments needing a TMDL, RWQCBs shall develop a completion schedule in compliance with federal law and regulation based on, but not limited to, the following criteria:

- Water body significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of water body);
- Degree that water quality objectives are not met or beneficial uses are not attained or threatened (such as the severity of the pollution or number of pollutants/stressors of concern) [40 CFR 130.7(b)(4)];
- Degree of impairment;
- Potential threat to human health and the environment;
- Water quality benefits of activities ongoing in the watershed;
- Potential for beneficial use protection and recovery;
- Degree of public concern;
- Availability of funding; and
- Availability of data and information to address the water quality problem.

All water body-pollutant combinations on the section 303(d) list shall be assigned a TMDL schedule date.

6 Policy Implementation

This section provides SWRCB guidance on implementation of this Policy. The most recently completed section 303(d) list shall form the basis for any subsequent lists.

6.1 Process for Evaluation of Readily Available Data and Information

All readily available data and information shall be evaluated. To develop the section 303(d) list the RWQCBs and SWRCB shall use the following process.

6.1.1 Definition of Readily Available Data and Information

RWQCBs and SWRCB shall actively solicit, assemble, and consider <u>all</u> readily available data and information. Data and information that shall be reviewed include, but are not limited to: submittals resulting from the solicitation, selected data possessed by the RWQCBs, and other sources. At a minimum, readily available data and information includes paper and electronic copies of:

- The most recent section 303(d) list, and the most recent section 305(b) report;
- Drinking water source assessments;
- Municipal Separate Storm Sewer System (MS4) reports;
- Information on water quality problems in documents prepared to satisfy Superfund and Resource Conservation and Recovery Act requirements;
- Fish and shellfish advisories, beach postings and closures, or other water quality-based restrictions;
- Reports of fish kills, cancers, lesions or tumors;
- Dilution calculations, trend analyses, or predictive models for assessing the physical, chemical, or biological condition of streams, rivers, lakes, reservoirs, estuaries, coastal lagoons, or the ocean;
- Applicable water quality data and information from SWAMP, USEPA's Storage and Retrieval Database Access (STORET) or other USEPA databases and information sources, the Bay-Delta Tributaries Database, Southern California Coastal Water Research Project, and the San Francisco Estuary Regional Monitoring Program; and
- Water quality problems and existing and readily available water quality data and information reported by local, state and federal agencies (including receiving water monitoring data from discharger monitoring reports), citizen monitoring groups, academic institutions, and the public. The Federal agencies that shall be actively solicited for data and information include but are not limited to: U.S. Department of Agriculture, National Oceanic and Atmospheric Administration, U.S. Geological Survey, and U.S. Fish and Wildlife Service.

6.1.2 Administration of the Listing Process

6.1.2.1 Solicitation of All Readily Available Data and Information

SWRCB and RWQCBs shall seek all readily available data and information on the quality of surface waters of the State. Readily available data and information shall be solicited from any interested party, including but not limited to, private citizens, public agencies, state and federal governmental agencies, non-profit organizations, and businesses possessing data and information regarding the quality of the Region's waters.

Though the SWRCB and RWQCBs must specifically solicit all readily available data and assessment information, SWRCB and RWQCB may place emphasis in the solicitation on the data and information generated since the last listing cycle. For the purposes of this solicitation, information means any documentation describing the water quality condition of a surface water body. Data are considered a subset of information that consists of reports detailing measurements of specific environmental characteristics. The data and information may pertain to physical, chemical, and/or biological conditions of the State's waters or watersheds.

Information solicited should contain the following:

- The name of the person or organization providing the information;
- The name of the person certifying the completeness and accuracy of the data and information and a statement describing the standards exceedance;
- Mailing address, telephone numbers, and email address of a contact person for the information provided;
- A copy of all information provided. The submittal must specify the software used to format the information and provide definitions for any codes or abbreviations used;
- Bibliographic citations for all information provided; and
- If computer model outputs are included in the information, provide bibliographic citations and specify any calibration and quality assurance information available for the model(s) used.

Data solicited should contain the following:

- Data in electronic form, spreadsheet, database, or ASCII formats. The submittal should use the SWAMP data format and should define any codes or abbreviations used in the database.
- Metadata for the field data, i.e., when measurements were taken, locations, number of samples, detection limits, and other relevant factors.
- Metadata for any Geographical Information System data must be included. The metadata must detail all the parameters of the projection, including datum.
- A copy of the quality assurance procedures.
- A copy of the data.
- Data from citizen volunteer water quality monitoring efforts require the name of the group and indication of any training in water quality assessment completed by members of the group. Data submitted by citizen monitoring groups should meet the data quality assurance procedures as detailed in section 6.1.4.
- For photographic documentation, adhere to the guidelines detailed in section 6.1.4.

Data and information previously submitted to RWQCBs, such as Discharge Monitoring Reports, need not be solicited if the data and information are remain available to RWQCBs.

6.1.2.2 RWQCB Fact Sheet Preparation

When data and information are available, each RWQCB shall prepare a standardized fact sheet for each water and pollutant combination that is proposed for inclusion in or deletion from the section 303(d) list. Fact sheets shall present a description of the line(s) of evidence used to support each component of the weight of evidence approach. Fact sheets shall be prepared for all data and information solicited. If the data and information reviewed indicate standards are attained, a single fact sheet may address multiple water and pollutant combinations.

The fact sheets shall contain the following:

A. Region
B. Type of water body (Bay and Harbors, Coastal Shoreline, Estuary, Lake/Reservoir, Ocean, Rivers/Stream, Saline Lake, Tidal Wetlands, Freshwater Wetland)
C. Name of water body segment (including Calwater watershed)
D. Pollutant or type of pollution that appears to be responsible for standards exceedance
E. Medium (water, sediment, tissue, habitat, etc.)
F. Water quality standards (copy applicable water quality standard, objective, or criterion from appropriate plan or regulation) including:
    1. Beneficial use affected
    2. Numeric water quality objective/water quality criteria plus metric (single value threshold, mean, median, etc.) <u>or</u> narrative water quality objective plus guideline(s) used to interpret attainment or non-attainment
    3. Antidegradation considerations (if applicable to situation)
    4. Any other provision of the standard used
G. Brief Watershed Description (e.g., land use, precipitation patterns, or other factors considered in the assessment)
H. Summary of data and/or information
    1. Spatial representation, area that beneficial use is affected or determined to be supported, including a map, any site specific information, and reference condition
    2. Temporal representation
    3. Age of data and/or information
    4. Effect of seasonality and events/conditions that might influence data and/or information evaluation (e.g., storms, flow conditions, laboratory data qualifiers, etc.)
    5. Number of samples or observations
    6. Number of samples or observations exceeding guideline or standard
    7. Source of or reference for data and/or information
I. For numeric data include:
    1. Quality assurance assessment
J. For non-numeric data include:
    1. Types of observations
    2. Perspective on magnitude of problem
    3. Numeric indices derived from qualitative data
K. Potential source of pollutant (the source category should be identified as specifically as possible)
L. Program(s) addressing the problem, if known

M. Data evaluation as required by sections 3 or 4 of this Policy
N. Recommendation
O. TMDL schedule (developed only for the section 303(d) list as required by section 5 of this Policy).

6.1.3 Evaluation Guideline Selection Process

Narrative water quality objectives shall be evaluated using evaluation guidelines. When evaluating narrative water quality objectives or beneficial use protection, RWQCBs and SWRCB shall identify evaluation guidelines that represent standards attainment or beneficial use protection. The guidelines are not water quality objectives and shall only be used for the purpose of developing the section 303(d) list.

To select an evaluation guideline, the RWQCB or SWRCB shall:

- Identify the water body, pollutants, and beneficial uses;
- Identify the narrative water quality objectives or applicable water quality criteria;
- Identify the appropriate interpretive evaluation guideline that potentially represents water quality objective attainment or protection of beneficial uses. If this Policy requires evaluation values to be used as one line of evidence, the evaluation value selected shall be used in concert with the other required line(s) of evidence to support the listing or delisting decision. Depending on the beneficial use and narrative standard, the following considerations shall be used in the selection of evaluation guidelines:

  1. Sediment Quality Guidelines for Marine, Estuarine, and Freshwater Sediments: RWQCBs may select sediment quality guidelines that have been published in the peer-reviewed literature or by state or federal agencies. Acceptable guidelines include selected values (e.g., effects range-median, probable effects level, probable effects concentration), and other sediment quality guidelines. Only those sediment guidelines that are predictive of sediment toxicity shall be used (i.e., those guidelines that have been shown in published studies to be predictive of sediment toxicity in 50 percent or more of the samples analyzed).

  2. Evaluation Guidelines for Protection from the Consumption of Fish and Shellfish: RWQCBs may select evaluation guidelines published by USEPA or OEHHA. Maximum Tissue Residue Levels (MTRLs) and Elevated Data Levels (EDLs) shall not be used to evaluate fish or shellfish tissue data.

  3. Evaluation Guidelines for Protection of Aquatic Life from Bioaccumulation of Toxic Substances: RWQCBs may select the evaluation values for the protection of aquatic life published by the National Academy of Science.

  For other parameters, evaluation guidelines may be used if it can be demonstrated that the evaluation guideline is:

  - Applicable to the beneficial use
  - Protective of the beneficial use

- Linked to the pollutant under consideration
- Scientifically-based and peer reviewed
- Well described
- Identifies a range above which impacts occur and below which no or few impacts are predicted. For non-threshold chemicals, risk levels shall be consistent with comparable water quality objectives or water quality criteria.

RWQCBs shall assess the appropriateness of the guideline in the hydrographic unit. Justification for the alternate evaluation guidelines shall be referenced in the water body fact sheet.

6.1.4 Data Quality Assessment Process

Even though all data and information must be used, the quality of the data used in the development of the section 303(d) list shall be of sufficient high quality to make determinations of water quality standards attainment. Data supported by a Quality Assurance Project Plan (QAPP) pursuant to the requirements of 40 CFR 31.45 are acceptable for use in developing the section 303(d) list.

The data from major monitoring programs in California and published U.S. Geological Survey (USGS) reports are considered of adequate quality. The major programs include SWAMP, the Southern California Bight Projects of the Southern California Coastal Water Research Project, USEPA's Environmental Monitoring and Assessment Program, the Regional Monitoring Program of the San Francisco Estuary Institute, and the BPTCP.

Numeric data are considered credible and relevant for listing purposes if the data set submitted meets the minimum quality assurance/quality control requirements outlined below. A QAPP or equivalent documentation must be available containing, at a minimum, the following elements:

- Objectives of the study, project, or monitoring program;
- Methods used for sample collection and handling;
- Field and laboratory measurement and analysis;
- Data management, validation, and recordkeeping (including proper chain of custody) procedures;
- Quality assurance and quality control requirements;
- A statement certifying the adequacy of the QAPP (plus name of person certifying the document); and
- A description of personnel training.

A site-specific or project-specific sampling and analysis plan for numeric data should also be available containing:

- Data quality objectives or requirements of the project;
- A statement that data quality objectives or requirements were achieved;
- Rationale for the selection of sampling sites, water quality parameters, sampling frequency and methods that assure the samples are spatially and temporally representative of the surface water and representative of conditions within the targeted sampling timeframe; and

- Documentation to support the conclusion that results are reproducible.

The RWQCBs shall make a finding in the fact sheets on the availability of the QAPP (or equivalent), adequacy of data collection, analysis practices, and adequacy of the data verification process (including the chain of custody, detection limits, holding times, statistical treatment of data, precision and bias, etc). If any data quality objectives or requirements in the QAPP are not met, the reason for not meeting them and the potential impact on the overall assessment shall be documented.

Data without rigorous quality control can be used in combination with high quality data and information. If the data collection and analysis is not supported by a QAPP (or equivalent) or if it is not possible to tell if the data collection and analysis were supported by a QAPP (or equivalent), then the data and information should not be used by itself to support listing or delisting of a water segment. All data of whatever quality can be used as part of a weight of evidence determination (sections 3.11 or 4.11).

For narrative and qualitative submittals, the submission must:

- describe events or conditions that indicate impacts on water quality;
- provide linkage between the measurement endpoint (e.g., a study that may have been performed for some other purpose) and the water quality standard of interest;
- be scientifically defensible;
- provide analyst's credentials and training; and
- be verifiable by SWRCB or RWQCB.

For photographic documentation, the submission must:

- identify the date;
- identify location on a general area map;
- either mark location on a USGS 7.5 minute quad map along with quad sheet name or provide location latitude/longitude;
- provide a thorough description of photograph(s);
- describe the spatial and temporal representation of the photographs;
- provide linkage between photograph-represented condition and condition that indicates impacts on water quality;
- provide photographer's rationale for area photographed and camera settings used; and
- be verifiable by SWRCB and RWQCB.

6.1.5 Data Quantity Assessment Process

Before determining if water quality standards are exceeded, RWQCBs have wide discretion establishing how data and information are to be evaluated, including the flexibility to establish water segmentation, as well as the scale of spatial and temporal data and information that are to be reviewed. The following considerations shall be documented in each water body fact sheet.

6.1.5.1 Water Body Specific Information
Data used to assess water quality standards attainment should be actual data that can be quantified and qualified. Information that is descriptive, estimated, modeled, or projected may be used as ancillary lines of evidence for listing or delisting decisions. In order to be used in developing the lists:

- Data must be measured at one or more sites in the water segment;
- If applicable and available, environmental conditions in a water body or at a site must be taken into consideration (e.g., effects of seasonality, events such as storms, the occurrence of wildfires, land use practices, etc.); and
- The fact sheet shall contain a description of readily available pertinent factors such as the depth of water quality measurements, flow, hardness, pH, the extent of tidal influence, and other relevant sample- and water body-specific factors.

6.1.5.2 Spatial Representation
Samples should be representative of the water body segment. To the extent possible, samples should represent statistically or in a consistent targeted manner the segment of the water body.

Samples collected within 200 meters of each other should be considered samples from the same station or location. However, samples less than 200 meters apart may be considered to be spatially independent samples if justified in the water body fact sheet.

6.1.5.3 Temporal Representation
Samples should be representative of the critical timing that the pollutant is expected to impact the water body. Samples used in the assessment must be temporally independent. If the majority of samples were collected on a single day or during a single short-term natural event (e.g., a storm, flood, or wildfire), the data shall not be used as the primary data set supporting the listing decision.

Documentation should include the time of day in which the sample was taken, and, to the extent possible, the critical season for the pollutant and applicable water quality standard. In general, samples should be available from two or more seasons or from two or more events when effects or water quality objective exceedances would be expected to be clearly manifested.

Sampling ephemeral waters, during a specific season, or during human-caused events (except spills) should be used to assess significant pollutant-related exceedances of water quality standards. Timing of the sampling should include the critical season for the pollutant and applicable water quality standard. If the implementation of a management practice(s) has resulted in a change in the water body segment, only recently collected data [since the implementation of the management measure(s)] should be considered. The water quality fact sheet should describe the significance of the sample timing.

6.1.5.4 Aggregation of Data by Reach/Area
At a minimum, data shall be aggregated by the water body segments as defined in the Basin Plans. In the absence of a Basin Plan segmentation system, the RWQCBs should define distinct reaches based on hydrology and relatively homogeneous land use.

If available data suggest that a pollutant may cause an excursion above a water quality objective, the RWQCB should, to the extent information is readily available, identify land uses, subwatersheds, tributaries, or dischargers that could be contributing the pollutant to the water body. The RWQCBs should identify stream reaches or lake/estuary areas that may have different pollutant levels based on significant differences in land use, tributary inflow, or discharge input. Based on these evaluations of the water body setting, RWQCBs should aggregate the data by appropriate reach or area.

Data must be measured at one or more sites in the water segment in order to place a water segment on the section 303(d) list.

6.1.5.5 Quantitation of Chemical Concentrations

When available data are less than or equal to the quantitation limit and the quantitation limit is less than or equal to the water quality standard, the value will be considered as meeting the water quality standard, objective, criterion, or evaluation guideline.

When the sample value is less than the quantitation limit and the quantitation limit is greater than the water quality standard, objective, criterion, or evaluation guideline, the result shall not be used in the analysis.

The quantitation limit includes the minimum level, practical quantitation level, or reporting limit.

6.1.5.6 Evaluation of Data Consistent with the Expression of Numeric Water Quality Objectives, Water Quality Criteria, or Evaluation Guidelines

If the water quality objectives, criteria, or guidelines state a specific averaging period and/or mathematical transformation, the data should be evaluated in a consistent manner prior to conducting any statistical analysis for placement of the water on the section 303(d) list. If sufficient data are not available for the stated averaging period, the available data shall be used to represent the averaging period.

To be considered temporally independent, samples collected during the averaging period shall be combined and considered one sampling event. For data that is not temporally independent (e.g., when multiple samples are collected at a single location on the same day), the measurements shall be combined and represented by a single resultant value. For dissolved oxygen measurements, the minimum value shall be used to determine compliance with the water quality objective. For pH measurements, the minimum or maximum values of the data set shall be used to determine compliance with the water quality objective.

If the averaging period is not stated for the standard, objective, criterion, or evaluation guideline, then the samples collected less than 7 days apart shall be averaged.

6.1.5.7 Binomial Model Statistical Evaluation

Once data have been summarized, RWQCBs shall determine if standards are exceeded. The RWQCBs shall determine for each averaging period which data points exceed water quality standards. The number of measurements that exceed standards shall be reported in the water body fact sheet.

When numerical data are evaluated, all of the following steps shall be completed:

A. For each data point representing the averaging period, the RWQCB shall answer the question: Are water quality standards met?

B. If the measurement is greater than the water quality standard, objective, criterion, or evaluation guideline, then the standard is exceeded.

C. Sum the number of samples exceeding the standard, objective, criterion, or evaluation guideline.

D. Sum the total number of measurements (sample population).

E. Compare the result to the appropriate table (i.e., Tables 3.1, 3.2, 4.1, or 4.2).

F. Report the result of this comparison in the water body fact sheet.

6.1.5.8 Evaluation of Bioassessment Data

When evaluating biological data and information, RWQCBs shall evaluate all readily available data and information and shall:

- Identify appropriate reference sites within water segments, watersheds, or ecoregions. Document methods for selection of reference sites.
- Evaluate bioassessment data at reference sites using water segment-appropriate method(s) and index period(s). Document sampling methods, index periods, and Quality Assurance/Quality Control procedures for the habitat being sampled and question(s) being asked.
- Evaluate bioassessment data from other sites, and compare to reference conditions. Evaluate physical habitat data and other water quality data, when available, to support conclusions about the status of the water segment.
- Calculate biological metrics for reference sites and develop Index of Biological Integrity if possible.

6.1.5.9 Evaluation of Temperature Data

Temperature water quality objectives shall be evaluated as described in sections 6.1.5.1 through 6.1.5.7. When "historic" or "natural" temperature data are not available, alternative approaches shall be employed to assess temperature impacts.

In the absence of necessary data to interpret numeric water quality objectives, recent temperature monitoring data shall be compared to the temperature requirements of aquatic life in the water segment. In many cases, fisheries, particularly salmonids, represent the beneficial uses most sensitive to temperature. Information on current and historic conditions and distribution of sensitive beneficial uses (e.g., fishery resources) in the water segment is necessary, as well as recent temperature data reflective of conditions experienced by the most sensitive life stage of the aquatic life species. If temperature data from past (historic) periods corresponding to times when the beneficial use was fully supported are not available, information about presence/absence or abundance of sensitive aquatic life species shall be used to infer past (historic) temperature conditions if loss of habitat, diversions, toxic spills, and other factors are also considered.

Determination of life stage temperature requirements of sensitive aquatic life species shall be based on peer-reviewed literature. Similarly, evaluation of temperature data shall be based on temperature metrics reflective of the temperature requirements for the sensitive aquatic life species, including but not limited to, the maximum weekly average temperature and upper lethal limit.

6.2 RWQCB Approval

At a public hearing, the RWQCB shall consider and approve each proposed list change as documented in water body fact sheet. Advance notice and opportunity for public comment shall be provided. RWQCB shall develop written responses to all comments. After consideration of all testimony, RWQCBs shall approve a resolution in support of their recommendations for the section 303(d) list. RWQCBs shall submit to SWRCB the water body fact sheets, responses to comments, documentation of the hearing process, and a copy of <u>all</u> data and information considered. For the 2004 section 303(d) list, RWQCB approval of list changes is not required.

6.3 SWRCB Approval

During the development of the 2004 section 303(d) list, SWRCB shall perform all tasks required by this Policy.

Subsequent to the 2004 listing cycle, SWRCB shall evaluate RWQCB-developed water body fact sheets for completeness, consistency with this Policy, and consistency with applicable law. The SWRCB shall assemble the fact sheets and consolidate all the RWQCB lists into the statewide section 303(d) list.

Before the adoption of the section 303(d) list, the SWRCB shall hold a public workshop. Advance notice and opportunity for public comment shall be provided. Requests for review of specific listing decisions must be submitted to the SWRCB within 30 days of the RWQCB's decision. The SWRCB shall consider changes only to waters that are requested for review unless the SWRCB, on its own motion, decides to consider recommendations on other waters. Subsequent to the workshop, the SWRCB shall approve the section 303(d) list at a Board Meeting. The approved section 303(d) list and the supporting fact sheets shall be submitted to USEPA for approval as required by the Clean Water Act.

7 Definitions

α (Alpha) is the statistical error of rejecting a null hypothesis that is true. This type of error is also called Type I error.

ALTERNATE HYPOTHESIS is a statement or claim that a statistical test is set up to establish.

β (Beta) is the statistical error of failing to reject a null hypothesis that is not true. This type of error is also called Type II error.

BINOMDIST is an Excel® function that is used to calculate the cumulative binomial distribution.

BINOMIAL DISTRIBUTION is a mathematical distribution that describes the probabilities associated with the possible number of times particular outcomes will occur in series of observations (i.e., samples). Each observation may have only one of two possible results (e.g., standard exceeded or standard not exceeded).

BIOACCUMULATION is the process by which a chemical is taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

BIOASSESSMENT is an assessment of biological community information along with measures of the physical/habitat quality to determine, in the case of water quality, the integrity of a water body of interest.

CONVENTIONAL POLLUTANTS include dissolved oxygen, pH, and temperature.

DIEL measurements pertain to measurements taken over a 24-hour period of time.

EFFECT SIZE is maximum magnitude of exceedance frequency that is tolerated.

NULL HYPOTHESIS is a statement used in statistical testing that has been put forward either because it is believed to be true or because it is to be used as a basis for argument, but has not been proved.

RANK CORRELATION is the association between paired values of two variables that have been replaced by their ranks within their respective samples (e.g., chemical measurements and response in a toxicity test).

REFERENCE CONDITION refers to the characteristics of water body segments least impaired by human activities. As such, reference conditions can be used to describe attainable biological or habitat conditions for water body segments with common watershed/catchment characteristics within defined geographical regions.

STATISTICAL SIGNIFICANCE occurs when it can be demonstrated that the probability of obtaining a difference by chance only is relatively low.

TOXICANTS include priority pollutants, metals, chlorine, and nutrients.

TOXICITY IDENTIFICATION EVALUATION (TIE) is a technique to identify the unexplained cause(s) of toxic events. TIE involves selectively removing classes of chemicals through a series of sample manipulations, effectively reducing complex mixtures of chemicals in natural waters to simple components for analysis. Following each manipulation the toxicity of the sample is assessed to see whether the toxicant class removed was responsible for the toxicity.

WATER QUALITY LIMITED SEGMENT is any segment of a water body where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by CWA sections 301(d) or 306.

State Water Resources Control Board

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Office of Legislative Affairs: (916) 341-5251

Financial Assistance information: (916) 341-5700
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www.waterboards.ca.gov/centralcoast
895 Aerovista Place, Suite 101
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bhageman@rb3.swrcb.ca.gov

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320 W. 4th Street, Suite 200
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Redding, CA 96002

(530) 224-4845 TEL • (530) 224-4857 FAX

Lahontan Region (6)
www.waterboards.ca.gov/lahontan
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
rdodds@rb6s.swrcb.ca.gov

(530) 542-5400 TEL • (530) 544-2271 FAX

Victorville branch office
15428 Civic Drive, Suite 100
Victorville, CA 92392-2383

(760) 241-6583 TEL • (760) 241-7308 FAX

Colorado River Basin Region (7)
www.waterboards.ca.gov/coloradoriver
73-720 Fred Waring Dr., Suite 100
Palm Desert, CA 92260
info@rb7.swrcb.ca.gov

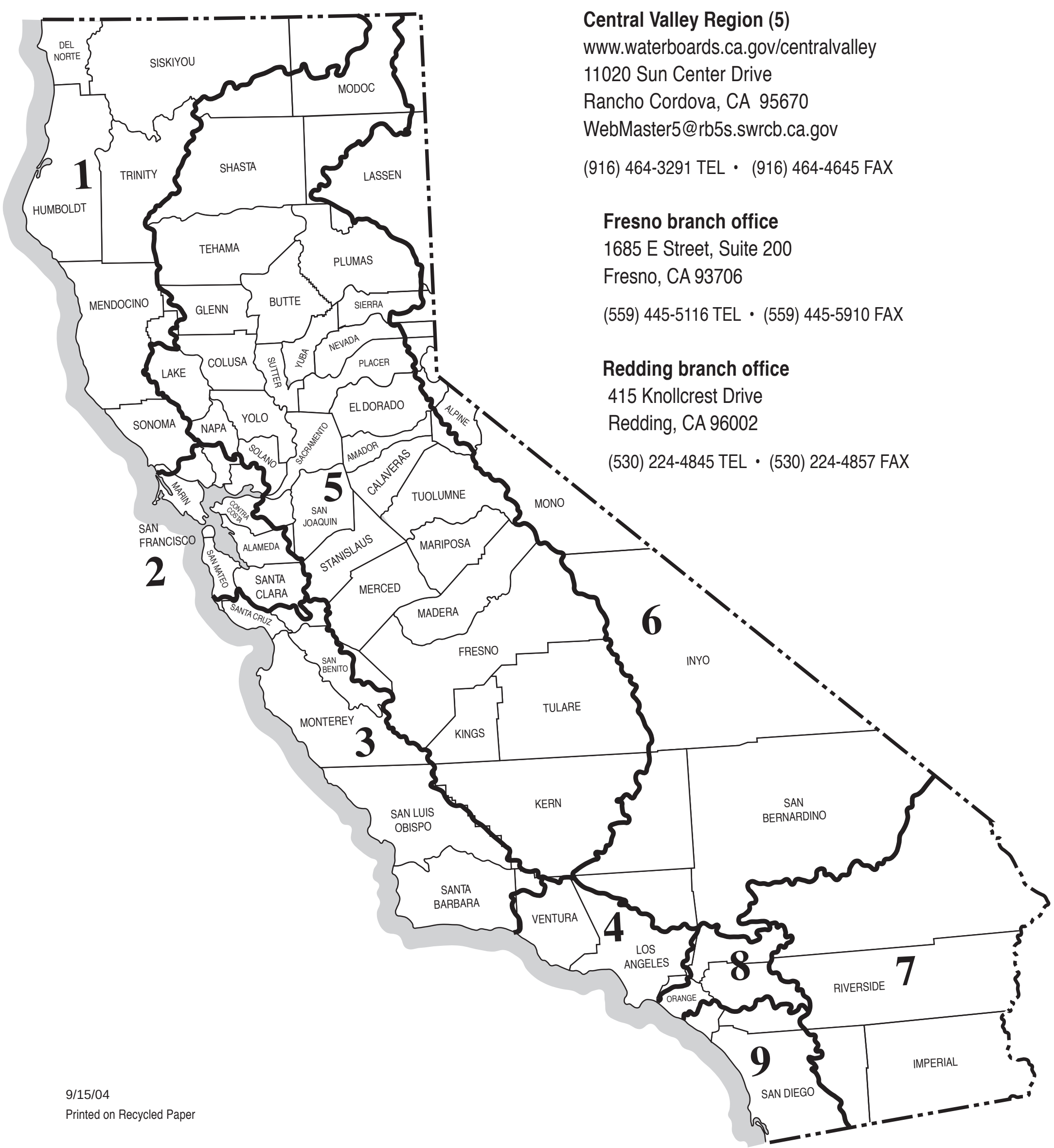
(760) 346-7491 TEL • (760) 341-6820 FAX

Santa Ana Region (8)
www.waterboards.ca.gov/santaana
California Tower
3737 Main Street, Suite 500
Riverside, CA 92501-3339
region8info@rb8.swrcb.ca.gov

(909) 782-4130 TEL • (909) 781-6288 FAX

San Diego Region (9)
www.waterboards.ca.gov/sandiego
9174 Skypark Court, Suite 100
San Diego, CA 92123
questions@rb9.swrcb.ca.gov

(858) 467-2952 TEL • (858) 571-6972 FAX



State of California
Arnold Schwarzenegger, Governor

California Environmental Protection Agency
Terry Tamminen, Secretary

State Water Resources Control Board
Arthur G. Baggett, Jr., Chair
Celeste Cantú, Executive Director

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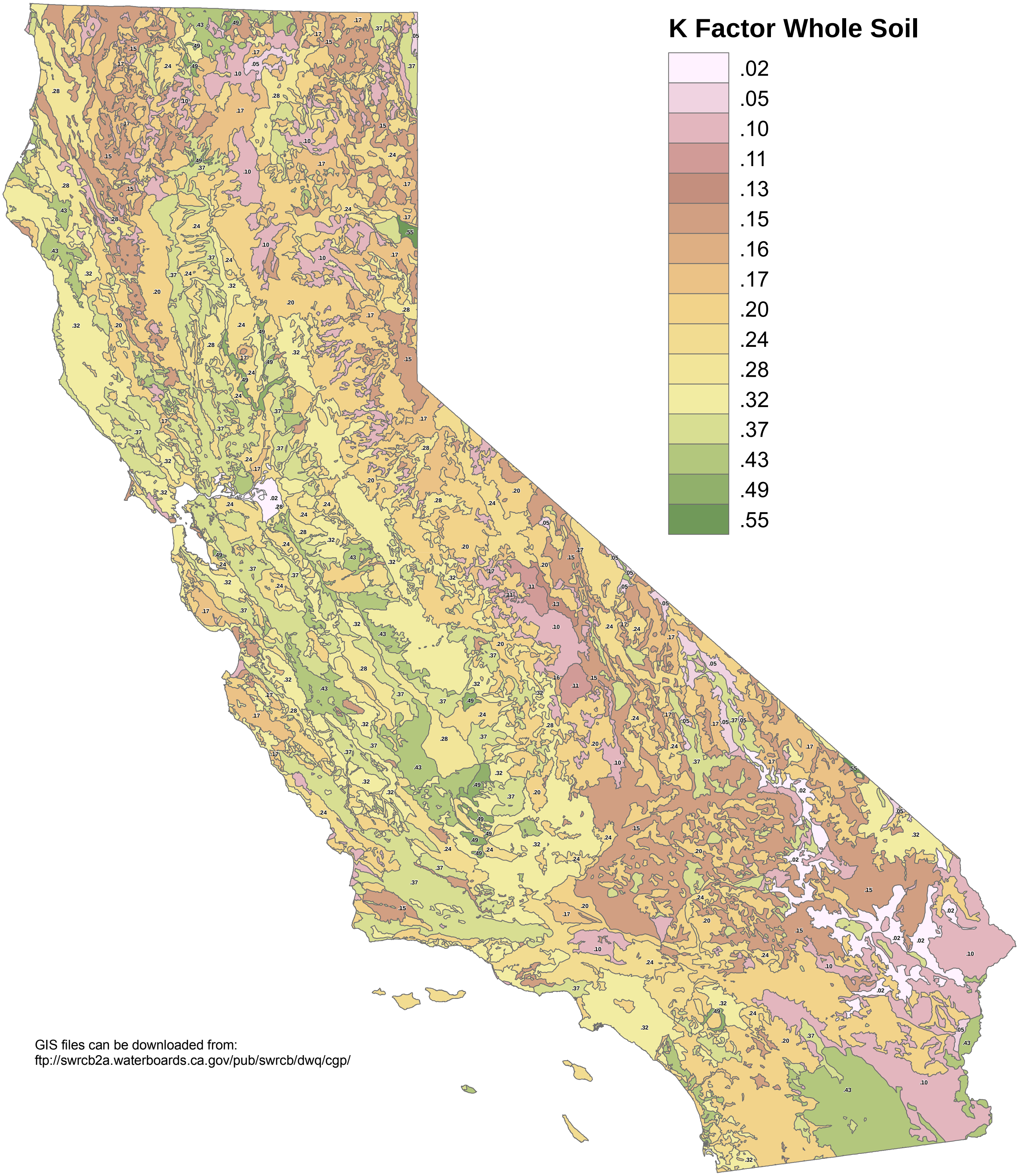
RUSLE K Values

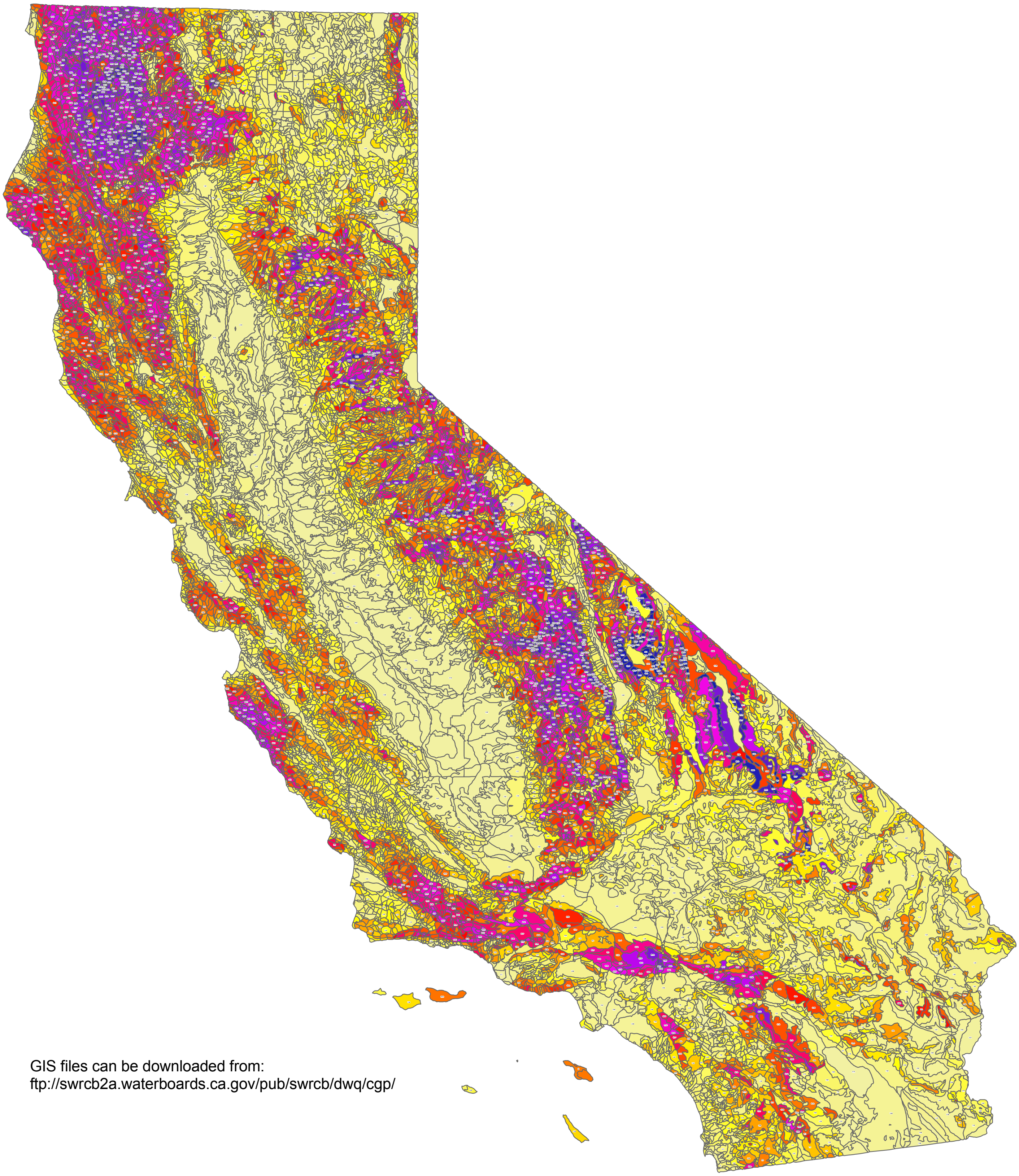


GIS files can be downloaded from:
ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/

Water Boards

Data Source: *Natural Resources Conservation Service,*
U.S. Dept. of Agriculture and State Water Resources Control Board

RUSLE LS Values



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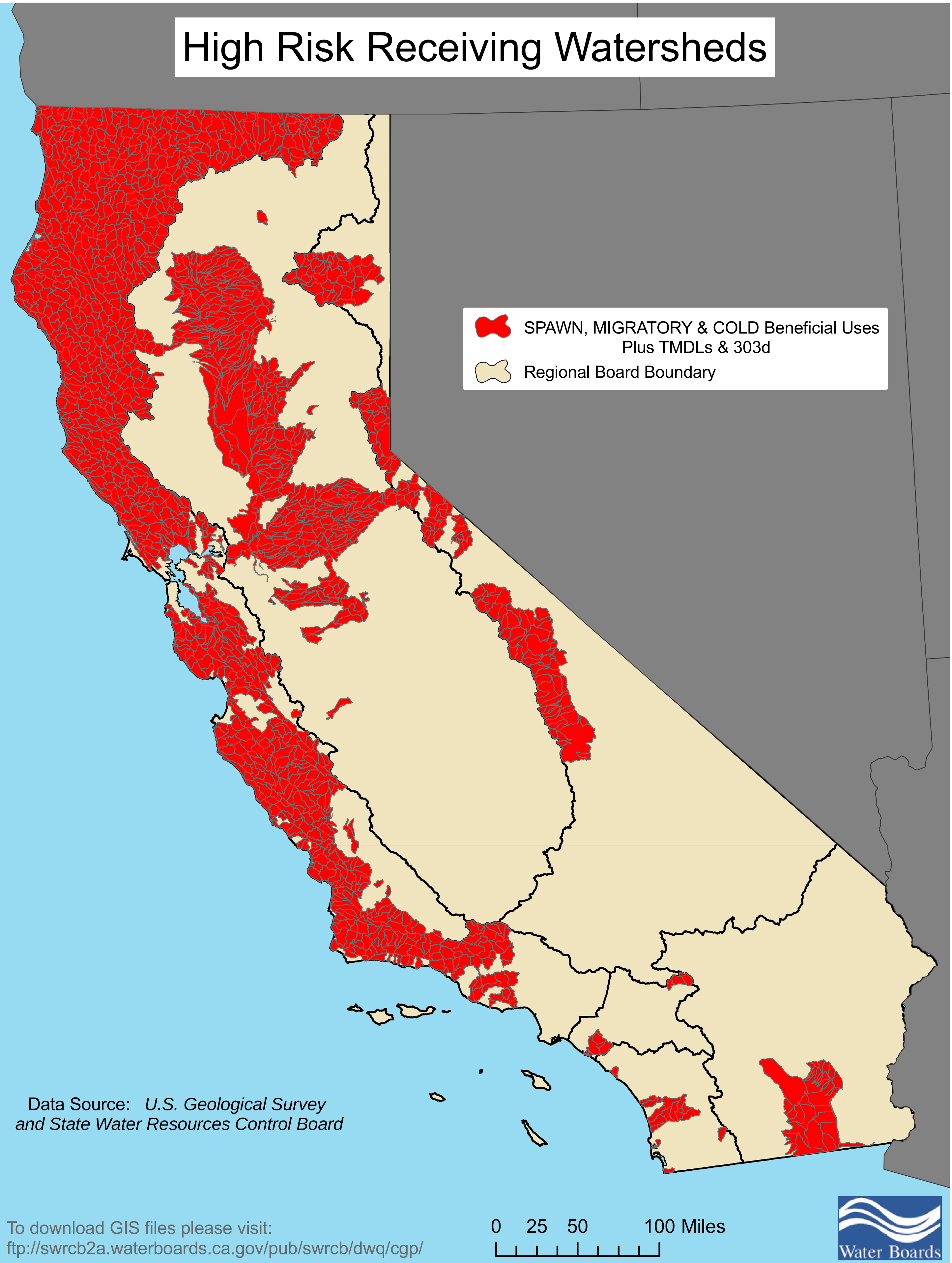
Data Source:*State Water Resources Control Boards and*



To download GIS files please visit:
ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/

	A	B	C	D	E	F
1	Version 8/17/2011					
2		**Risk Determination Worksheet**				
3						
4			**Step 1**	Determine Sediment Risk via one of the options listed:		
5				1. GIS Map Method - EPA Rainfall Erosivity Calculator & GIS map		
6				2. Individual Method - EPA Rainfall Erosivity Calculator & Individua		
7			**Step 2**	Determine Receiving Water Risk via one of the options listed:		
8				1. GIS map of Sediment Sensitive Watersheds provided		
9				2. Site Specific Analysis (support documentation required)		
10			**Step 3**	Determine Combined Risk Level		

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		16.56
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.15
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0.8
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**	1.9872	
16	**Site Sediment Risk Factor**	**Low**	
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet	**Entry**	**Score**
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml	**yes**	**High**
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan		

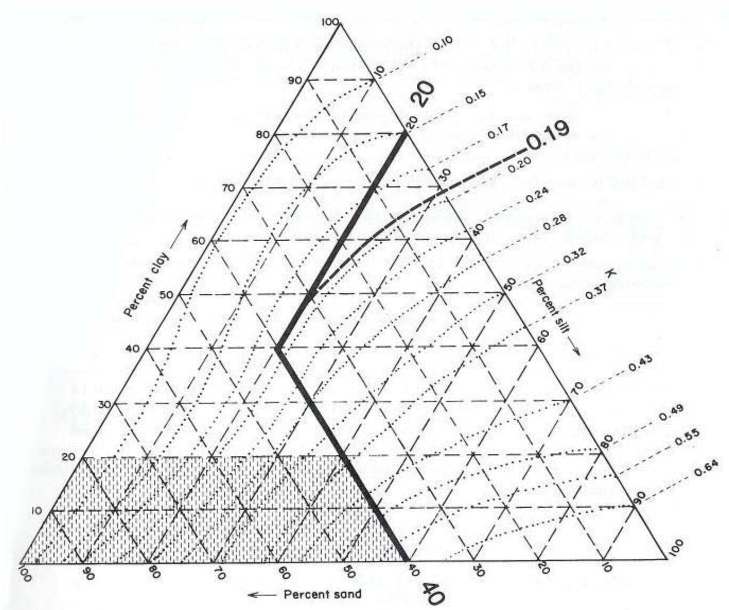
Combined Risk Level Matrix

<table>
<tr><th></th><th></th><th colspan="3">Sediment Risk</th></tr>
<tr><th></th><th></th><th>Low</th><th>Medium</th><th>High</th></tr>
<tr><th rowspan="2">Receiving Water Risk</th><th>Low</th><td>Level 1</td><td colspan="2">Level 2</td></tr>
<tr><th>High</th><td colspan="2">Level 2</td><td>Level 3</td></tr>
</table>

Project Sediment Risk:	**Low**
Project RW Risk:	**High**
Project Combined Risk:	**Level 2**

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Erickson triangular nomograph used to estimate soil erodibility (K) factor.
The figure above is the USDA nomograph used to determine the K factor for a soil, based on its texture (% silt plus very fine sand, % sand, % organic matter, soil structure, and permeability). *Nomograph from Erickson 1977 as referenced in Goldman et. al., 1986.*

Sheet Flow Length (ft)	Average Watershed Slope (%)																		
	0.2	**0.5**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**20.0**	**25.0**	**30.0**	**40.0**	**50.0**	**60.0**
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35	0.36	0.38	0.39	0.41	0.45	0.48	0.53	0.58	0.63
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37	0.41	0.45	0.49	0.56	0.64	0.72	0.85	0.97	1.07
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38	0.45	0.51	0.56	0.67	0.80	0.91	1.13	1.31	1.47
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39	0.47	0.55	0.62	0.76	0.93	1.08	1.37	1.62	1.84
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40	0.49	0.58	0.67	0.84	1.04	1.24	1.59	1.91	2.19
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57	0.71	0.85	0.98	1.24	1.56	1.86	2.41	2.91	3.36
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91	1.15	1.40	1.64	2.10	2.67	3.22	4.24	5.16	5.97
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20	1.54	1.87	2.21	2.86	3.67	4.44	5.89	7.20	8.37
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46	1.88	2.31	2.73	3.57	4.59	5.58	7.44	9.13	10.63
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.92	2.51	3.09	3.68	4.85	6.30	7.70	10.35	12.75	14.89
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34	3.07	3.81	4.56	6.04	7.88	9.67	13.07	16.16	18.92
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72	3.60	4.48	5.37	7.16	9.38	11.55	15.67	19.42	22.78
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09	4.09	5.11	6.15	8.23	10.81	13.35	18.17	22.57	26.51
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75	5.01	6.30	7.60	10.24	13.53	16.77	22.95	28.60	33.67
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95	6.67	8.45	10.26	13.94	18.57	23.14	31.89	39.95	47.18
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03	8.17	10.40	12.69	17.35	23.24	29.07	40.29	50.63	59.93
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02	9.57	12.23	14.96	20.57	27.66	34.71	48.29	60.84	72.15

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

APPENDIX H

CONSTRUCTION SWPPP AMENDMENT SUMMARY FORM (on CD only)

Photocopies of the completed forms will be appended to the field copy of the SWPPP that will be maintained on-site. Original copies of the completed forms will be kept in the TtEC filing system.

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SWPPP Amendment Summary Form

Amendment Summary

Amendment Date

Affected SWPPP Sections

Approval

Name

Signature

Title

Date

APPENDIX I

TRAINING DOCUMENTATION
(on CD only)

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CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

Vincent Richards

Feb 29, 2012 - Feb 28, 2014

Certificate # 22540

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION

California Stormwater Quality Association and
California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Vincent Richards

Jul 15, 2012 - Jul 15, 2014

Certificate # 23222

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

California Stormwater Quality Association and
California Construction General Permit Training Team

ATTACHMENT 9

DUST CONTROL AND AIR MONITORING PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 9

FINAL

DUST CONTROL AND AIR MONITORING PLAN

April 2013

**INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

DCN: RMAC-0809-0009-0004

Prepared by:

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, California 92101-8536

Hedy Abedi, PhD, PE
Project Manager

Pete Everds, Technical Lead

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ABBREVIATIONS AND ACRONYMS

ºF	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
BAAQMD	Bay Area Air Quality Management District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
^{60}Co	cobalt-60
^{137}Cs	cesium-137
DAC	derived air concentration
DCAMP	Dust Control and Air Monitoring Plan
DON	Department of the Navy
IR	Installation Restoration (Program)
LLRW	low-level radioactive waste
mph	miles per hour
NRC	Nuclear Regulatory Commission
QC	quality control
RA	remedial action
^{226}Ra	radium-226
RASO	Radiological Affairs Support Office
RAWP	Remedial Action Work Plan
ROD	Record of Decision
SOP	standard operating procedure
^{90}Sr	strontium-90
^{232}Th	thorium-232
TtEC	Tetra Tech EC, Inc.
^{238}U	uranium-238

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1.0 INTRODUCTION

This Dust Control and Air Monitoring Plan (DCAMP) has been prepared to support the Tetra Tech EC, Inc. (TtEC) remedial action (RA) at Installation Restoration (IR) Site 2 at Alameda Point, Alameda, California. TtEC has been contracted by the Department of the Navy (DON) to develop and implement this RA for the Base Realignment and Closure Program Management Office West under Naval Facilities Engineering Command Southwest Contract No. N62473-10-D-0809.

The DON is directing the RA in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan. According to Section 121(e) of CERCLA, permits are not required for on-site activities associated with a CERCLA action. Therefore, no permits that potentially relate to air quality protection or air monitoring will be prepared or submitted for the RA. However, the substantive provisions of permits that would otherwise be required for a non-CERCLA action will be adhered to during the project. Specifically, the site is located within the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). While no BAAQMD permits are required or will be obtained, the RA project will meet the substantive aspects of BAAQMD air quality permitting requirements.

The final Record of Decision (ROD) for IR Site 2 was approved by the DON, U.S. Environmental Protection Agency, California Environmental Protection Agency, and the San Francisco Bay Regional Water Quality Control Board (DON 2010). The soil remedy selected for IR Site 2 in the approved final ROD consists of installation of a multilayer soil cover to isolate buried waste and soil contaminants and to prevent animal burrowing.

This DCAMP is to be used in conjunction with Remedial Action Work Plan (RAWP) and in the Radiological Work Plan (Attachment 2 to the RAWP). All radiological aspects will be implemented in close coordination with the Naval Sea Systems Detachment Radiological Affairs Support Office (RASO).

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2.0 PROJECT BACKGROUND

The location, general site features, and history of IR Site 2 are described in Section 2.0 of the RAWP. The activities to implement the RA are included in Section 5.0 of the RAWP. The site location is shown on Figure 1-1 and site features are shown on Figure 2-2 of the RAWP. Design drawings and specifications are included in the 100% Remedial Design (Attachment 1 to the RAWP). Radiological control and monitoring during implementation of the RA are discussed in the Radiological Work Plan (Attachment 2 to the RAWP) and the Radiation Protection Plan (Attachment 3 to the RAWP).

2.1 CLIMATE

Average daily temperature at Alameda Point ranges from approximately 51 degrees Fahrenheit (ºF) in December and January to approximately 66 ºF in August and September. Alameda Island's mean annual precipitation is approximately 23 inches, with the majority of the precipitation occurring between October and April. There is generally little precipitation during the summer months and intermittent rain during the winter months. In the Alameda Point area, winds are predominantly from the west to northwest. Generally, prevailing winds are most evident in the late spring, summer, and early fall, with more variable winds in winter. The winter wind pattern is influenced by storms that track generally from north to south, which can result in winds from the east or southeast (FWENC 2002). A windrose diagram for the Alameda Point area is included as Figure 2-1.

2.2 PROJECT DESCRIPTION

To achieve the project Remedial Action Objectives, the scope of the selected remedy in the approved final ROD for IR Site 2 (DON 2010) includes a multilayer soil cover, engineering and institutional controls, and monitoring. This alternative consists of installation of an engineered soil cover over the former landfill to isolate buried waste and soil contaminants and prevent animal burrowing; implementation of engineering and land use controls to protect human health and soil cover integrity; provision for any necessary wetlands mitigation if impacts to wetlands occur; monitoring the soil cleanup action and wetlands mitigation to ensure their proper construction and long-term effectiveness; and conduct of methane gas monitoring as necessary.

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3.0 DUST CONTROL

Two forms of dust control will be implemented at the site during the IR Site 2 RA project. Specifically, dust prevention will be proactively practiced in areas of the site where potential radiologically impacted sediment and soil are staged or handled. Dust prevention for these areas will be implemented through engineering practices accompanied by in situ moisture content monitoring, airborne dust and radioactivity monitoring, and mitigation contingencies.

In areas where nonimpacted sediment and soil will be staged or handled, and generally across other portions of the site, dust control will be implemented through engineering practices and routine airborne dust monitoring. Dust monitoring for these portions of the site will also be accompanied by mitigation contingencies. Monitoring in support of the dust control plan is described in Section 4.0, and mitigation contingencies are described in Section 5.0.

3.1 POTENTIAL SOURCES OF FUGITIVE DUST

Site activities have the potential to generate air emissions in the form of fugitive dust. Possible sources of emissions include the following activities:

- Construction Traffic – Movement of construction equipment around the construction areas is capable of creating construction emissions in excavated or cleared areas.
- Site Preparation – Vegetation removal will increase the potential for fugitive dust emissions through wind erosion.
- Excavation – Removal of soil from the ground and loading it either onto screening pads or into waiting vehicles could cause fugitive dust emissions.
- Material Stockpiles – Import soils or on-site soil that has been cleared of radioactivity may be stockpiled prior to being used as backfill. Soil will be loaded into trucks for stockpiling or direct site placement. Fugitive emissions during stockpiling and truck loading, as well as wind erosion, are possible.

3.2 DUST PREVENTION

Dust prevention in the areas of the site where potential radiologically impacted sediment and soil are staged or handled will be accomplished primarily by maintaining the material in a sufficiently moist condition to eliminate the potential for dust generation. The areas of the site where potential radiologically impacted sediment and soil will be staged or handled include debris staging/screening pads, radiological sediment holding pads, rejected waste screening pads, and associated decontamination pads.

The approach to dust prevention will be proactive as opposed to reactive. Dust generation is significantly reduced at moisture levels as low as 1 to 5 percent and is nearly negligible at levels of 10 percent or higher. Accordingly exposed areas where dust could be generated will be monitored for moisture.

3.3 DUST CONTROL MEASURES

General dust control measures identified below will also be implemented across the site:

- Water trucks will be dedicated to IR Site 2 remedial action operations.
- Active construction areas outside the dewatering and radiological screening pads will be watered at a minimum of twice daily and more often during windy conditions that generate visible dust.
- Soil will be wetted prior to excavation activities to reduce dust migration. Additional water will be added during active excavation, material handling, and loading on an as-needed basis. Active excavation areas will be wetted every 2 hours during periods of dry weather or in windy conditions that generate visible dust. A water truck or water buffalo shall be dedicated to excavation and removal operations.
- The area subject to excavation and other construction activity will be limited at any one time. A soil tackifier (SoilTac or equivalent) stabilizer will be applied to on-site storage piles of soil or sediments.
- The height from which excavated soil is dropped either to trucks, stockpiles, or pads will be minimized.
- Truck traffic shall be minimized to the shortest haul routes from the work areas, screening yard, and stockpile areas.
- Chemical soil stabilizer will be applied in sufficient quantities to disturbed areas so as to create a stabilized surface.
- Backfill materials will be wetted on an as-needed basis to maintain moisture. Loader buckets will be emptied slowly and drop height from loader bucket minimized.
- A chemical soil stabilizer will be applied to backfill material and storage piles when not actively handled (i.e., no activity in 7 days).
- All trucks hauling loose materials will have at least 1 foot of freeboard.
- All paved access roads, parking areas, and staging areas will be swept (with water sweepers; dry sweepers will not be used to avoid the potential of dust generation), and streets will be swept daily if visible soil material is deposited onto the adjacent roads.
- Traffic speeds on roads will be limited to 15 miles per hour (mph).
- Field work with heavy equipment will not proceed when wind conditions are in excess of 25 mph.

Sediment handling activities will be suspended if high winds produce visible dust clouds that extend beyond the construction site.

4.0 MONITORING

In support of the dust control and overall radiological control program during the IR Site 2 RA, monitoring will be conducted for ambient dust and airborne radioactive particulate concentrations. Air monitoring for airborne radioactive particulates will be conducted in accordance with TtEC's Standard Operating Procedure (SOP) 9 (See the Radiological Work Plan, Attachment 2 to the RAWP, for reference).

4.1 AIR MONITORING

Air monitoring is performed to ensure worker and associated Alameda Point personnel safety in accordance with approved air sampling methodologies. The current RA plans at IR Site 2 minimizes hazards associated with the chemicals and radionuclides of interest for the IR Site 2 sediment by minimizing excavations in known waste areas. No material hazard of chemical or radiological exposure is expected in ambient air itself based on the site history; however, personnel monitoring during any excavation work will be conducted by the Site Safety and Health Officer and rely on specific meters to detect any hazardous emission. These contingencies are detailed in the Site Safety and Health Plan.

A field instrument and visual observations will be used to verify that no fugitive dusts are present in air in the area of excavations, debris staging/screening pads, radiological screening and sediment holding pads, rejected waste screening pads, and associated decontamination pads. In addition, airborne radioactive particulate concentration monitoring will be conducted to ensure no work areas exceed 10 percent of a derived air concentration (DAC) for radionuclides of interest for the project, including radium-226 (^{226}Ra), cesium-137 (^{137}Cs), strontium-90 (^{90}Sr), cobalt-60 (^{60}Co), thorium-232 (^{232}Th) and uranium-238 (^{238}U). Note that a separate DAC value is used for radioactive particulate alpha and beta/gamma concentrations because ^{226}Ra, ^{232}Th and ^{238}U are primarily alpha emitters and ^{60}Co, ^{137}Cs and ^{90}Sr are primarily beta and/or gamma emitters. DAC values are provided in the Nuclear Regulatory Commission (NRC) regulation Title 10, *Code of Federal Regulations*, Part 20, Appendix B for the relevant radionuclides. For alpha emitters the most restrictive DAC value for ^{232}Th will be used. For beta/gamma emitters, the most restrictive DAC value for ^{90}Sr will be used. The DAC and 10 percent DAC values are listed in Table 4-1.

Air will be monitored downwind of site operations to evaluate the impact of RA activities. Upwind (background) conditions will also be assessed to evaluate the relative contribution of off-site activities to any measurement.

4.1.1 Air Monitoring Stations

Air monitoring locations will be established at a minimum of two sites in each work area to collect ambient measurements during the IR Site 2 RA. Specifically, for each portion of the site being monitored, one upwind and one downwind monitoring location will be established. The number of monitoring locations may be altered in the field in consultation with the RASO.

As described in Section 2.0 of this DCAMP, the predominant wind direction at Alameda Point is from the west. A representative windrose diagram showing the predominant wind direction is included as Figure 2-1. Specific air monitoring locations will be selected in the field on the basis of field conditions (e.g., wind speed and prevalent wind direction) and the judgment of site personnel. Daily assessments of the prevailing wind direction will be conducted in the morning, prior to the beginning of site work, and any significant changes in the predominant wind direction during the days operations will be observed and recorded. Adjustments to air monitoring locations may be made as needed, but monitoring locations will not be moved while sampling is occurring. A windsock will be set up to clearly indicate wind direction. The windsock will be established at the project office trailer location or in another suitable location that is easily accessed by/visible to project workers. Wind speed can be determined by the use of portable or stationary equipment.

4.1.2 Air Monitoring Equipment

Air monitoring for dust will be conducted using a factory calibrated, portable aerosol dust monitor (Thermo Electron pDR 1200). The dust monitor (shown below) will be configured to provide concentrations of PM_{10} particulates in units of micrograms per cubic meter ($\mu g/m^3$).

Air monitoring for airborne radioactive particulate will be conducted using a properly calibrated, portable, real-time sampling device (i.e., a pump with appropriate filter media) and a radiation detection instrument (e.g., a Ludlum Model 2929 meter with a Ludlum Model 43-10-1 detector or equivalent) in accordance with TtEC's SOP 9.

4.1.3 Air Monitoring Frequency

Air monitoring for ambient dust will be conducted at different frequencies during RA dependent on field activities and field observations, including high wind conditions and any visual observations that suggest the potentially imminent release of dust. During the initial subgrade preparation, fieldwork will include clear and grubbing, excavations of non-impacted berms and small areas within waste cells, and the placement of stockpiled fill materials. The initial subgrade work will require daily monitoring for dust to document compliance with dust control measures. At the completion of work to establish the subgrade elevations, site work will consist of placement and compaction of clean fill material to reach final elevations. During this period dust monitoring will occur on a weekly basis to confirm that fugitive dust is controlled and that contingencies actions are effective.

Air monitoring for airborne radioactivity will be conducted on a daily basis when all filling, excavations, or processing of impacted materials occurs, with each day's monitoring being a continuous assessment throughout the work day. As with dust monitoring, this frequency may be altered on the basis of field observations.

During prolonged precipitation events (greater than 8 hours of precipitation in a 24-hour period), the air monitoring units will not be operated. An air monitoring station or individual units being inoperable shall not preclude construction activities at the associated work site.

4.1.4 Air Monitoring for Dust

The potential for fugitive dust emissions will be monitored at each monitoring station using the pDR1200s. At each location and monitoring episode, the instruments will be deployed upwind and downwind of the monitored area per the manufacturer's operating manual for a minimum of 1 hour. The instruments will be deployed in the breathing zone at roughly 3 to 6 feet above ground surface. The maximum and 5-minute average observed measurements will be recorded for the measurement period.

PM_{10} levels shall not exceed 50 $\mu g/m^3$ when determined by simultaneous monitoring as the difference between upwind and downwind monitoring locations (Rule 403). If no upwind monitors are utilized, upwind concentrations will be assumed zero and the downwind level shall not be allowed to exceed 50 $\mu g/m^3$. If monitoring indicates the potential for an exceedance of the 50 $\mu g/m^3$ threshold, site activities should be modified and fugitive dust controls increased and/or adjusted to ensure that an exceedance does not occur.

4.1.5 Air Monitoring for Radioactive Particulate Concentrations

Airborne radioactive particulate concentrations will be monitored in accordance with TtEC's SOP 9 as discussed in the Radiological Work Plan (Attachment 2 to the RAWP).

Airborne radioactive particulate sampling results will be provided to the RASO. In consultation with the RASO, dust control contingencies specified in Section 5.0 will be implemented as necessary and in accordance with TtEC's NRC Radioactive Material License.

If analytical results indicate exceedances of 10 percent of DAC values for project radionuclides of interest, work will be suspended until the source of the emissions is identified. If the project activities are the cause of exceedances, additional control measures will be considered.

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5.0 MITIGATION CONTINGENCIES

5.1 DUST MITIGATION CONTINGENCIES

If the moisture content of the sediment material in the radiological screening pads or holding areas is measured below 10 percent and/or radioactivity is measured in air and consultation with the RASO requires, the sediment material will either be wetted or coated with a soil tackifier (SoilTac or equivalent) material to suppress dust. A Material Data Safety Sheet for the soil tackifier is included as Appendix A.

When sediment material is moved from the radiological screening pads to temporary holding areas pending dredge material radiological sampling data and a determination of whether the sediment is low-level radioactive waste (LLRW) or non-LLRW, it will be coated with soil tackifier (SoilTac or equivalent), following sampling, to proactively prevent dust generation. Visible dust will not be permitted during the execution of the IR Site 2 RA. If visible dust is observed, contingency measures will be implemented immediately.

5.2 ADDITIONAL CONTINGENCIES

Additional engineering controls may be developed in conjunction with the RASO and the regulatory agencies and will be implemented, if required, to maintain airborne radioactive particulate concentrations below 10 percent of a DAC for project radionuclides of interest.

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6.0 QUALITY ASSURANCE

This section discusses quality assurance elements of the dust control and air monitoring program.

6.1 AIR MONITORING PERSONNEL

Qualified field technicians with proper training will conduct routine field operations and air monitoring/sampling. Training in the use of specific air monitoring equipment will be provided and will include routine maintenance and calibration procedures. The field technician's activities will be documented in appropriate operating logs and maintenance forms.

Air monitoring and/or sampling for airborne radioactive particulate concentrations will be performed by a qualified Radiological Control Technician. All radiological air monitoring and/or sampling information will be provided to the RASO throughout the IR Site 2 RA.

6.2 ROUTINE OPERATION AND MAINTENANCE

Routine operations, calibration, and maintenance procedures will be used to minimize the potential for instrument downtime or collection of distorted data. Field technicians will perform routine equipment inspections in accordance with manufacturer recommendations. Routine communications on field activities will be conducted with and may be periodically supplemented by inspection by the TtEC Radiation Safety Officer Representative.

For airborne radioactive particulate concentration monitoring, routine operation and maintenance will be performed in accordance with TtEC's SOPs 2 and 9.

For non-airborne radioactive particulate concentration monitoring, technicians will follow a prescribed list of activities to check the status of each equipment item upon visiting each monitoring station. The results of all checks will be documented on check sheets and in on-site logbooks. Whenever monitoring locations are visited, technicians will note any phenomena or unusual activity that could have an effect on measurements. Equipment inspection will be conducted at the beginning and end of every sampling sequence as part of scheduled preventive maintenance.

6.3 NON-ROUTINE MAINTENANCE AND CORRECTIVE ACTION

Routine operations, preventive maintenance, and quality control (QC) procedures are intended to minimize the potential for monitoring system component failures. Non-routine maintenance provisions are intended to minimize the downtime or loss of data that may result from any unscheduled outages. It should be noted that the equipment specified for this program would be selected in part based on its reliability and minimum potential for failure.

Field technicians will initially attempt to diagnose and correct a problem with existing components and perform repairs on-site. Major repairs that require professional service will be given top priority so systems can be returned to service and spare parts restocked as quickly as possible.

7.0 QUALITY CONTROL

This section discusses the activities associated with the QC program for the dust control and air monitoring program. The purpose of the QC program is to ensure that the monitoring instrumentation and support equipment are operating within specifications at all times. Furthermore, the QC program will ensure that a complete, valid, and defensible database is developed. For airborne radioactive particulate concentration monitoring, QC will be performed in accordance with TtEC's NRC Radioactive Materials License and associated SOPs as discussed in the Radiological Work Plan (Attachment 2 to the RAWP).

7.1 QUALITY CONTROL PROCEDURES

The QC program will be implemented to ensure that collected data are accurate and precise in order to effectively characterize both the magnitude and variations in measured conditions at the monitoring stations. Complete documentation of the results of routine operations and QC aspects of the program, including all log notes, calibration forms, and certifications, will be maintained on file and will be delivered to the DON upon completion of the project. Key elements of the routine field QC program will include:

- Routine assessment at each sampling location over the sampling period to verify operation and sample conditions, and note any ambient conditions that could affect the accuracy or representativeness of the sample, as appropriate
- Calibration of field instruments, sampling pumps, and flow devices
- Routine preventive maintenance of all equipment components, as appropriate

Although laboratory analysis is not required, in the event that changes, any laboratory performing sample analyses will have a QC program that will ensure the accuracy of the data as the data are being analyzed. Key elements of the routine QC procedures implemented during the sample analyses will include analysis of laboratory blanks and spikes and calibration of the analytical instruments as specified in the appropriate methodology.

In addition to the field QC activities, data will be subjected to a series of data consistency and miscellaneous checks during the data processing phase. This will include a review of all component performances, daily data sheets, operating logs, calibration records, laboratory documentation, and the results of chemical and radiological analysis, as applicable.

An operations logbook for non-airborne radioactive particulate concentration monitoring will be initiated at the onset of the sampling program and will be maintained throughout the program. This log will allow for a narrative description of all activities and conditions as these events affect the collected data and will include the following information:

- Sample identification
- Monitoring/sample date
- Monitoring/sample site
- Construction activity occurring on the day of monitoring/sampling
- Sample start and stop times
- Record of differential pressure for sampling systems
- Total monitoring/sample time
- Submittal date of samples to the laboratory
- Signature of the technician responsible for monitoring/sampling and completing the sheet

Also, the following information will be documented during each monitoring/sampling sequence:

- Observation date
- Observation site
- Construction activity occurring on the day of monitoring/sampling
- Times of instrument inspections
- Observed readings during the inspection
- Observations of ambient conditions and the monitored/sampled environment
- Signature of the technician responsible for acquiring the data

An additional element of the overall QC program will be the documentation of certificates of calibration for all calibration and test equipment during field activities. This requirement will also extend to any vendor factory calibration checks.

Field logs will be used to properly record information after monitoring information and samples are collected. Appropriate field data, such as date, time, sample identification, calibration data, sample location, ambient temperature, and pressure, and any additional information or observations that could influence analyses of the results, will be entered on the field logs.

8.0 DATA EVALUATION

All field materials, including field notes and operating logs, calibration forms, filters, and laboratory results, will be periodically assembled and reviewed. The purpose of the review is to monitor performance, check for completeness, and assess data validity as well as compare the monitoring results to the compliance standards. Field records and logbook entries of calibration results will also be reviewed and verified, as appropriate, and final calculated data values will be entered into the data file.

Ultimately, all final data values for the site will be prepared in a tailored format listing monitoring and/or sampling values for all parameters, as available. The TtEC Project Managers will review results of all activities, and corrections and modifications to the file will be made as appropriate.

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9.0 REFERENCES

DON (United States Department of the Navy). 2010. Final Record of Decision (ROD) for IR Site 2, Former Naval Air Station Alameda, California. August.

FWENC (Foster Wheeler Environmental Corporation). 2002. Final Time-Critical Removal Action Closeout Report. Installation Restoration Site 2, Alameda Point, Alameda, California.

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TABLES

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TABLE 4-1

DERIVED AIRBORNE CONCENTRATIONS FOR RADIONUCLIDES OF INTEREST

Radionuclide	Radiation	DAC (μCi/mL)	10% DAC (μCi/mL)
Radium-226	Alpha (α)	3.0×10^{-10}	3.0×10^{-11}
Thorium-232		5.0×10^{-13}	5.0×10^{-14}
Uranium-238		2.0×10^{-11}	2.0×10^{-12}
Strontium-90	Beta (β^{-})	8.0×10^{-9}	8.0×10^{-10}
Cobalt-60	Beta/gamma (β^{-}, γ)	7.0×10^{-8}	7.0×10^{-9}
Cesium-137		6.0×10^{-8}	6.0×10^{-9}

Abbreviations and Acronyms:
μCi/mL – microcuries per milliliter
CFR – *Code of Federal Regulations*
DAC – derived air concentration (10 CFR 20 Appendix B)

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FIGURES

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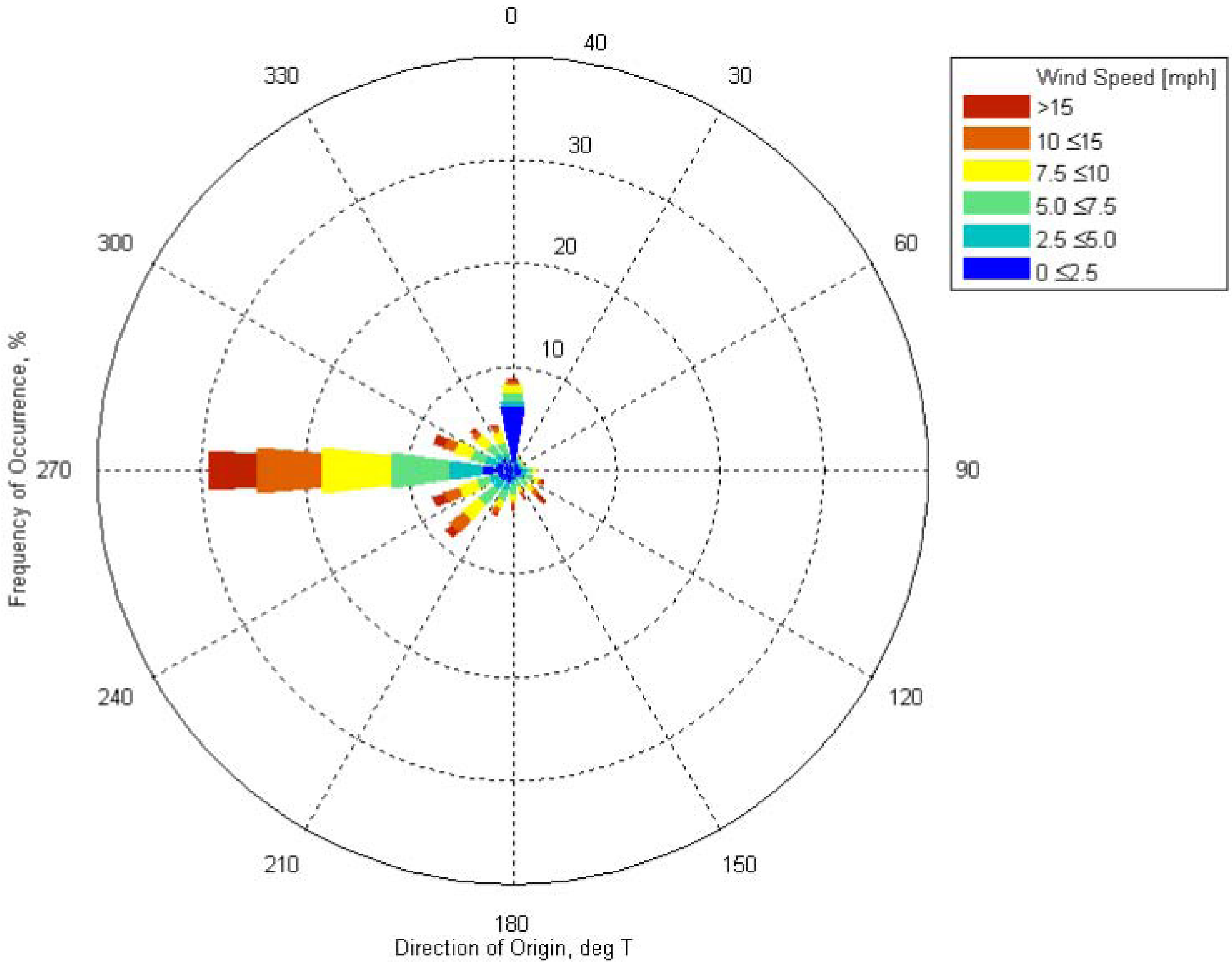

Figure 2-1. Wind Rose Diagram for Alameda Point

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APPENDIX A

MATERIAL SAFETY DATA SHEET

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10:42:34 AM

Toll Free: 1-800-545-5420

- Home Page
- Product Information
- Application Uses
- Application Rates
- Application Equipment
- Application Methods
- Shipping Containers
- Photo Gallery
- Material Safety Data Sheet
- Frequently Asked Questions
- Product Pricing
- Test and Evaluation Data
- Environmental Data
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- About Soilworks
- Contact Information

McAfee SECURE TESTED 18-FEB

Soilworks Product Lines

GSA Official Federal Supply Service Contract Holder

Material Safety Data Sheet

Soiltac® Soil Stabilizer & Dust Control Agent Material Safety Data Sheet

SECTION 1 - MATERIAL IDENTIFICATION	
PRODUCT NAME	SOILTAC*
	SOILTAC is a registered trademark of Soilworks, LLC.
MANUFACTURER	Soilworks, LLC.
	1750 E. Northrop Blvd., Suite 250, Chandler, AZ 85286-1747 USA www.soilworks.com
TELEPHONE NUMBER	800-545-5420
ONLINE INFORMATION	www.Soiltac.com
EMERGENCY TELEPHONE NUMBERS	800-545-5420 (National & International)
REVISION DATE	November 2009
EMERGENCY OVERVIEW	
PHYSICAL FORM	Mobile liquid
COLOR	Milky White (transparent once cured)
ODOR	Mild / Slight (no odor once cured)
HAZARDS	There are no known health hazards.
EXTINGUISHING MEDIA	The product will only burn after the water it contains is driven off.
C.A.S. CHEMICAL NAME	Mixture
SYNONYMS	Soil stabilizer, soil stabilization agent, soil solidifier, soil amendment, soil additive, soil crusting agent, dust control agent, dust inhibitor, dust palliative, dust suppressant, dust retardant
CHEMICAL FAMILY	Vinyl Copolymer Emulsion
EMPIRICAL FORMULA	Mixture

Product Information | Application Uses | Application Rates | Application Equipment | Application Methods | Shipping Containers | Photo Gallery | Material Safety Data Sheet | Frequently Asked Questions | Product Pricing | Test and Evaluation Data | Environmental Data | Downloads | About Soilworks | Contact Information |

INTENDED USE	Soil stabilization, soil solidification, fugitive dust control, dust suppression, dust abatement, tackifier, dust abatement, PM10 and PM2.5 air quality control and erosion control

SECTION 2 - INGREDIENTS

	%	**CAS Number**	**Chemical Name**
1.	50-60	Proprietary	Vinyl Copolymer
2.	40-60	7732-18-5	Water

SECTION 3 - HEALTH HAZARDS

ROUTES OF ENTRY
Eye Contact, Skin Contact, Ingestion and Inhalation

SIGNS AND SYMPTOMS OF ACUTE EXPOSURE
Eyes: Direct contact with this material may cause eye irritation including lachrymation (tearing).
Inhalation: Inhalation of vapor or aerosol may cause irritation to the respiratory tract (nose, throat, and lungs).
Skin: Contact may cause skin irritation. Ingestion: No hazard in normal industrial use. Skin: Contact may cause skin irritation. Ingestion: No hazard in normal industrial use.

SIGNS AND SYMPTOMS OF CHRONIC EXPOSURE
Prolonged or repeated contact with skin may cause irritation and dermatitis (inflammation).

CARCINOGENICITY
This material **does not** contain 0.1% or more of any chemical listed by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), or regulated by the Occupational Safety and Health Administration (OSHA) as a carcinogen.

SECTION 4 - FIRST AID

EYE CONTACT
Rinse immediately with plenty of water. Get immediate medical attention.

SKIN CONTACT
Remove contaminated clothing and shoes. Wash affected area with soap and water. Get medical attention if irritation develops or persists.

INHALATION
Move patient to fresh air. If breathing has stopped or is labored give assisted respiration (e.g. mouth-to-mouth). Supplemental oxygen may be indicated. Seek medical advice.

INGESTION
Give the victim one or two glasses of water or milk to drink. Get immediate medical attention . Never give anything by mouth to an unconscious person.

SECTION 5 - FIRE AND EXPLOSION DATA

FLASH POINT (closed cup)	Not applicable
UPPER EXPLOSION LIMIT (UEL)	Not applicable
LOWER EXPLOSION LIMIT (LEL)	Not applicable
AUTOIGNITION TEMPERATURE	Not applicable
FIRE HAZARD CLASSIFICATION (OSHA/NFPA)	Non-Combustible

EXTINGUISHING MEDIA
Product does not burn. The product will only burn after the water it contains is driven off. For dry polymer use carbon dioxide, foam, dry chemical or water fog to extinguish fire. Aqueous solution **is not flammable**.

FIRE FIGHTING EQUIPMENT
Wear self-contained breathing apparatus (SCBA) and full fire-fighting protective clothing. Thoroughly decontaminate all protective equipment after use.

FIRE AND EXPLOSION HAZARDS
This material **will not burn** unless it is evaporated to dryness. Closed containers may rupture when exposed to extreme heat.

HAZARDOUS COMBUSTION PRODUCTS
When dried polymer burns, water (H2O), carbon dioxide (CO2), carbon monoxide (CO) and smoke are produced.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

CONTAINMENT TECHNIQUES (Removal of ignition sources, diking etc)
Stop the leak, if possible. Ventilate the space involved.

CLEAN-UP PROCEDURES
Wear suitable protective equipment. If recovery is not feasible, admix with dry soil, sand or non-reactive absorbent and place in an appropriate chemical waste container. Prevent spilled material from entering sanitary sewers, storm sewers, drainage systems and from entering bodies of water or ditches that lead to waterways. Transfer to containers by suction, preparatory for later disposal. Place in metal containers for recovery or disposal. Flush area with water spray. Wash contaminated property (e.g., automobiles) quickly before the material dries. For large spills, recover spilled material with a vacuum truck.

OTHER EMERGENCY ADVICE
Spilled polymer emulsion is very slippery. Use care to avoid falls. A film will form on drying. Remove saturated clothing and wash contacted skin area with soap and water. Product imparts a milky white color to contaminated waters. Foaming may result. Sewage treatment plants may not be able to remove the white color imparted to the water.

SECTION 7 - HANDLING AND STORAGE

STORAGE
Keep from freezing. Store in a dry area. Keep containers closed when not in use to minimize contact with atmospheric air and prevent inoculation with microorganisms.

HANDLING
Use only in well-ventilated areas. Avoid contact with eyes. Avoid breathing vapors. Avoid prolonged or repeated contact with skin. Wash hands thoroughly after handling and before eating or drinking.

SECTION 8 - PERSONAL PROTECTION / EXPOSURE CONTROLS

EXPOSURE GUIDELINES
There are no Occupational Safety and Health (OSHA) Permissible Exposure Limits (PEL) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) or Short Term Exposure Limits (STEL) established for the component(s) of this product.

EYE PROTECTION
Chemical safety glasses.

HAND PROTECTION
Rubber Gloves. The breakthrough time of the selected glove(s) must be greater than the intended use period.

RESPIRATORY PROTECTION
Not required under normal use.

PROTECTIVE CLOTHING
No specific recommendation.

ENGINEERING CONTROLS
Good general ventilation should be sufficient to control airborne levels of irritating vapors.

SECTION 9 - TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL FORM	liquid

COLOR	Milky White (transparent once cured)
ODOR	Mild / Slight (no odor once cured)
pH	4. 5-6.0
EVAPORATION RATE	< 1 (BuAc=1)
VAPOR DENSITY	> 1 (Air = 1)
BOILING POINT	> 100.00°C (>212.00°F)
FREEZING POINT	<0°C (<32°F)
SOLUBILITY IN WATER	Completely (100%) (until cured)
SPECIFIC GRAVITY (Water = 1)	1.0 5-1.10

SECTION 10 - STABILITY AND REACTIVITY

STABILITY
Stable at ambient temperatures. Coagulation may occur following freezing, thawing or boiling.

INCOMPATIBILITY (Materials to Avoid)
No incompatibilities have been identified.

HAZARDOUS DECOMPOSITION PRODUCTS
Thermal decomposition may form: Acetic acid and Acrolein. Thermal decomposition may produce various hydrocarbons and irritating, acrid vapors.

HAZARDOUS POLYMERIZATION
Will not occur

CONDITIONS TO AVOID
Freezing temperatures (until cured).

SECTION 11 - TOXICOLOGICAL PROPERTIES

ACUTE EYE TOXICITY
No Information is available.

ACUTE ORAL TOXICITY
No Information is available.

ACUTE SKIN TOXICITY
No Information is available.

ACUTE INHALATION TOXICITY
No Information is available.

CHRONIC/CARCINOGENICY
This material **does not** contain 0.1% or more of any chemical listed by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), or regulated by the Occupational Safety and Health Administration (OSHA) as a carcinogen.

SECTION 12 - ECOLOGICAL INFORMATION

ECOTOXICITY				
Common Name	**Species**	**Test**	**Result**	**Concentration**
Green Algae	Raphidocelus Subcapitata	96-hr chronic LC50	>1,000	Undiluted

Fathead Minnow	Pimephales Promelas	96-hr acute LC50	>1,208	Undiluted
Rainbow Trout	Oncorhynchus Mykiss	96-hr acute LC50	>1,000	Undiluted

ENVIRONMENTAL FATE
No data is available.

SECTION 13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD
This material **is not** a RCRA hazardous waste. Disposal of this material is not regulated under RCRA. Consult federal, state and local regulations to ensure that this material and its containers, if discarded, is disposed of in compliance with all regulatory requirements . NOTE: As supplied or diluted, product material (foam included), when splashed on automobiles or other personal property, is difficult to remove if allowed to dry.

RCRA HAZARD CLASS
This material **is not** a RCRA hazardous waste. When discarded in its purchased form, this material would not be regulated as a RCRA Hazardous waste under 40 CFR 261.

SECTION 14 - TRANSPORT INFORMATION

DOT NON-BULK SHIPPING NAME	Refer to Bill of Lading - Not DOT Regulated // Keep From Freezing // Not dangerous goods
DOT BULK SHIPPING NAME	Refer to Bill of Lading.
IMO SHIPPING DATA	Refer to Bill of Lading.
ICAO/IATA SHIPPING DATA	Refer to Bill of Lading - Not IATA Regulated // Keep From Freezing // Not dangerous goods
CFR	Not Regulated // Keep From Freezing // Not dangerous goods
IMDG	Not Regulated // Keep From Freezing // Not dangerous goods
CTC	Not Regulated // Keep From Freezing // Not dangerous goods

SECTION 15 - REGULATORY INFORMATION

TSCA SECTION 8(b) INVENTORY STATUS
All components are included in the EPA Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

TSCA SECTION 12(b) EXPORT NOTIFICATION
This material **does not** contain any components that are subject to the U.S. Toxic Substances Control Act (TSCA) Section 12 (b) Export Notification requirements.

OSHA Hazard Communication Standard (29CFR1910.1200) hazard class(es)
This material **is not** classified as hazardous under the criteria of the U.S. Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR 1910.1200

EPA SARA Title III Section 304 CERCLA
Reportable quantities have not been established for any of this material's components.

EPA SARA Title III Section 311/312 HAZARD COMMUNICATION STANDARD (HCS)
This material **is not** a hazardous chemical.

EPA SARA Title III Section 313 TOXIC CHEMICAL LIST (TCL)
This product **does not** contain Section 313 Reportable Ingredients.

CANADIAN INVENTORY STATUS
All components of this material are listed on the Canadian Domestic Substances List (DSL)

CANADIAN WHMIS
This material **is not** classified as a controlled product under the Canadian Workplace Hazardous Material Information System.

ADDITIONAL CANADIAN REGULATORY INFORMATION
This product **does not** contain a substance present on the WHMIS Ingredient Disclosure List (IDL) which is at or above the specified concentration limit.

EUROPEAN INVENTORY STATUS (EINECS)
The polymer portion of this product is manufactured from reactants which are listed on EINECS and meets the EINECS definition of an exempt polymer.

AICS (Australia)
Included on inventory

ENCS (Japan)
Included on inventory

ECL (South Korea)
Included on inventory

SEPA (China)
Included on inventory

SECTION 16 – OTHER INFORMATION

HMIS and NFPA Classification

Health	: 1
Flammability	: 0
Reactivity	: 0
Special Hazard	: 0

ATTACHMENT 10

WASTE MANAGEMENT PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 10

FINAL

WASTE MANAGEMENT PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

TETRA TECH EC, INC.

1230 Columbia Street, Suite 750
San Diego, California 92101-8530

Prepared by: ______________________
Jennifer Dessort
Environmental Compliance Manager

Reviewed by: ______________________
Hedy Abedi, PhD, PE
Project Manager

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ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
BMP	best management practice
CAMU	Corrective Action Management Unit
CCR	*California Code of Regulations*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
DoD	Department of Defense
DON	Department of the Navy
DOT	Department of Transportation
EPA	U.S. Environmental Protection Agency
IR	Installation Restoration (Program)
LDR	land disposal restriction
LLCW	low-level contaminated waste
LLMW	low-level mixed waste
LLRW	low-level radioactive waste
mR/hr	milliroentgens per hour
NRC	Nuclear Regulatory Commission
PjM	Project Manager
PPE	personal protective equipment
RASO	Radiological Affairs Support Office
RCRA	Resource Conservation and Recovery Act
RTM	Remedial Technical Manager
STLC	Soluble Threshold Limit Concentration
SWPPP	Stormwater Pollution Prevention Plan
TSDF	treatment, storage, and disposal facility
TtEC	Tetra Tech EC, Inc.
TTLC	Total Threshold Limit Concentration
WET	Waste Extraction Test
WMP	Waste Management Plan

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1.0 WASTE MANAGEMENT PLAN

The purpose of the Waste Management Plan (WMP) is to present the waste management practices and procedures to be followed for the types and quantities of waste expected to be generated during the field activities at Installation Restoration Program (IR) Site 2. The WMP identifies waste management activities conducted during the storage and the preparation and/or disposal of waste (including waste characterization, packaging, storage, and management while in storage). The transportation and disposition of waste materials at appropriate disposal and recycling facilities are also included. It is the responsibility of the Project Manager (PjM) to verify that all project personnel are aware of the requirements stipulated in this WMP.

The WMP provides information on how wastes, including potentially hazardous wastes associated with project activities, will be managed and disposed. In addition, a secondary goal of this section is to ensure that waste minimization practices are followed, to the extent practical, to reduce the volume of waste that will be generated, stored, and removed from the site for disposal.

The WMP is also a primary component of the Tetra Tech EC, Inc. (TtEC), Compliance Program, which includes on-site environmental compliance inspections. The WMP will be revised if the scope of this project or the applicable regulations change.

1.1 PROJECT WASTE DESCRIPTIONS

Construction activities will involve the generation, management, and disposal of various waste streams, which may include:

- Green waste including grass, shrubs, and trees removed prior to grading activities
- Low-level radioactive waste (LLRW) including soil and point sources
- RCRA hazardous, non-RCRA hazardous, and nonhazardous soil
- Nonhazardous solid waste, such as trash, empty calibration gas canisters, and inert construction debris
- Oversized contaminated debris – rock, wood, piping, concrete, and scrap metal
- Wastewater, including impacted stormwater runoff, fluids from equipment and personnel decontamination, and groundwater monitoring well development purge water
- Used oil (including motor oil, hydraulic fluid, greases, antifreeze/coolant, and so forth), oil filters, fuel and air filters from equipment maintenance operations
- Decontamination pad solids/sludges
- Used polyethylene liners from soil stockpiles and/or waste storage areas

- Used personal protective equipment (PPE)

During these activities, the site will be managed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Area-of-Contamination policy, which allows impacted soil and/or waste to be uncovered, moved, and reconsolidated without triggering the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDRs) and minimum technical requirements for a landfill under RCRA.

Table 1-1 presents a summary of applicable waste characterization, containment, storage, transportation, and disposal requirements for each of the aforementioned waste streams.

1.2 WASTE MANAGEMENT

In accordance with the applicable or relevant and appropriate requirements (ARARs) for remedial activities, the substantive requirements of the state and federal hazardous waste generation, characterization, storage, treatment, and management regulations of Title 22 *California Code of Regulations* (CCR), Sections 66261, 66262, and 66264, and 40 *Code of Federal Regulations* (CFR), Parts 261, 262 and 264, are applicable to the management of hazardous wastes generated during the remedial action and associated project activities. A summary of the key aspects of the waste management program is provided below.

1.2.1 Waste Classification

Federal RCRA hazardous waste determination is necessary to determine whether a waste is subject to RCRA requirements at Title 22 CCR, Division 4.5 and other state requirements at Title 23 CCR, Division 3, Chapter 15. The first step in the RCRA hazardous waste characterization process is to evaluate contaminated media at the site(s) and determine whether it constitutes a "listed" RCRA waste. The preamble to the National Oil and Hazardous Substances Pollution Contingency Plan states that "…it is often necessary to know the origin of the waste to determine whether it is a listed waste and that, if such documentation is lacking, the lead agency may assume it is not a listed waste" (55 Federal Regulation 8666, 8758 [1990]).

This approach is confirmed in the U.S. Environmental Protection Agency (EPA) guidance for CERCLA compliance with other laws (EPA 1988), as follows: "To determine whether a waste is a listed waste under RCRA, it is often necessary to know the source. However, at many Superfund sites, no information exists on the source of wastes. The lead agency should use available site information, manifests, storage records, and vouchers in an effort to ascertain the nature of these contaminants. When this documentation is not available, the lead agency may assume that the wastes are not listed RCRA hazardous wastes, unless further analysis or information becomes available that allows the lead agency to determine that the wastes are listed RCRA hazardous wastes."

RCRA hazardous wastes that have been assigned EPA hazardous waste numbers (or codes) are listed in Title 22 CCR, Sections 66261.30 through 66261.33. The lists include hazardous waste codes beginning with the letters "F," "K," "P," and "U." Knowledge of the exact source of a waste is required for source-specific listed wastes ("K" waste codes). Some knowledge of the nature or source of the waste is required even for listed wastes from non-specific sources, such as spent solvents ("F" waste codes) or commercial chemical products ("P" and "U" waste codes). These listed RCRA hazardous wastes are restricted to commercially pure chemicals used in particular processes such as degreasing. P and U wastes cover only unused and unmixed commercial chemical products, particularly spilled or off-specification products (EPA 1992). Not every waste containing a P or U chemical is a hazardous waste. To determine whether a CERCLA investigation-derived waste contains a P or U waste, there must be direct evidence of product use. In particular, all the following criteria must be met. The chemicals must be:

- Discarded (as described in 40 CFR, Section 261.2[a][2])
- Either off-specification commercial products or a commercially sold grade
- Not used (soil contaminated with spilled unused wastes is a P or U waste)
- The sole active ingredient in a formulation

Hazardous waste characteristics, as defined in 40 CFR, Sections 261.21 through 261.24, are commonly referred to as ignitable, corrosive, reactive, and toxic. California environmental health standards for the management of hazardous waste set forth in 22 CCR, Division 4.5, were approved by EPA as a component of the federally authorized California RCRA program. Therefore, the characterization of RCRA waste is based on the state requirements.

The characteristics of ignitability, corrosivity, reactivity, and toxicity are defined in 22 CCR, Sections 66261.21 through 66261.24. According to 22 CCR, Section 66261.24(a)(1)(A), waste that exhibits the characteristic of toxicity is assigned a hazardous waste code beginning with the letter "D" to wastes that exhibit the characteristic of toxicity; D waste codes are limited to "characteristic" hazardous wastes.

According to 22 CCR, Section 66261.10, waste characteristics can be measured by an available standardized test method or be reasonably classified by generators of waste based on their knowledge of the waste, provided that the waste has already been reliably tested or if there is documentation of chemicals used.

A waste determined not to be a RCRA hazardous waste may still be considered a state-regulated non-RCRA hazardous waste. The state is broader in scope in its RCRA program in determining hazardous waste. Title 22 CCR, Section 66261.24(a)(2), lists the Total Threshold Limit Concentrations (TTLCs) and the Soluble Threshold Limit Concentrations (STLCs) for non-RCRA hazardous waste. The state applies its own leaching procedure, Waste Extraction Test

(WET), which uses a different acid reagent and has a different dilution factor (tenfold). There are other state requirements that may be broader in scope than federal ARARs for identifying non-RCRA wastes regulated by the state. See additional subsections of 22 CCR, Section 66261.24. A waste is considered hazardous if its total concentrations exceed the TTLCs or if the extract concentrations from the WET exceed the STLCs. A WET is required when the total concentrations exceed the STLC by a factor of ten, but are less than the TTLCs. California also has additional hazardous waste classification criteria (including 96-hour fish bioassays) that may need to be considered on a case-by-case basis. Wastes determined to be hazardous wastes under California regulations and not under federal regulations are referred to as non-RCRA wastes.

The waste classification requirements also apply to contents from decontamination water generated from daily decontamination activities, collected stormwater, groundwater monitoring well purge water, construction debris, and waste oils and fluids generated from the on-site project equipment. Wastewater resulting from stormwater runoff and decontamination water will be collected and contained within a portable aboveground tank. When the tank or container is approximately half-full or at least every 60 days, whichever occurs first, the tank will be sampled to determine proper disposition of the wastewater. PPE and soil stockpile liners will be characterized based on generator knowledge and will be disposed of at an off-site landfill. Debris will also be characterized based on generator knowledge to determine if it is a potential hazardous waste. Waste oil and other fluids generated during equipment maintenance activities will be collected, contained, and sent off-site for recycling.

1.2.2 Waste Accumulation and Storage

Title 40 CFR, Part 262, 40, and 22 CCR, Section 66262, consist of regulations applicable to the generation, storage, management, and accumulation of RCRA and non-RCRA hazardous wastes, respectively. Specific requirements apply to the accumulation time for hazardous wastes on site and to the accumulation and labeling of hazardous wastes. This project may result in the temporary accumulation of hazardous wastes in staging piles, containers, and tanks. These wastes will be managed, accumulated, and inspected in accordance with the regulations.

Nonhazardous waste is not subject to specific regulatory requirements for accumulation or storage; however, appropriate best management practices (BMPs) will be implemented.

1.2.3 Soil and Waste Stockpiles and Staging Piles

Soil excavated during this project will be stockpiled in inactive areas of the site until such time it is needed for reconsolidation or for use as cover material. During these activities, the soil and refuse will be managed under the CERCLA Area-of-Contamination policy, which allows impacted soil and/or refuse waste to be uncovered, moved, and reconsolidated without triggering the RCRA LDRs and minimum technical requirements for a landfill under RCRA. During construction, excavated materials and drill cuttings requiring temporary stockpiling prior to reconsolidation will be staged on-site and will not require characterization or off-site disposal. While not anticipated, if refuse is excavated and is not reconsolidated and the material is determined to be RCRA hazardous waste based on representative sampling and analysis data, then the new (effective April 22, 2002) RCRA temporary Corrective Action Management Unit (CAMU) regulations are applicable. These regulations consist of the performance and technical standards for staging piles (Sections 264.554[d][1][i–ii] and [d][2]) and closure requirements for staging piles (Section 264.554[j–k]). Under the new regulations, a temporary CAMU may be designated for temporary (up to 2 years) treatment or storage of solid, non-flowing remediation waste. The RCRA LDRs, the landfill minimum technology requirements, and the waste pile permitting requirements are not applicable to temporary CAMUs for RCRA hazardous wastes. The temporary CAMU regulations also require that the unit:

- The unit will be designed using appropriate measures (for example, liners, soil crusting agents, run-on/runoff controls, groundwater monitoring system) to prevent or minimize releases and cross media transfers of hazardous wastes and constituents (Section 264.554[d][1][ii]).
- For units located in a previously contaminated area of the facility—All remediation wastes, contaminated containment system components, structures, and equipment that are contaminated with waste or leachate must be removed and decontaminated within 180 days (264.554[j]). In addition, contaminated subsoils must be remediated in accordance with an approved plan and schedule, but the 180-day time limit does not apply.
- For units located on uncontaminated areas of the facility—Within 180 days following expiration of the operating term, any remaining contamination (such as, containment system components and subsoils) must be removed in accordance with the clean closure standards for waste piles in 22 CCR, Sections 66264.558(a) or 66265.558(a), and the closure performance standards in 22 CCR, Sections 66264.111 or 66265.111, for permitted and interim status facilities, respectively (264.554[k]).

For non-RCRA hazardous waste, in accordance with Division 20, Chapter 6.5, Section 25123.3 of the *California Health and Safety Code*, the material can be stockpiled at the site for up to 90 days without satisfying all substantive requirements of a hazardous waste facility permit, provided the following conditions are met:

- The materials do not contain free liquids.
- The waste is accumulated on an impermeable surface (minimum 20-mil liner).
- The generator controls against wind dispersion and rain runoff.
- The generator inspects the site weekly and after storms to ensure the erosion controls are working properly.

- After final off-site transportation, the accumulation site is inspected and remediated as necessary.
- The site is certified for compliance with these standards by a registered engineer.

A log of all hazardous soil and debris stockpiles (or staging piles) will be maintained and updated on a daily basis. The log will include date of accumulation, date of sampling, analytical results obtained or pending, RCRA hazardous or non-RCRA hazardous designation, and so forth.

In addition to the aforementioned requirements, the State Water Resources Control Board Policy Number 92-08, which pertains to the control of stormwater discharges from construction activities, may also be relevant and appropriate to the temporary storage of stockpiled materials. Appropriate best management practices (BMPs) will be implemented to protect stockpiles from erosion and from stormwater run-on and runoff. These BMPs include erosion control, stormwater drainage control, secondary containment, fugitive emissions and wind dispersion control, and spill prevention. A site-specific Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the project in accordance with ARARs (See Attachment 8 to the RAWP).

1.2.4 Wastewater and Waste Fluids

Title 22 CCR, Section 66264, and 40 CFR, Part 264, contain applicable requirements for facilities that store hazardous wastes in tanks or containers for over 90 days. Decontamination water and stormwater that comes in contact with the hazardous waste stockpiles will be collected and stored on-site in an approved tank of an appropriate capacity. The tank will be installed, managed, and inspected in accordance with the substantive requirements of 22 CCR, Sections 66264.191, 66264.192, 66264.193, and 66264.194. These regulations require specific engineering and design specifications, daily inspections of the tanks, adequate secondary containment (110 percent of the tank volume, plus the maximum rainfall from a 25-year, 24-hour storm event), and closure standards. The contents of the tank will be characterized based on generator knowledge from the project waste streams and/or per the requirements of 22 CCR, Section 66261, to determine appropriate disposal options. In addition, daily inspections of wastewater tanks will be conducted and logged to ensure the integrity of the tanks and secondary containment to check for leaks or spills, and to ensure that labels and markings are in good condition.

Wastewater generated, which may include decontamination water generated from equipment and personnel decontamination and purge water from well development activities, will be collected in 55-gallon drums, or combined in a large temporary storage tank (such as a Baker tank), and labeled as “Potentially Hazardous Decontamination (or Purge) Water.” The drums will be temporarily staged within a pre-designated and secondarily contained on-site waste accumulation area pending characterization and appropriate disposal. When possible, waste fluids generated from heavy equipment maintenance activities will be collected and removed from the site by the maintenance contractor for recycling. If waste fluids are required to be stored on-site, they will be labeled accordingly, contained within Department of Transportation (DOT)-approved 55-gallon drums, and situated within a pre-designated and properly designed hazardous waste container storage area. Containers of hazardous wastes containing free liquids have stringent secondary containment requirements. These requirements include:

- A base free of cracks or gaps and sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.
- The base will be sloped or the containment system will be otherwise designed and operated to drain and remove liquids resulting from leaks, spills, or precipitation. Alternatively, the containers may be elevated on pallets to prevent contact with accumulated liquids.
- The containment system will have sufficient capacity to contain 10 percent of the volume of containers or the volume of the largest container, whichever is greater, plus the maximum rainfall from a 25-year 24-hour storm event.
- Spilled or leaked waste and accumulated precipitation will be removed from the sump or collection area in a timely manner to prevent overflow of the collection system.

1.2.5 Used Personal Protective Equipment

Used PPE will be stored in DOT-approved 55-gallons drums or LLRW bins within the designated hazardous waste container storage area or the Radiological Material Area (RMA), respectively. The storage area will be designed and managed in accordance with the substantive requirements of the container management regulations codified in 22 CCR, Sections 66264.170 through 66264.178.

1.2.6 Container Labeling

Containers of potentially hazardous waste will be labeled with indelible ink with the following information: source and location; contents and quantity; potential health, safety, and environmental hazards; accumulation start date; date container sampled; parameters analyzed for; and the words “Analysis Pending – Potentially Hazardous.” If containers are determined to contain nonhazardous waste, they will be labeled accordingly. If containers are determined to contain hazardous waste, they will immediately be labeled with a completed “Hazardous Waste” label, which will include:

- EPA Identification Number of the generator
- Name and address of the generator
- EPA waste code
- DOT shipping name (prior to off-site shipment)
- Description of contents
- Date of generation (date first drop of waste placed in container)

An inventory of waste containers will be maintained for later submittal to the Department of the Navy (DON). In addition, weekly inspections of container storage areas will be conducted and logged while wastes remain in these areas to ensure the integrity of the containers and secondary containment, to check for leaks or spills, and to ensure labels and markings are in good condition.

1.2.7 Waste Accumulation Areas

Hazardous waste storage areas require:

- A sign with the legend, "Danger Hazardous Waste Area-Unauthorized Personnel Keep Out" (written in English and Spanish), will be posted at each 90-day accumulation area and stockpile in sufficient numbers to be seen from any approach. The signs will be legible from a distance of at least 25 feet.
- Aisle space will be maintained to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency, unless aisle space is not needed for any of these purposes.
- The following emergency equipment will be located or available to personnel during active waste management activities at each accumulation area:
  - A device, such as a telephone or a hand-held two-way radio, capable of summoning emergency assistance will be available.
  - Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment will be available.
  - Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.
  - A spill response kit for minor spills. The kit will include a shovel, adsorbent pads and/or "kitty litter," and a collection container.

Bulk quantities of fuel, oil, or other hazardous materials will not be stored on-site. Equipment fueling and maintenance activities will be performed by an off-site contractor on an as-needed basis.

1.2.8 Waste Disposal

Although not anticipated, soil or refuse that is excavated during this project and that is not reconsolidated will be disposed of off-site at an appropriately permitted waste disposal facility. Non-soil related wastes, which may include wastewater, debris, used PPE, used oil, and impacted stormwater, will be managed in accordance with the regulations and transported off-site for appropriate recycling or disposal. Used PPE will generally be managed as LLRW and disposed of by the LLRW contractor. Each waste stream requiring off-site disposal will be characterized by generator knowledge or sampled and analyzed, as necessary, to ensure that it is properly characterized and profiled and meets the waste acceptance criteria and packaging requirements for the proposed treatment, storage, and disposal facility (TSDF) prior to transport. Hazardous waste debris generated on site, which has been treated using an alternate treatment technology as indicated in 40 CFR, Part 268.45, and 22 CCR, Section 66268, (decontaminated with a water wash and spray), will be disposed of as nonhazardous solid waste. Used PPE and debris (oversized material, polyethylene liners, polyvinyl chloride piping, and so forth) that is determined to be radiological waste or a hazardous waste and is unsuitable for decontamination, will be transferred to the LLRW contractor or sent off-site to a hazardous waste landfill facility respectively. Waste oil and other fluids generated during equipment maintenance activities will be collected, contained, and sent off-site for recycling.

Non-radiologically impacted hazardous waste will be disposed only at a hazardous waste disposal facility approved by the DON and permitted for the disposal of the particular type of hazardous waste generated. Wastes disposed off-site will be sent to RCRA Subtitle C or RCRA Subtitle D facilities that meet the requirements of 40 CFR, Part 300.440 (CERCLA Off-site Policy).

1.2.9 Waste Transportation

Hazardous wastes sent off-site for disposal or recycling will be done so in accordance with the DOT Hazardous Material Transportation regulations of 49 CFR, Parts 171 through 177, and 40 CFR, Part 262, Subpart B, and 22 CCR, Section 66262, which involve packaging, placarding, labeling, and manifesting requirements, and with appropriate LDR certification notices per 40 CFR, Part 268, and 22 CCR, Section 66268. Personnel having the required DOT-training will perform all DOT functions. In addition, all transporter and disposal contractors will be subject to the contractor qualification process. Under no circumstances will TtEC personnel sign hazardous waste manifests.

Material that does not exhibit one of the nine DOT hazard class characteristics (explosives, gases, flammable/combustible liquids, flammable solids/spontaneously combustible materials, dangerous when wet materials, oxidizers and organic peroxides, toxic materials and infectious substances, radioactive materials, corrosive materials) is not regulated under DOT rules for hazardous material transportation. If material is suspected to be hazardous, it will be shipped under the appropriate hazard class. All hazardous waste will be transported under DOT hazardous material regulations. Each shipment of a suspected hazardous material will be properly classed using the Hazardous Materials Table in 49 CFR, Part 172.101. DOT-trained personnel will make all determinations.

1.2.10 Waste Minimization

To minimize the volume of waste, the following general guidelines will be followed:

- Waste materials will not be contaminated unnecessarily.

- Work will be planned ahead.
- Materials may be stored in large containers, but the smallest reasonable container will be used to transport the material to the location where it is needed.
- Cleaning and extra sampling supplies will be maintained outside any potentially contaminated area to keep them clean and to minimize additional waste generation.
- Mixing of detergents or decontamination solutions will be performed outside potentially contaminated areas.
- Drop cloths or other absorbent material will be used to contain small spills or leaks.
- Contaminated materials will not be placed with clean materials.
- Wooden pallets inside the exclusion zone will be covered with plastic.
- Material and equipment will be decontaminated and reused when practical.
- Volume reduction techniques will be used when practicable.
- Waste containers will be verified to ensure they are solidly packed to minimize the number of containers.
- Only the size waste containers adequate to contain the volume of waste generated will be used.
- Less hazardous substances will be used whenever possible (only the volume of standard solutions needed for testing will be brought; minimal amounts of decontamination water and solvent rinses will be used).

1.2.11 Waste Management Inspection and Documentation Program

This section presents the waste inspection procedures and documentation program to be employed during the project field activities.

1.2.12 Inspections

While all waste accumulation areas will be informally inspected on a daily basis, formal inspections of all hazardous container accumulation areas will be conducted and recorded at least weekly in accordance with 40 CFR, Part 264, Subpart I, and 22 CCR, Section 66264. However, daily inspections will be conducted for tanks containing hazardous wastewater. In addition, hazardous soil stockpiles will be inspected daily to ensure that liners are in place and the stockpiles are adequately protected. The Project Quality Control Manager or his designee will conduct inspections. Inspections will be logged in a field notebook, and a weekly (daily for tanks) inspection checklist will be completed. The container storage area(s) will be inspected to ensure the following:

- Containers are in good condition. If a container is not in good condition or appears to be leaking, the waste will be transferred to another container.

- Containers are made of materials that will not react with, and are otherwise compatible with, the hazardous waste to be stored.
- Containers are closed at all times, except when adding or removing waste.

Tanks used for storage of collected hazardous runoff and decontamination water will be inspected on a daily basis and the inspections will be logged. The inspections will ensure that tanks have adequate secondary containment, are properly labeled, are in good condition (no apparent structural defects or deterioration), and have no visible leaks.

1.2.13 Documentation

Documentation requirements apply to all waste managed during project activities. Field records will be kept of all waste generation activities. All pages of the field data record log will be signed and dated by the supervising field leader who is entering the data. In addition, the following information will be recorded in the log:

- Description of waste generating activities
- Location of waste generation (including depth, if applicable)
- Type and volume of waste
- Date and time of generation
- Description of any waste sampling
- Name of person recording information
- Name of field manager at time of generation

1.2.14 Hazardous Waste Manifests and LDR Certification

All hazardous waste transported from the site will be accompanied by a Hazardous Waste Manifest. DON personnel will be responsible for reviewing and signing all waste documentation, including waste profiles, manifests, and LDR notifications (manifest packages). Prior to signing the manifest, the designated DON official will ensure that pre-transport requirements of packaging, labeling, marking, and placarding are met according to 40 CFR, Parts 262.30 through 262.33, and 49 CFR, Parts 100 through 178.

The DON will receive one copy of the manifest; the remaining copies will be given to the transporter. The manifest will be returned to the DON's signatory official for the base's recordkeeping requirements. Copies of all manifests for waste generated at the site will be kept in a compliance file within the project files. (The PjM will provide the DON with the generator's copies of the manifest.)

An LDR form will accompany the shipment of hazardous waste to the TSDF. The TSDF will be notified prior to the waste being sent. The following items must accompany the notification and are included in one of the following facility-specific forms:

- EPA Hazardous Waste Generator identification number for material flow analysis
- Manifest number, including state disposal application number
- Waste analysis data
- Corresponding concentration-based or technology-based treatment standards will be identified if the waste is also land disposal restricted

RCRA recordkeeping requirements per 40 CFR, Parts 262.20 through 262.44, including retention of signed copies of manifests from the designated facility that received the waste, will be adhered. Additionally, biennial and exception reporting information will be submitted, as necessary, according to 22 CCR, Sections 66262.41 and 66261.42, and 40 CFR, Parts 262.41 and 262.42. Additional reporting may be required in accordance with 22 CCR, Section 66262.43, and 40 CFR, Part 262.43.

1.3 WASTE MANAGEMENT FOR RADIOACTIVE WASTES

The following subsections address specific control and management practices for LLRW and low-level mixed waste (LLMW), hereafter including low-level contaminated waste (LLCW), that should be followed by the certified waste broker contracted by the Department of Defense (DoD) Executive Agency for LLRW. Disposal of all LLRW and LLMW will be handled through the DON's LLRW Disposal Program. TtEC has no responsibilities in verifying that the DoD broker adheres to these requirements.

The certified DoD waste broker should be used for all packaging, storage, shipping, manifesting, and disposal of LLRW and LLMW. The waste broker should coordinate closely with the Radiological Affairs Support Office (RASO).

1.3.1 Waste Classification

Radioactive wastes should be classified as specified in 49 CFR and/or disposal facility requirements. These wastes should be categorized as either LLRW or LLMW. Waste characteristics, including the radionuclides present and their associated specific activity, should be measured by an available standardized test method such as gamma spectroscopy, strontium analyses, and/or alpha spectroscopy. Additionally, for LLMW, chemical waste characteristics can be measured by a standardized test method or be reasonably classified by generators of waste based on their knowledge of the waste, provided that the waste has already been reliably tested for acceptance at the waste disposal facility.

A waste determined not to be a RCRA LLMW may still be considered a state-regulated non-RCRA LLCW (low level radioactive and non-RCRA hazardous). The state is broader in scope in its RCRA program in determining hazardous waste.

1.3.2 Waste Accumulation and Storage

As for hazardous waste, specific requirements apply to the accumulation time for LLMW or LLCW on-site and to the accumulation and labeling of LLMW. This project may result in the temporary accumulation of LLMW or LLCW in containers. These wastes should be managed, accumulated, and inspected in accordance with the hazardous waste regulations and may only be stored on-site for less than 90 days. Accumulation time requirements do not apply to LLRW-only waste.

All LLRW, LLMW, and LLCW should be packaged per the direction of a waste broker certified by the DoD Executive Agency for LLRW (Army Field Support Command) in accordance with federal directives and disposal facility requirements. Typical containers that may be used for these wastes include bins, 55-gallon drums, B-25 boxes, and/or covered roll-off containers. Containers should be properly lined, and absorbent should be used if it is considered necessary. All containers should be radiologically surveyed and/or swiped by the DoD broker when received. Each container should be properly inventoried and labeled. Inventories should include material description and isotopic identification, and hazardous components if appropriate. The contents of each container should be recorded in the field logbook, and each container should be assigned a unique identification number. Records should be maintained by the DoD broker.

Containers should be stored in a designated and posted radiological materials storage area under the authority of the DoD broker's Nuclear Regulatory Commission (NRC) or California Agreement State radioactive materials license. Storage areas may be at the site where the waste originated. Containers should be secured to prevent unauthorized access to the contents of the container. Once filled, all containers should be surveyed and surface radiation measurements collected by the DoD broker using an ion chamber survey meter or equivalent.

1.3.3 Radiological Point Sources

Radiological point sources (such as radium-containing dials) should be packaged in metal drums in accordance with DOT regulations specified in 49 CFR, Subpart I, and should be stored in a posted radiological materials area. The DON is responsible for the transportation and disposal of radiological point sources.

1.3.4 Soil, Debris, and Materials

Soil, debris, and materials classified as LLRW or LLMW may be generated during excavation. When classified as LLRW or LLMW, these wastes should be placed in bins, 55-gallon drums, B-25 boxes, and/or roll-off containers.

1.3.5 Wastewater and Waste Fluids

Wastewater from the radioactive material decontamination area should be maintained separately from hazardous decontamination and dewatering wastewater. If the wastewater chemical characteristics are unknown, wastewater should be managed as LLRW wastewater, until characterized. Known or suspected LLMW or LLCW wastewater should be segregated during accumulation and storage. When decontaminating and dewatering radioactively contaminated material, every effort should be made to minimize the generation of mixed waste.

1.3.6 Labeling and Posting of Containers Containing Radioactive Waste

Each waste container containing LLRW or LLMW should be labeled by the DoD broker. The specific activity contained in each waste container and maximum contact radiation levels should be measured in milliroentgens per hour (mR/hr). Following the surveying and labeling, the waste container should be placed in a designated and posted radioactive material storage area. The waste container should be posted with a "Caution – Radioactive Material" sign. The sign should also note the maximum surface radiation level (measured in mR/hr). An inventory of contents with radionuclide and specific activity (if available) should be posted on the outside of the container or a notice should be posted stating where this information is found. The waste inventories should be managed under DoD NRC or California Agreement State radioactive materials license, including the mixed waste inventory due to the radioactive constituents.

1.3.7 Waste Accumulation Areas

The DoD broker working on this project in conjunction with TtEC should implement, at a minimum, the following requirements for radioactive waste stored on-site within a designated radioactive waste storage area:

- An industry standard placard and barrier materials should be displayed with wording that includes the following, "Caution, Radioactive Materials Area-Unauthorized Personnel Keep Out" (written in English and Spanish), at each radioactive waste storage area sufficient to be seen from any approach. The signs should be legible and clearly conspicuous for outdoor and indoor locations.
- Aisle space should be maintained to allow for the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency, unless aisle space is not needed for any of these purposes.
- The areas should be secured to prevent unauthorized access to the material.
- The following emergency equipment should be located or available to personnel during radioactive waste management activities at each accumulation area:
  - A device, such as a telephone or a hand-held two-way radio, capable of summoning emergency assistance

- Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment

Filled containers generated during performance of this remedial action should be stored at the site where they were generated, until the contained material can be characterized for packaging and disposal by the DoD waste broker.

1.3.8 Waste Disposal

A certified waste broker contracted by the DoD Executive Agency for LLRW should be used for all packaging, shipping, manifesting, transportation, and disposal of LLRW, LLMW, and LLCW. The certified waste broker should coordinate closely with RASO. LLRW, LLMW, and LLCW inventories once identified by TtEC will be immediately turned over for management to the waste broker. These materials should be managed under the DoD broker's NRC license because of the radioactive constituents.

The certified waste broker should be responsible for preparing the hazardous waste manifests for the LLMW and the radioactive waste manifests for the LLRW. These manifests should be signed by the certified waste broker. The certified waste broker should also be responsible for coordinating the shipment of LLMW and LLRW and coordinating with the waste disposal facilities.

1.3.9 Waste Transportation

Wastes sent off-site for disposal should be done so in accordance with the DOT Radioactive Material Transportation regulations of 49 CFR, by a certified waste broker contracted by the DoD Executive Agency for LLRW. Personnel having the required DOT training should perform assistance as needed.

The certified waste broker should be responsible for surveying and taking radiation measurements on the outside of the container prior to shipment. The certified waste broker should work with the Caretaker Site Office (CSO) representative to ensure that containers leaving the site meet the release limits for equipment and materials as identified in the Radiological Work Plan (Attachment 2 to the RAWP).

1.3.10 Waste Minimization

To minimize the volume of radioactive waste generated during the project, the following general guidelines will be followed:

- Waste material will not be contaminated unnecessarily.
- Work will be planned ahead.
- Cleaning and extra sampling supplies will be maintained outside any potentially contaminated area to keep them clean and to minimize additional waste generation.

- Mixing of detergents or decontamination solutions will be performed outside potentially contaminated areas.
- When decontaminating radioactively contaminated material, every effort should be made to minimize the generation of mixed waste.
- Contaminated material will not be placed with clean material.
- Wooden pallets inside the exclusion zone will be covered with plastic.
- Material and equipment will be decontaminated and reused when practicable.
- Volume reduction techniques will be used when practicable.

1.3.11 Inspections

The DoD broker is responsible for LLRW accumulation areas. While all waste accumulation areas should be informally inspected on a daily basis, formal inspections of all container accumulation areas should be conducted and recorded at least weekly in accordance with the DoD broker's NRC license requirements. The RTM or designee will conduct inspections. Inspections will be recorded in a dedicated field logbook, and a weekly inspection checklist should be completed. The container storage area(s) should be inspected to ensure the following:

- The containers should be checked for good condition. If a container is not in good condition the certified waste broker will be informed.
- The containers should l be checked to ensure that they remain closed and secured at all times, except when adding or removing waste.
- The container label should be checked to ensure that it is visible and filled out properly.

1.3.12 Documentation

Documentation requirements apply to all waste managed during project activities. Field records should be kept of all waste-generation activities. All pages of the field data record log will be signed and dated by the person who is entering the data. In addition, the following information will be recorded in the log:

- Description of waste-generating activities
- Location of waste generation (including depth, if applicable)
- Type and volume of waste
- Date and time of generation
- Description of any waste sampling
- Name of person recording information
- Name of RTM at time of generation

1.3.13 Radioactive Waste Manifests

All radioactive waste transported from the site should be accompanied by a radioactive waste manifest and/or hazardous waste manifest if necessary. The LLRW/LLMW/LLCW manifests are the responsibility of the certified waste broker. LLRW manifests are signed by the broker.

The CSO and RASO should each receive one copy of the manifest; the remaining copies should be given to the transporter. The manifest should be returned to the DON's signatory official for the base's recordkeeping requirements. Copies of all manifests for waste generated at the site should be kept in a compliance file within the DoD broker's project files.

1.4 HAZARDOUS MATERIAL SECURITY PLAN

If it is determined that placardable DOT hazardous materials will be generated on-site, a DOT Hazardous Material Security Plan will be prepared as a stand-alone document. The Hazardous Material Security Plan will be prepared in accordance with 49 CFR 172, Subpart H, and will guide the management for security purposes of hazardous materials prior to shipment. All site personnel responsible for hazardous materials security will receive both general awareness and plan-specific training. This training will be documented in the project file.

1.5 UPDATING THE WASTE MANAGEMENT PLAN

The WMP will be updated as changes in site activities or conditions or changes in applicable regulations occur. Revisions to the WMP will be reviewed and approved by the DON. All changes to the WMP associated with radioactive or mixed waste will require approval from the RASO.

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2.0 REFERENCES

EPA (United States Environmental Protection Agency). 1992. Guide to Management of Investigation-Derived Wastes. Publication 9345.3-03FS. January 2.

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TABLES

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TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Excavated soil and/or refuse intended for off-site disposal	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous or nonhazardous) can be made based on generator knowledge, stockpiled soil and/or refuse will be sampled in accordance with the SAP. Samples will be run for potential contaminants including: VOCs, SVOCs, TPH, PCBs/Pesticides, total metals analysis and STLC or TCLP, as appropriate.	Contain in within the RMA until characterized. RCRA hazardous and non-RCRA hazardous soil contain in bermed pad with underlying 20-mil polyethylene liners.	All hazardous excavated soil and/or refuse intended for off-site disposal will be stockpiled on liners or placed bins. Nonhazardous soils may be taken to an unlined area the Navy has designated. All stockpiles will have appropriate erosion, wind, and stormwater run-on and runoff controls and other appropriate BMPs will be employed as required. Hazardous stockpiles will be identified as RCRA hazardous or non-RCRA hazardous waste. Hazardous stockpiles will be managed in accordance with the staging pile requirements of 40 CFR, Section 264.554.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	Due to the CERCLA Off-site Rule, all excavated soil will be sent to an appropriate TSDF approved under the CERCLA Off-site Rule. Prior to transport, the soil will be segregated as RCRA hazardous, non-RCRA hazardous, and/or nonhazardous. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal. All LLRW wastes will be turned over to the DoD Waste Broker for transportation and disposal.
Trees and other above ground vegetation	Above ground tree and other vegetation will be considered to be non-hazardous unless it has contacted hazardous materials	Laydown in uncontaminated area or on a clean surface within the contaminated area.	For clean vegetation and trees, no storage requirements. For vegetation or debris contacting radiological or other contamination materials, the materials will be stored in accordance with the above (Excavated soil or refuse intended for disposal off-site).	Trees and vegetation may be transported in open rolloff bins as green wastes.	Green materials will be sent to an off-site composting facility. Trees and woody materials may be chipped and dispersed in the random fill area of the landfill.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Used oil (including motor oil, hydraulic fluid, greases	Used oil may be characterized based on process knowledge when solely from heavy equipment. Other oils, or oils without process knowledge will be sampled and tested in accordance with the SAP	Used oil to be stored in 55-gallon containers.	Used oil to be stored in 55-gallon drums labeled "**USED OIL**" and located within a secondary containment unit. A contracted waste oil recycler shall pick up used oil for recycling.	Used oil will require a bill of laden for recycled materials.	Used Oil will be Recycled, no disposal.
Used fuel and oil filters	Used oil filters and oil will be handled as a Specified California Hazardous Waste. "Drained" oil filters may be managed as a nonhazardous solid waste. Recycling of the "empty" filters is an alternate method for removal of this material from site. Run total analysis and STLC or TCLP, or use process knowledge to make a waste determination. Spent fuel filters (drained) will be handled as nonhazardous solid waste.	"Drained" oil filters to be placed into plastic bags within 55 gallon open top drums. Filters to be drained and stored within the secondary containment area.	Spent oil and fuel filters will be completely drained and placed into plastic bags before being placed into nonhazardous solid waste dumpsters or retained for recycling.	Hazardous waste manifest required for disposal. Hazardous waste manifest to be signed by the DON. Recycled filters will require a bill of laden for recycled materials.	Contracted recycler to pick up and recycle used oil Secondary choice would be disposal of the bagged (drained) oil filters at an approved Class III solid waste landfill.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Wastewater (decontamination water, and collected radiologically impacted stormwater)	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous or nonhazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including: pH, VOCs, SVOCs, TPH, PCBs/Pesticides, total metals analysis and STLC or TCLP, as appropriate.	DOT-approved 55-gallon (bunghole-type) metal drums (1A1) or aboveground tank(s).	Ninety-day storage limit applies to tanks and containers containing hazardous waste. Containers and tanks will be marked as **“HAZARDOUS WASTE”** and include the accumulation date, composition and physical state of the waste, hazardous properties, and name and address of generator. Containers and tanks will be sealed when not being filled/unloaded. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids. Store in predesignated hazardous waste storage areas with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent off-site for disposal at an appropriate TSDF approved under the CERCLA Off-site Rule. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal. Alternately, radiologically impacted waters may be treated on site, sampled and used for dust control purposes.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Hazardous contents from buried containers, if encountered.	Unless a definitive nonhazardous waste determination can be made based on generator knowledge, container contents will be presumed hazardous pending analytical results and waste determination (e.g., RCRA hazardous, non-RCRA hazardous or nonhazardous) to determine appropriate management and disposal procedures. Samples will be run for reactivity, corrosivity, ignitability, and all potential contaminants of concern including: VOCs, SVOCs, PCBs, Pesticides, TPH, and metals.	DOT-approved 55-gallon (bunghole-type) metal drums for liquids (1A1) or over-pack containers. For limited amounts of material, open top 55 gallon drums maybe be used. For bulk wastes, closed top rolloffs can be used, or the materials placed on a lined containment area and covered	Ninety-day storage limit applies to containers containing hazardous waste. Containers will be marked as **"HAZARDOUS WASTE"** and include the accumulation date, composition and physical state of the waste, hazardous properties, and name and address of generator. Containers and tanks will be sealed when not being filled/unloaded. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids. Store in predesignated hazardous waste storage areas with secondary containment. Incompatible materials will be segregated.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent off-site for disposal at an appropriate TSDF approved under the CERCLA Off-site Rule. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal.
Used air filters	Air filters will be surveyed for radiological contamination.	Spent air	All filters are to be placed into plastic bags and placed into nonhazardous solid waste dumpsters.	Contracted solid waste management company to collect trash.	Dispose of air filters in site dumpsters or roll-off bins for nonhazardous solid waste and subsequent disposal at an approved Class III Landfill.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Construction debris (rock, wood, piping, concrete, asphalt, and oversized material)	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous or nonhazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including: VOCs, SVOCs, TPH, total metals analysis, and STLC or TCLP. Debris not having contact with waste or contaminated soil may be characterized as a nonhazardous solid waste.	Hazardous debris moved from point of generation to the decontamination area. Hazardous debris stored in bins or managed stockpiles.	Decontaminated debris (debris that meets the debris treatment standard and is not contaminated with a listed waste) and nonhazardous debris may be stored in nonhazardous solid waste roll-offs bins. Hazardous debris that cannot be decontaminated and does not meet the debris treatment standards will be stored in containers and/or bins and will be marked as follows: **"HAZARDOUS WASTE"** and include the accumulation date, composition and physical state of the waste, hazardous properties, and name and address of generator. Containers and/or bins will be sealed/ covered when not being loaded/unloaded. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids.	No special transporter requirements for debris determined to be nonhazardous. Contracted solid waste management company to collect material. If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	Nonhazardous debris or debris treated to meet "Alternate Treatment" standards may be disposed off-site at an approved Class III solid waste landfill. Hazardous waste will be containerized and sent off-site for disposal at an appropriate TSDF approved under the CERCLA Off-site Rule. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal.
Nonhazardous waste (trash, inert construction debris, calibration canisters, clean polyethylene liners, and so forth)	Materials generated during the remedial action project and not contaminated with any waste or waste residue may be characterized as a nonhazardous solid waste.	Waste to be stored in nonhazardous roll-off bins or stockpiles.	Nonhazardous waste to be stored separate from hazardous waste and labeled accordingly to prevent commingling of hazardous and nonhazardous wastes.	No special transporter requirements for wastes determined to be nonhazardous. Contracted solid waste management company to collect material.	Nonhazardous waste to be disposed off-site at an approved Class III solid waste landfill.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Polyethylene sheeting or other liner materials (Contaminated)	Liners used for containing hazardous soil will be presumed to be hazardous.	Liners will be stored in roll-off bins or DOT 55-gallon drums.	Labeling should consist of a completed commercial hazardous waste label. Roll-off bins will be marked as **"HAZARDOUS WASTE"** and include the accumulation date, composition and physical state of the waste, hazardous properties, and name and address of generator. Roll-off bins will be sealed/covered when not being loaded/unloaded. Roll-off bins will be elevated to prevent contact with any ponded precipitation and/or liquids.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent off-site for disposal at an appropriate TSDF approved under the CERCLA Off-site Rule. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal. For LLRW, wastes will be turned over to the US Army Waste Broker for transportation and disposal.
Scrap metal	Unless generator knowledge is sufficient to make a nonhazardous determination, metal debris will be decontaminated in accordance with the hazardous debris treatment standards before it can be managed as scrap metal for recycling.	Segregate scrap metal from other construction debris following decontamination.	Store in unique rolloffs outside the contamination area to prevent commingling with hazardous wastes and construction debris.	No special transporter requirements for scrap metal determined to be nonhazardous. Contracted scrap metal recycling company to collect material.	Scrap metal routed thru a portal monitor prior to being sent to an approved scrap metal recycling facility.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
PPE	Use process knowledge to make a waste determination. Decontaminated PPE can be managed as a nonhazardous solid waste. LLRW PPE will be treated as being LLRW.	Use plastic bags at point of generation to transport to the 90-day accumulation area. (for non-rad PPE). LLRW PPE will be placed in DOT-approved 55-gallon metal drums (1A2).or placed into LLRW rolloff bins.	Labeling should consist of a completed commercial hazardous waste label. Containers will be sealed/covered when not being loaded/unloaded. Containers and roll-off bins will be elevated to prevent contact with any ponded precipitation and/or liquids. Store in predesignated hazardous waste storage areas with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements. Decontaminated PPE may be placed into nonhazardous solid waste roll-off bin to be picked up by contracted solid waste disposal contractor.	Decontaminated PPE may be disposed at an approved Class III solid waste landfill. If hazardous the waste will be containerized and sent off-site for disposal at an appropriate TSDF approved under the CERCLA Off-site Rule. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal. For LLRW, wastes will be turned over to the DoD Waste Broker for transportation and disposal.

TABLE 1-1

SUMMARY OF WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL REQUIREMENTS

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Unidentified waste streams (i.e., waste streams that may be generated during site activities, but have yet to be identified)	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous or nonhazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including VOCs, SVOCs, TPH, PCBs/pesticides, total metals analysis, and STLC or TCLP, as appropriate.	DOT-approved 55-gallon metal drums (1A1 or 1A2) depending on whether a liquid or solid.	If hazardous waste, labeling should consist of a completed commercial hazardous waste label. Containers will be sealed/covered when not being managed. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids. If a hazardous waste, the storage accumulation clock starts from the date that waste is first put into the container destined for off-site disposal (90-day max. allowed). Store in predesignated hazardous waste storage areas with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA-permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the DON. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent off-site for disposal at an appropriate TSDF approved under the CERCLA Off-site Rule. All disposal facilities will be submitted for preapproval to the CSO prior to off-site transport and disposal.
UXO/MEC	UXO/MEC will be evaluated by a UXO Technician to determine if the item(s) are hazardous or inert.	MEC that is determined to be MEC or MMPEH	Will be inventoried and stored in drums or magazines as determined by the UXO Supervisor.	Will be made inert, demilitarized by the UXO supervisor, or destroyed by EOD.	Disposal at an approved disposal facility as determined by the UXO Supervisor.

Abbreviations and Acronyms:

Cal/EPA – California Environmental Protection Agency
CFR – *Code of Federal Regulations*
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CSO – Caretaker Site Office
DoD – Department of Defense
DON – Department of the Navy
DOT – Department of Transportation
LLRW – low-level radioactive waste
LDR – land disposal restriction
MEC – munitions and explosives of concern
MPPEH – material potentially presenting an explosive hazard
PCB – polychlorinated biphenyl
PPE – personal protective equipment
RCRA – Resource Conservation and Recovery Act
RMA – Radiological Material Area
SAP – Sampling and Analysis Plan
STLC – Soluble Threshold Limit Concentration
SVOC – semivolatile organic compound
TCLP – Toxicity Characteristic Leaching Procedure
TPH – total petroleum hydrocarbons
TSDF – treatment, storage, and disposal facility
UXO – unexploded ordnance
VOC – volatile organic compound

ATTACHMENT 11

POST-CLOSURE OPERATIONS, MAINTENANCE, AND MONITORING PLAN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 11

FINAL
POST-CLOSURE OPERATIONS, MAINTENANCE, AND MONITORING PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

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ABBREVIATIONS AND ACRONYMS

BGMP	Basewide Groundwater Monitoring Program
CCR	*California Code of Regulations*
CFR	*Code of Federal Regulations*
COC	contaminant of concern
CTR	California Toxics Rule
DON	Department of the Navy
DTSC	Department of Toxic Substances Control
EC	engineering control
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
FWBZ	first water-bearing zone
GME	Groundwater Monitoring Evaluation
HCH	hexachlorocyclohexane
IC	institutional control
IR	Installation Restoration (Program)
MNA	monitored natural attenuation
NAS	Naval Air Station
PCGMP	post-closure groundwater monitoring program
RAO	remedial action objective
RAWP	Remedial Action Work Plan
RD	Remedial Design
RI	remedial investigation
ROD	Record of Decision
SOP	standard operating procedure
SWBZ	second water-bearing zone

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1.0 INTRODUCTION

Tetra Tech EC, Inc., has prepared this Post-Closure Operations, Maintenance, and Monitoring Plan (Plan) for Installation Restoration (IR) Site 2, former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California. This Plan was prepared for the Department of the Navy (DON), Base Realignment and Closure Program Management Office West under Contract No. N62473-10-D-0809, Contract Task Order 0009. The purpose of this Plan is to describe the operations, maintenance, and monitoring to be implemented after construction of the multilayer soil cover (cover) on the IR Site 2 landfill. The approach set forth in this Plan was developed based on the description of the selected soil remedy in Record of Decision (ROD) (DON 2010), site conditions described in the Remedial Investigation (RI) Report (Battelle and BBL 2006), and the Feasibility Study (FS) Report (Battelle and BBL 2008)

1.1 SITE DESCRIPTION

The site covers approximately 110 acres in the southwest corner of the former Alameda NAS, now referred to as Alameda Point (Figure 1-1). The site consists of the former landfill area (West Beach Landfill), which occupies approximately 60 acres, and a wetland, which covers approximately 33 acres immediately south and west of the landfill. The wetland area includes two surface water features, the north pond and the south pond. The north pond is connected by a culvert to San Francisco Bay. The remaining 17 acres within the site boundary is known as the interior margin and the coastal margin. The site is bound on the south and west by San Francisco Bay and on the east and north by runways and tarmacs.

Additional site background information is presented in Section 2.0 of the Remedial Action Work Plan (RAWP).

1.2 SITE HISTORY

The site was formerly part of the San Francisco Bay and was created by construction of a seawall around the perimeter, filling with dredge materials, and subsequent disposal of wastes generated by former NAS Alameda activities from 1956 through early 1978. Historical disposal methods at the site generally consisted of trench-and-fill operations and placement of cover soil on an intermittent basis. These operations resulted in waste that is in contact with shallow groundwater. Alameda Point was included on the National Priorities List of Superfund sites in August 1999, U.S. Environmental Protection Agency (EPA) (Identification: CA2170023236).

After landfill operations ceased in 1978, an earthen berm was constructed around the perimeter of the landfill. The extent of the landfill, as defined in the ROD (DON 2010) and as modified based on the Intermediate Draft Remedial Design Report (KCH 2011), is shown on Figure 1-1.

1.3 FUTURE USE

IR Site 2 has been designated for federal agency (DON) to federal agency (Office of Veterans Affairs) transfer. The proposed future use at IR Site 2 is "undeveloped" with potential for recreational uses such as a perimeter hiking trail.

1.4 PREVIOUS ACTIVITIES

IR Site 2 was used as a landfill. There was no land use at the site prior to 1956, when the perimeter sea wall was constructed and the site was first formed by using dredged fill. Due to its historical use solely as a landfill, no persons have resided or currently reside at the site.

1.4.1 Remedial Investigation/Feasibility Study

The Final RI Report (Battelle and BBL 2006), the FS, and Basewide Groundwater Monitoring Program (BGMP) reports describe in detail the nature and extent of groundwater contamination. The most commonly detected organic contaminants in site groundwater are volatile organic compounds, total petroleum hydrocarbons, and other fuel-related compounds (ITSI 2008). Groundwater contamination is characterized by a relatively widespread pattern of low-level contamination. The source of contamination is attributed to the operation of the site as the principal waste disposal facility for Alameda Point between 1956 and 1978.

1.4.2 Record of Decision

The DON conducted an FS (Battelle and BBL 2008) to evaluate potential remedial alternatives for IR Site 2 and prepared a ROD (DON 2010) to document the selected remedy for the site. The DON and the Federal Facility Agreement signatories (the EPA, California Environmental Protection Agency, Department of Toxic Substances Control [DTSC], and the San Francisco Bay Regional Water Quality Control Board) concurred on the selected remedy for the site. The decision agreed to in the ROD is based on information contained in the administrative record file as well as on extensive field investigations, laboratory analyses, interpretation of the data, review of current and future conditions, assessment of the potential human health and ecological risks, and an evaluation of potential remedial alternatives.

1.4.3 Remedy for Soil

The selected remedy for soil, as outlined in the ROD, is Alternative 2, a multilayer soil cover, engineering controls (ECs) and institutional controls (ICs), and monitoring. This alternative consists of installation of an engineered soil cover over the former landfill to isolate buried waste and soil contaminants and prevent animal burrowing; implementation of engineering and land use controls to protect human health and soil cover integrity; provision for any necessary wetlands mitigation if impacts to wetlands occurs; monitoring of the soil cleanup action and wetlands mitigation to ensure their proper construction and long-term effectiveness; and conduct of methane gas monitoring as necessary. The RAWP addresses the design of the soil remedy and includes more details on the ECs and ICs.

1.4.4 Remedy for Groundwater

The selected remedy for groundwater, as outlined in the ROD, is Alternative 2 – Monitored Natural Attenuation (MNA). This alternative consists of regularly monitoring groundwater quality using shoreline groundwater monitoring wells to ensure that there are continued stable to decreasing trends in contaminant concentrations, and protection of the beneficial uses of surface water in San Francisco Bay; and implementation of engineering controls and ICs to protect human health and the groundwater remedy.

The objective of MNA is to verify the occurrence of natural attenuation of groundwater contaminants through monitoring. In accordance with the ROD, contaminants will not be actively remediated, but will be allowed to degrade, adsorb, dilute, or transform according to natural, unaided environmental processes (DON 2010). The groundwater remedy meets the Remedial Action Objective (RAO) described in the ROD to protect beneficial uses of surface water in San Francisco Bay from the potential for discharge of site groundwater (DON 2010).

Because groundwater at the site is not used for drinking water and is not considered a potential drinking water source, numerical standards associated with groundwater (such as maximum contaminant levels for drinking water) do not apply. Instead, chemicals identified during the remedial investigation in excess of California Toxics Rule (CTR) surface water quality criteria were summarized in ROD Table 2.7.

While the CTR criteria are not directly applicable to groundwater, the criteria are appropriate to provide suitable context for evaluating IR Site 2 groundwater relative to groundwater RAOs. Currently, risk to San Francisco Bay surface water from site groundwater is considered negligible. A groundwater monitoring evaluation and groundwater monitoring activities will be detailed in an Addendum to the RAWP.

1.5 SELECTED REMEDY COMPONENTS

1.5.1 Gas Venting

The landfill area was designed with a passive gas venting system to prevent landfill gas buildup which could disrupt the cover. The gas venting trenches are filled with high permeability aggregate and geotextile surrounding a 4-inch perforated pipe. The pipes connect to gas vents open to the atmosphere.

Ten existing landfill gas probes will be destroyed during soil cover construction. Nine new perimeter gas probes will be installed at IR Site 2, as shown in the design drawings presented in RAWP Attachment 1. These probes will be designed and located as described in the RAWP and attached 100% Remedial Design (RD).

1.5.2 Subgrade and Foundation Fill

The subgrade and foundation fill will consist of common fill materials or natural ground. The primary requirement for this fill material is that it be compatible and provide stable support for the cover. The primary purpose of the subgrade and foundation fill is to build up the original landfill surface to moderate, uniform slopes. Grades established for the cover system will be approximately 1.5 percent to account for potential settlement and maintain positive drainage over the cover system.

1.5.3 Multilayer Soil Cover

The proposed cover will be 2 feet thick to provide required isolation from the waste, and will consist of three distinct layers:

- Animal intrusion barrier consisting of minimum 220-mil high-density polyethylene geonet
- Cover layer of 18 inches of common fill
- Vegetative layer of 6-inch-thick topsoil amended to help establish vegetation

1.5.3.1 Animal Intrusion Barrier

The animal intrusion barrier will be installed utilizing minimum 220-mil layer of high-density polyethylene geonet. The material will require no specialized seaming and will transverse the fill.

1.5.3.2 Cover Layer

After the animal intrusion barrier is placed over a portion of the site, a cover layer will be installed consisting of an 18-inch layer of import material meeting geotechnical specifications and conditioned for moisture.

1.5.3.3 Vegetative Layer

The vegetative layer is a 6-inch layer that requires only 85 percent compaction and is amended to help establish vegetation. This fill material is similar to the cover material.

1.5.3.4 Vegetation

The landfill cover will be hydroseeded with a mixture identified in the Specifications in the 100% RD (Attachment 1 to the RAWP).

1.5.3.5 Surface Water Management System (Drainage and Swale Layer)

Two new earthen swales with turf reinforcement mats are integrated into the cover design. The channels slope from 0.5 to 1 percent and have been placed to maximize the efficiency of collection and transfer of sheet flow from the completed cover. An existing concrete channel located on the eastern boundary of the site will be maintained throughout construction and incorporated into the final drainage system.

1.5.4 Settlement Monuments

Four settlement monuments will be installed on the final cover system as specified in the 100% RD (Attachment 1 of the RAWP). Markers will be located where the depth of fill is the greatest and therefore settlement potential the highest. The monuments will be located so that settlement rate and trends can be monitored and assessed.

1.6 DOCUMENT ORGANIZATION

This Plan is organized as follows:

- **Section 1.0** provides the site description, history, previous activities, site remedy components, and document organization.
- **Section 2.0** describes the requirements for post-closure groundwater and methane monitoring.
- **Section 3.0** describes the operation and maintenance requirements for site structures.
- **Section 4.0** describes the operation and maintenance requirements for the landfill cover settlement.
- **Section 5.0** describes the monitoring and maintenance requirements for the wetlands mitigation areas.
- **Section 6.0** provides the proposed schedule.
- **Section 7.0** describes reporting requirements.
- **Section 8.0** provides post-closure financial assurance.
- **Section 9.0** provides post-closure certification.
- **Section 10.0** lists the references cited in the text.
- Tables and figures follow the text.
- **Appendix A** includes the Standard Operating Procedures (SOPs).
- **Appendix B** presents the estimated annual cost for operations, maintenance, and monitoring.
- **Appendix C** presents the required Emergency Response Plan.

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2.0 OPERATIONS AND MAINTENANCE FOR GROUNDWATER AND METHANE MONITORING

2.1 GROUNDWATER MONITORING WELL NETWORK EVALUATION

The DTSC, in a written communication dated March 1, 2013, requested that the DON submit a separate Groundwater Monitoring Evaluation (GME) as a Remedial Design Addendum document. Groundwater monitoring requirements will be detailed in the GME and will be incorporated in the post-closure United Federal Programs Quality Assurance Project Plan. The construction of the soil remedy is not dependent on concurrence with a GME.

2.2 METHANE MONITORING

Methane monitoring will be conducted in accordance with Title 27 CCR, Section 20921 (a), to provide for the protection of public health and safety and the environment by demonstrating that methane migration is not occurring in the vadose zone and that methane levels in ambient air at the landfill perimeter is in compliance. Nine new monitoring probes will be installed around the landfill perimeter. Methane monitoring probe construction details are included in the 100% RD (Attachment 1 to the RAWP, sheet D-2). Probe locations are shown on sheets C-9 through C-11.

Methane monitoring will be conducted quarterly. Methane will be measured at each probe to evaluate subsurface concentrations. An exceedance of the criterion will be considered verified if concentrations are above 5 percent by volume for any two of three consecutive quarters. If methane concentrations are confirmed, the EPA and the San Francisco Bay Regional Water Quality Control Board will be promptly notified and the gas control system design re-evaluated.

In addition, barometric pressure, atmospheric temperatures, and general weather conditions will be reported at the time of gas collection. It is recommended by the Integrated Waste Management Board to collect landfill gas during barometric low pressures. Depending on the weather, this may be late in the morning or early in the afternoon.

In addition to monitoring the probes, perimeter monitoring locations spaced approximately 250 feet apart along the boundary of the landfill cover will be used to monitor ambient air at the point of compliance. Establishing the perimeter monitoring locations will be the responsibility of the post-closure operations and maintenance contractor. Relevant standard operating procedures for landfill probe and surface perimeter monitoring are listed in Table 2-1 and included in Appendix A.

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3.0 OPERATIONS AND MAINTENANCE FOR SITE STRUCTURES

The maintenance and monitoring will begin once the landfill soil cover construction is complete, anticipated in January 2014.

3.1 LANDFILL COVER SURFACE WATER MANAGEMENT SYSTEM

Existing drainage features include concrete channel, drainage piping and inlets, concrete outfall culverts, and earthen swales. Supplemental drainage in accordance with the final cover design will supplement existing drainage with a total of three turf reinforced mat channels. An existing concrete channel located on the eastern boundary of the site will be maintained throughout construction, and incorporated into the final drainage system.

Concrete channels and earthen swales with turf reinforcement mat collect and divert stormwater runoff. Concrete channels prevent erosion in areas where stormwater flow might accumulate. Proper and adequate inspections of the channels are required to prevent sediment build-up and failure of integrity. Inspections will be conducted annually before the rainy season and in the event of heavy precipitation resulting in either 0.50 inch or more of rainfall within 24 hours or 0.25 inch or more within 1 hour. The inspection will be in accordance with SOP 004 (Appendix A).

Concrete channels associated with the landfill cover drainage system will be visually inspected by walking the length of each channel. Special attention is required to verify sediment and debris accumulation along the channels, cracking or fractures of the concrete structure, erosion at joints or along edges, and separation or deterioration of joints between concrete sections.

Drainage pipe cleanout ports and discharge piping will be visually inspected for damage or blockage. Drainage pipe outlets, discharge piping, and riser pipes will be cleared to allow free flow of water. The pipe outlets will also be inspected for blockage.

Nonconcrete drainage channels and swales will be inspected for erosion and proper functioning. Special attention should be directed to areas of no grass or patchy grass; ripples or swells in the soil caused by erosion; and settlement that inhibits or prohibits storm water flow.

Stormwater should flow around, off, and away from the landfill covers, with visual flow directly into the concrete channels or other established drainage routes. The perimeter of both covers should be inspected to check that drainage flows around and away from the covers. The lip and entrance to concrete drainage channels will also be inspected to check for areas where storm water may not readily enter a channel. Inspection should be made by walking the cover perimeters and drainage channels.

3.2 WETLANDS CULVERT

The wetlands culvert hydraulically connects the North Pond to San Francisco Bay. The culvert will be inspected quarterly and in the potential event that tidal circulation is inhibited or blocked due to culvert failure, the Navy will restore tidal circulation within 7 days.

3.3 GAS COLLECTION

The landfill passive gas collection system consists of a perimeter boundary conveyance trench filled with high permeability sandy soil surrounding a 4-inch perforated pipe. The pipes are connected to gas vents open to the atmosphere at the high end of the trenches.

The gas vent pipes will be visually inspected in accordance with SOP 009 (Appendix A) with extra attention centered on cracks or holes in the riser pipe; missing or damaged screens and end caps; and completely destroyed riser pipes. The gas collection system will be decommissioned if results of methane monitoring indicate that the system is not required.

3.4 GAS PROBES

Existing soil gas probes located within the landfill boundary will be destroyed prior to multilayer soil cover installation (see Figure 2-1). A network of nine probes will be installed around the perimeter of the landfill in order to establish a compliance plane. The probes will be monitored in accordance with SOP 008 (Appendix A).

3.5 MONITORING WELLS

Existing groundwater monitoring wells located within the landfill boundary will be protected during cover construction, where feasible. If an existing well is damaged or removed for cover construction purposes, replacement wells screened at the same intervals will be installed within a 5-ft radius of the original well (see Figures 2-1 and 2-2). Monitoring well inspection and maintenance will be during sampling activities. The condition of the well vault lid, lid bolds, well cap, and well ID will be inspected and noted during each sampling event. Observations will be recorded on field monitoring well sampling forms.

3.6 SETTLEMENT MONUMENTS

Four settlement monuments will be installed on the final cover system as shown in the100% RD (Attachment 1). Markers will be located where the depth of fill is the greatest and, therefore, settlement potential is the highest. The monuments will be located so that settlement rate and trends can be monitored and assessed.

Monuments will be surveyed annually. Additionally, topographic surveys of the entire cover will be conducted every 5 years to evaluate settlement. Annual surveying will include the following:

- Inspect each monument with respect to the surrounding surface of the cover, noting whether the station appears to be even with the surrounding surface, if it is in a depressed area, or if the area is higher than the surrounding surface.
- Record all observations.
- Survey and record the elevations of all four settlement monitoring stations to an accuracy of 0.01 foot vertically against the benchmark.

Survey data will be collected by a California licensed surveyor and the data will be included in the annual reports and 5-Year Review. If significant settlement is found (typically more than 0.75 foot), a professional engineer will evaluate the situation and the site operator/manager will be notified.

3.7 ACCESS ROADS

Access roads within IR Site 2 will be constructed to provide easy access to the site for monitoring and maintenance activities. Each road is approximately 24 feet wide, constructed with 12 inches of compacted aggregate over geotextile fabric (100% RD, Attachment 1 to the RAWP, sheet D-4). Inspection of the roads will be conducted in association with other monitoring and maintenance activities. Access road inspection will be in accordance with SOP 003 (Appendix A). Access road maintenance and repair will be conducted in accordance with SOP 006 (Appendix A).

3.8 SIGNAGE

Maintenance activities will include inspection of general information placards for the perimeter monitoring locations and signs for the public indicating trail use or restoration areas on a semiannual basis to ensure that they have not been damaged. Signs that have been altered, or affected by natural conditions, will be replaced.

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4.0 OPERATIONS AND MAINTENANCE FOR LANDFILL COVER SETTLEMENT, EROSION, AND VEGETATION

4.1 DIFFERENTIAL SETTLEMENT AND EROSION

Differential settlement is caused by decomposition and/or consolidation of subsurface material, which may result in adverse grade or depression on the surface of the landfill cover. Since the groundwater remedy is MNA and the cover design does not address groundwater, differential settlement that results in ponding of surface water or affects drainage controls may not require corrective action. Erosion is anticipated to be the most common problem that will affect the landfill cover. Erosion is typically noted at the base of long slopes where water tends to accumulate due to grading and drainage patterns. Settlement or effects to drainage controls that cause erosion and reduce the thickness of the cover will need to be corrected.

4.1.1 Detection

The IR Site 2 landfill cover will be visually inspected quarterly by the Operations Manager or his/her designee and annually by a registered civil engineer or engineering geologist as described in SOP 001 (Appendix A) to ensure the integrity. Landfill cover maintenance activities will include assessment of the landfill cover conditions, vegetation control and restoration, and animal control. The perimeter of the landfill will be evaluated for areas where surface water is impounded, excessive erosion is evident, or sloughing is apparent on a slope. Surface cracks more than 1 inch wide and 12 inches deep, or longer than 20 feet may indicate slope instability, settlement, or internal thermal activity of the landfill. The quarterly inspection will include looking for pieces of geonet material and waste items on the cover surface that indicate the geonet animal intrusion barrier has been breached by burrowing animals. Landfill cover maintenance and repairs will be conducted in accordance with SOP 007 (Appendix A).

4.1.2 Repairs

For areas where the thickness of the cover has been compromised and repair is warranted, the cover will be repaired by excavating and stockpiling the top cover soils in the impacted area down to the animal intrusion barrier, and regrading that portion of the cover with material comparable to that used in the original cover design. Animal burrows that breach the geonet layer will be filled with low-strength concrete slurry. Repairs will need to be inspected by a registered civil engineer.

New fill soils would be placed at the locations designated by the registered civil engineer and compacted to 6 inches below the unaffected surrounding cover and compacted to approximately 90 percent of the Modified Proctor maximum dry density with water content within 0 to 4 percent of the modified optimum. The area will be re-covered with the removed topsoil cover material, compacted to approximately 85 percent, and scheduled for vegetation restoration.

The final grade will be graded with no more than a 1.5 percent slope and reseeded to match the undisturbed surrounding area. Major repair work will be inspected after completion by a registered engineer. The area will be surveyed after repair to obtain a record of the surface elevations of the repaired area.

4.2 VEGETATION

The landfill cover will be hydroseeded a mixture identified in the Specifications (100% RD Attachment 1 to the RAWP, sheet C-12). Once established, the vegetative cover will appear similar to local natural open space areas. The vegetative cover will turn green during the rainy season and is expected to fade to brown during the dry season. Since the landfill cover will be hydroseeded, during the rainy season, supplemental irrigation is not anticipated. The cover vegetation will be inspected as described in SOP 005 (Appendix A).

Reseeding may be required to cover repairs, eroded areas, dead areas, and bald spots. Supplemental irrigation may be required to help establish reseeded areas. Water will be apply re-seeded areas at a sufficient rate to ensure moist soil conditions to a minimum 1 inch depth, while preventing run-off.

4.3 DOCUMENTATION

Inspection of cover settlement should be recorded on the standardized form developed for this purpose provided in SOP 001, Multilayer Soil Cover Inspection.

Information on the form includes:

- Settlement location with regard to permanent markers
- Measurements of settlement or erosion

4.4 EXTRAORDINARY REPAIRS FOR THE COVER, BERM, AND SEAWALL

If a major seismic event occurs, the operation and maintenance contractor or designated alternate will initiate procedures to inspect all landfill systems, including settlement monuments. Initial repairs will be performed within 72 hours. For the purpose of this plan, a major seismic event is defined as one that equals or exceeds Intensity V (as defined by the Modified Mercalli Scale) at the site.

A major earthquake will require implementation of the following SOPs for inspection of all systems:

- SOP 001 Multilayer Soil Cover Inspection
- SOP 002 Landfill Gas Surface Monitoring
- SOP 003 Access Road Inspection
- SOP 004 Surface Water Management System Inspection and Maintenance

- SOP 005 Vegetative Cover Inspection and Maintenance
- SOP 006 Access Road Maintenance and Repair
- SOP 007 Multilayer Soil Cover Maintenance and Repair
- SOP 008 Landfill Gas Probe Monitoring
- SOP 009 Landfill Perimeter Gas Vent Inspection and Maintenance

If the seawall or the berm is damaged, it will be repaired. SOP 007 has procedures for repairing shallow and deep cracks, vertical cracks, cracks with vertical displacement, depressions, and sloughing/slope failure, which will be used for berm repair. For seawall repairs, inspection of the damage by a qualified engineer will be required to design the repairs including procedures for completing these repairs. These repairs could include relocating displaced riprap, and the use of gunite, concrete, or other similar materials to repair cracks and voids. Placement of additional riprap may also be necessary to repair and/or raise the seawall. Surface water that contacts the landfill waste as a result of a major seismic event will be confined and addressed. The PCGMP well network will also be inspected. Resampling of the monitoring wells will be evaluated. If inspection of the systems detects a noncompliance, the operations and maintenance contractor will notify the site management representative, who will notify the EPA, DTSC and the Regional Water Quality Control Board.

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5.0 MONITORING AND MAINTENANCE OF WETLANDS MITIGATION AREAS

A baseline vegetation and wildlife survey that will occur immediately prior to construction will establish overall percent cover, document the composition of the vegetative community, and establish average daily use of the reference areas by shorebirds and waterfowl. Hydrologic success will also be considered.

5.1 SUCCESS CRITERIA FOR VEGETATION

During the vegetation survey, permanent 1-meter-square reference plots will be established on transects running through the entire mitigation sites. These transects and monitoring plots will be assessed on a yearly basis using the same criteria as those used to establish baseline conditions. The survey will document mortality, weed invasion, and rate of colonization. Success criteria for vegetation are as follows:

- In the tidal marsh area, existing conditions show a pickleweed community cover density of approximately 75 to 100 percent in the wetland areas that will be affected. The 5-year monitoring goal is to attain this same density and the same plant community composition as under existing conditions. The Year 1 goal is to show 10 percent pickleweed cover, increasing to 25 percent at Year 2, 50 percent in Year 3, and 75 percent in Year 4. If these goals are not met, the restored area will be assessed to determine if site conditions are not conducive to plant growth. If needed, corrective actions including planting pickleweed plugs taken from a nearby location will be implemented. Corrective actions would be implemented in Year 2 and beyond if needed.
- There is no invasive cordgrass or pepperweed in the tidal marsh at this time. Success criteria require that this state be attained and maintained in the mitigation area for the duration of the 5-year monitoring period.
- In the open water/mudflat habitat, there will be little to no vegetation in the low-marsh (mudflat) areas, and the mid- and high-marsh areas are projected to be vegetated almost exclusively with pickleweed to reflect current conditions. Success criteria are such that the mudflat area will have less than 10 percent vegetation below -0.2 feet NGVD29, and this vegetation will be a minimum of 80 percent pickleweed. Above -0.2 feet, pickleweed will increase in density to 75 to 100 percent over 5 years. The pickleweed fringe will be maintained by work crews who will remove cordgrass and pepperweed by hand or other approved method to ensure no encroachment of these weed species.
- If success criteria are not met, corrective action will be taken. For vegetation establishment, this means that pickleweed plugs will be planted in quantities needed to attain goals if goals are not met at Years 2 and beyond. For invasive species, this means that all invasive cordgrass or pepperweed will be removed on a yearly basis, on a date preceding normal seedset.

5.2 SUCCESS CRITERIA FOR WILDLIFE

For wildlife, bird counts will occur at the appropriate time of year and will occur over successive tidal cycles. Bird usage of the tidal pond, the mudflats, and freshwater pond will be documented and used to create the baseline conditions against which to measure success. Success criteria for bird use of the mitigation sites is such that bird use would increase incrementally over a 5-year period as the invertebrate community in the substrate increased, and would match the rate of bird use in the reference (adjacent) areas at the end of the 5-year monitoring period.

5.3 SUCCESS CRITERIA FOR HYDROLOGY

Although a detailed hydrologic study of the site has not been completed, success criteria are such that hydrological features found at the reference areas (meaning wetlands directly adjacent to the mitigation areas) will be found in the mitigation areas as well. In the tidal areas, this means that the constructed wetlands will be tidally inundated and drained on a diurnal basis on the same intervals as the reference area.

In the open water/mudflat/pickleweed freshwater areas near the South Pond, the mitigation wetlands will have been graded to the same elevation as the reference habitat; therefore, success criteria are such that surface water levels and mudflats will mimic conditions found in the surrounding areas that have the same surface elevation. In general, this means that surface water levels will be highest in the period from December through April, and will diminish thereafter. In dry years, the freshwater open water area and mudflat may dry completely in late summer.

Hydrologic features of the site will not be manipulated during construction; however, if after project implementation hydrological features do not appear to be operating as planned, a hydrologic assessment of the area will be performed by a hydrologist and recommendations for further grading will be made.

6.0 SCHEDULE FOR ROUTINE OPERATIONS AND MAINTENANCE ACTIVITIES

The proposed schedule is presented on Figure 6-1. The schedule assumes that construction of the cover will be complete in January 2014. Adjustments to the schedule may be necessary if there are changes to the construction schedule. Time frames for activities are approximate and correspond with the frequency of tasks discussed in subsequent sections. Severe damage, catastrophic events, and some minor items, such as watering of the cover vegetation, have not been included since these events do not occur on a regular schedule.

6.1 SCHEDULED INSPECTION

IR Site 2 will be inspected quarterly and after major weather (any rain event with 0.5 inch of rain occurring in a 24-hour period) or seismic events (Modified Mercalli Intensity VII) for damage, and maintenance will be performed as necessary. Inundation due to gradual sea level rise will be monitored and reported as part of the quarterly inspections. Inspection items and corrective actions are described in the following sections. If damage to the cover system is observed during any post-closure inspection, the cause of the damage will be investigated and documented in the inspection log.

6.1.1 Cover Settlement

Inspection of the landfill cover condition and the slopes of the landfill will occur on a quarterly basis and after significant events.

6.1.2 Geonet Animal Intrusion Barrier

The quarterly inspection will include looking for pieces of geonet material and waste items on the cover surface that indicate the geonet animal intrusion barrier has been breached by burrowing animals.

6.1.3 Methane Monitoring

Methane monitoring will be conducted quarterly for the first 5 years following the completion of the cover construction, and will be re-evaluated during the 5-year review. Methane monitoring will consist of both soil gas probe monitoring and ambient air monitoring at the perimeter of the landfill.

6.1.4 Wetlands Culvert

The culvert connecting San Francisco Bay with the IR Site 2 wetlands area will be inspected on a quarterly basis and after significant events. The Navy will make necessary repairs, modifications or replacement to maintain tidal circulation as recommended by the structural assessment of the culvert if warranted. In the potential event that tidal circulation is inhibited or blocked due to culvert failure, the Navy will restore tidal circulation within 7 days.

6.1.5 Site Structures

The following structures shall be inspected semiannually:

- Signage
- Landfill perimeter gas vents
- Settlement monuments

Settlement monuments will be surveyed annually. Access roads and surface water management structures will be inspected annually before the rainy season and in the event of heavy precipitation resulting in either 0.50 inch or more of rainfall within 24 hours or 0.25 inch or more within 1 hour.

6.2 FIELD DOCUMENTATION

SOPs have been included in Appendix A with documentation forms for field recording of scheduled routine maintenance and monitoring data collection.

6.2.1 Document Corrections

Changes or corrections on any project documentation will be made by crossing out the erroneous item with a single line and initialing (by the person performing the correction) and dating the correction. The original item, although erroneous, must remain legible beneath the crossed-out line. The new information should be written clearly above the crossed-out item.

7.0 REPORT REQUIREMENTS AND DATA MANAGEMENT

Reporting will occur as a part of this Plan. Reporting will consist of submitting annual reports to the EPA, DTSC, and Regional Water Quality Control Board. The inspection and monitoring program established will be evaluated annually by an independent, qualified engineer registered in California, The inspection will include review of the condition of all surface improvements, drainage facilities, erosion control facilities, vegetative cover, gas control facilities, and monitoring facilities. Specifically, the annual report will present:

- Survey data
- Site inspection data:
  - Condition of vegetation
  - Erosion
  - Cracking
  - Seepage
  - Slope stability
  - Subsidence
  - Settlement
  - Condition of run-on and run-off control systems
  - Condition of surveyed benchmarks
- Groundwater monitoring system and analytical results for samples collected in the previous semiannual and current annual sampling events
- Perimeter landfill gas probe and ambient air monitoring results
- Trends analyses results

Initially (for the first year at a minimum), stand-alone reports will be submitted. A 5-year review will be completed for the site at the time of the basewide 5-year review cycle in 2016.

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8.0 POST-CLOSURE FINANCIAL ASSURANCE

A detailed cost estimate for annual operating, maintenance, monitoring, and reporting is included in Appendix B. The estimated annual cost for anticipated activities is $101,715 in 2012 dollars. The DON is fiscally responsible for post-closure related costs until such time as the site is transferred to the Office of Veteran Affairs.

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9.0 REFERENCES

AMEC (AMEC Earth & Environmental, Inc.). 2010. Draft 2009 Annual Groundwater Monitoring Report, Basewide Groundwater Monitoring Program, Alameda Point, Alameda, California. March.

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Battelle and BBL (Blasland, Bouck, and Lee, Inc.). 2006. Final Remedial Investigation Report IR Site 2, West Beach Landfill and Wetlands Alameda Point, California. Prepared for Base Realignment and Closure, Program Management Office West, San Diego, CA. June 23.

——————. 2008. Final Feasibility Study Report IR Site 2, West Beach Landfill and Wetlands Alameda Point, California. October.

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KCH (CH2M HILL Kleinfelder, A Joint Venture). 2011. Preliminary Draft Remedial Design Report, Installation Restoration Site 2, Alameda Point, Alameda, California. December.

SES-TECH. 2012. Draft Annual Groundwater Monitoring Report, Basewide Groundwater Monitoring Program, Alameda Point, Alameda, California (December).

TtEMI (Tetra Tech EM, Inc.). 2009. Draft 2008 Final Annual Groundwater Monitoring Report, Basewide Groundwater Monitoring Program, Alameda Point, Alameda, California. March.

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TABLES

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TABLE 2-1

STANDARD OPERATING PROCEDURES FOR POST-CLOSURE MONITORING AND MAINTENANCE

	Standard Operating Procedure Title
001	Multilayer Soil Cover Inspection
002	Landfill Surface Gas Monitoring
003	Access Road Inspection
004	Surface Water Management System Inspection and Maintenance
005	Vegetative Cover Inspection and Maintenance
006	Access Road Maintenance and Repair
007	Multilayer Soil Cover Maintenance and Repair
008	Landfill Gas Probe Monitoring
009	Landfill Perimeter Gas Vent Inspection and Maintenance

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FIGURES

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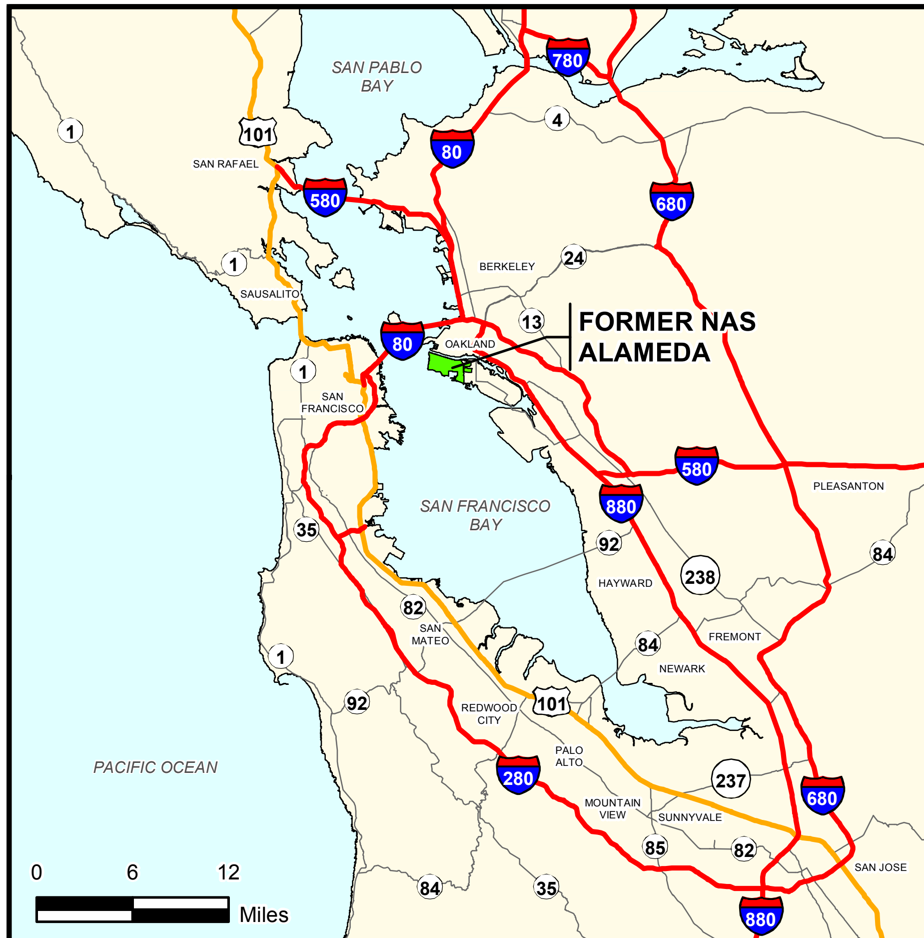
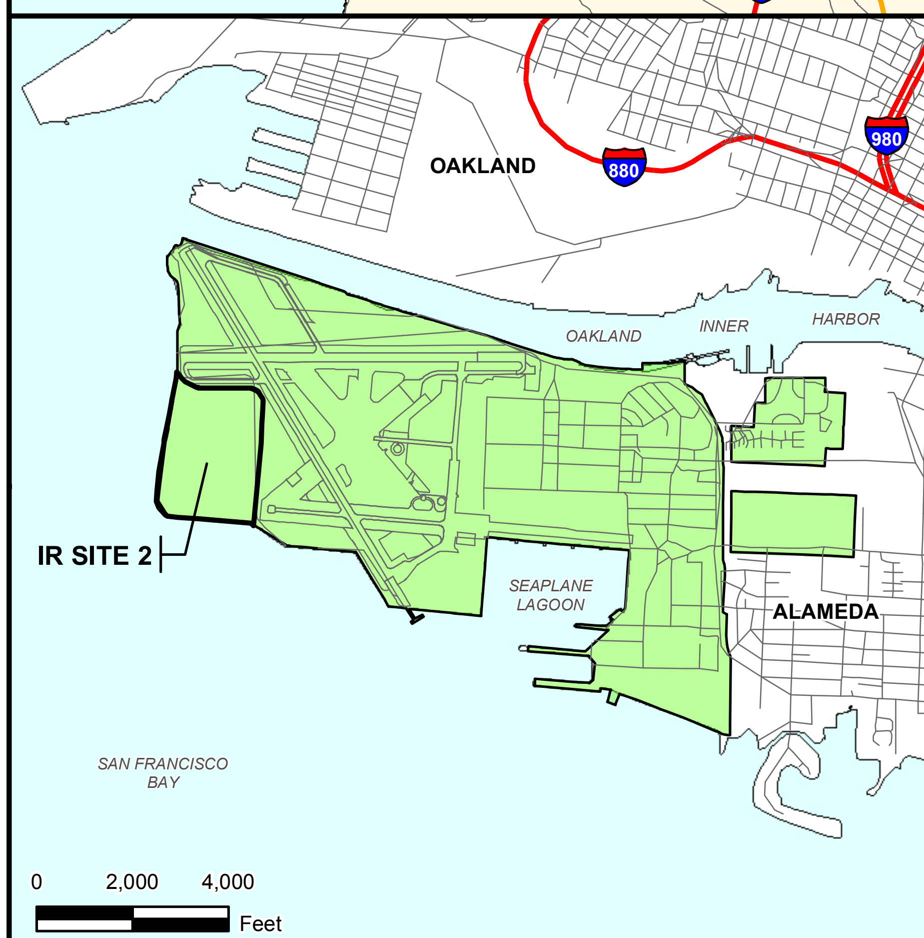




LEGEND

- ROAD/RUNWAY
- STATE HIGHWAY
- US HIGHWAY
- INTERSTATE HIGHWAY
- FORMER NAS ALAMEDA
- IR SITE 2 BOUNDARY
- SOIL COVER BOUNDARY
- WATER

NOTES:
IR - INSTALLATION RESTORATION
NAS - NAVAL AIR STATION

N

225 0 225 450
Feet

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

POST-CLOSURE OPERATION, MAINTENANCE, AND MONITORING
IR SITE 2

FIGURE 1-1

SITE LOCATION MAP

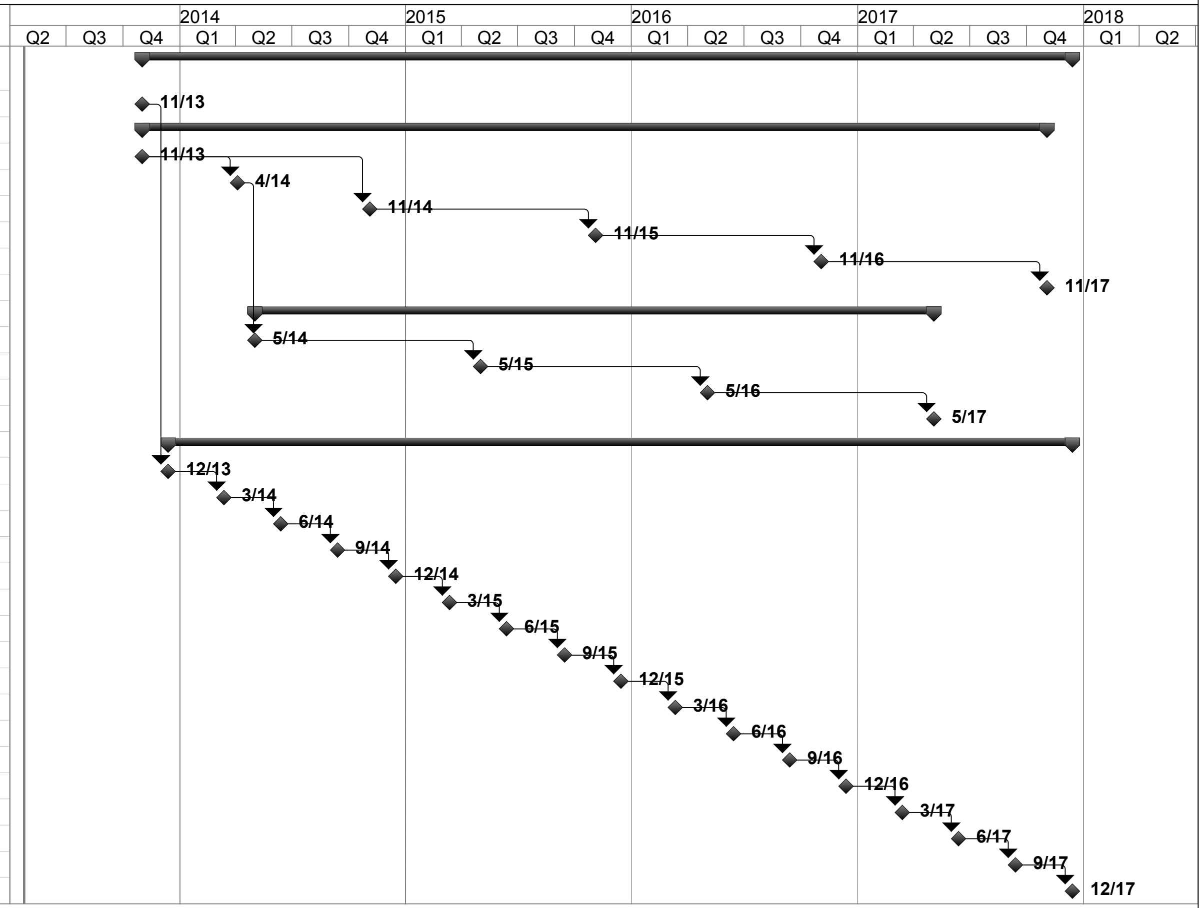
ALAMEDA POINT, ALAMEDA, CALIFORNIA

REVIEW: 0
AUTHOR: MS
FILE NUMBER: 120118S7564.mxd

TETRA TECH EC, INC.

Figure 6-1
Proposed Schedule

ID	Task Name
1	**Operation, Maintenance and Monitoring Schedule Site 2, Alameda Point, Alameda, CA**
2	Complete Cap Construction
3	**Groundwater Monitoring**
4	Perform Annual Groundwater Monitoring
5	Perform Semiannual Groundwater Monitoring
6	Perform Annual Groundwater Monitoring
7	Perform Annual Groundwater Monitoring
8	Perform Annual Groundwater Monitoring
9	Perform Annual Grounwater Monitoring
10	**Reporting**
11	Submit 1st Annual Monitoring Report
12	Submit 2nd Annual Monitoring Report
13	Submit 3rd Annual Monitoring Report
14	Submit 4th Annual Monitoring Report
15	**O&M Inspectons**
16	Quarterly Inspection
17	Quarterly Inspection
18	Quarterly Inspection
19	Quarterly Inspection
20	Quarterly Inspection
21	Quarterly Inspection
22	Quarterly Inspection
23	Quarterly Inspection
24	Quarterly Inspection
25	Quarterly Inspection
26	Quarterly Inspection
27	Quarterly Inspection
28	Quarterly Inspection
29	Quarterly Inspection
30	Quarterly Inspection
31	Quarterly Inspection
32	Quarterly Inspection



Project: Figure 6-1 Rev 1
Date: 4/24/13

Task | Milestone | Project Summary
Split | Summary

APPENDIX A

STANDARD OPERATING PROCEDURES
(on CD only)

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SOP 001

MULTILAYER SOIL COVER INSPECTION

1.0 GENERAL

The multilayer soil cover should remain intact, free of major cracking (defined as cracks 1-inches or wider, deeper than 12-inches, and longer than 20-feet), erosion (deeper than 12-inches) and surface depressions that could cause ponding. The vegetation inspection is described in Standard Operating Procedure (SOP) 005 (Vegetation Cover Inspection and Maintenance).

2.0 TASK DESCRIPTION

The task covered by this SOP is the visual inspection of the cover which guides maintenance and repair planning and implementation. Regular visual inspections of the cover shall be performed quarterly by the Operations Manager or his designee, and annually by a registered civil engineer.

3.0 REQUIRED MATERIALS

The following items are needed to perform a visual inspection:

- A copy of the landfill map (attached)
- Form SOP 001 (Cover Inspection Form)
- Survey stakes
- Measuring tape
- Clipboard
- Pen with indelible ink
- Camera

4.0 TASK PERFORMANCE

Record inspection observations on Form SOP 001. All areas exhibiting the conditions listed below shall be recorded on the form and flagged or staked in the field. The completed form shall be given to the Operations Manager, who will then refer to SOP 007 (Multilayer Soil Cover Maintenance and Repair). The following are guidelines for conditions to be observed and recorded:

- Eroded areas (erosion deeper than 6-inches)
- Landfill cover soil conditions such as sloughing and sliding

- Cracks, fissures, or other features that may potentially allow gas migration or surface water infiltration. Cracks in the cover longer than 20 feet and deeper than 12 inches and wider than 1 inches shall be examined and evaluated by a registered civil engineer.
- Areas of subsidence, depressions, or topography where ponding may occur
- The state of surface water management facilities, failure or malfunction of which could impact cover performance
- Culvert integrity and blockage which would impede flow to wetlands

In addition to regular visual inspections, the landfill cover shall be inspected as soon as it is accessible following the events listed below:

- Significant rainfall (as defined in SOP 004 – Surface Water Management System Inspection). Note in particular erosion, or areas of slope deformation
- Major earthquakes. Note in particular cracks, deformation, or zones of slope instability.
- Failure of the surface water management control system. Note in particular erosion, wet or saturated cover soils, ponding, or areas where there is a potential for increased infiltration.
- An emergency as defined in the Emergency Response Plan

If at any time a condition of cover distress is observed, it shall immediately be reported to the Operations Manager.

FORM SOP 001
COVER INSPECTION

Type of Inspection: ☐ Quarterly ☐ Semiannual **Inspector:** Name: _____________ Affiliation: ___________

Date: ________________ **Time** _______________ **Weather Condition:** ______________

OBSERVATION TYPE AND DETAILED DESCRIPTION:

☐ Erosion ☐ Sloughing/Sliding ☐ Cracks/Fissures ☐ Subsidence/Depression ☐ Other

LOCATION OF OBSERVATION (Show on map): ______________________________

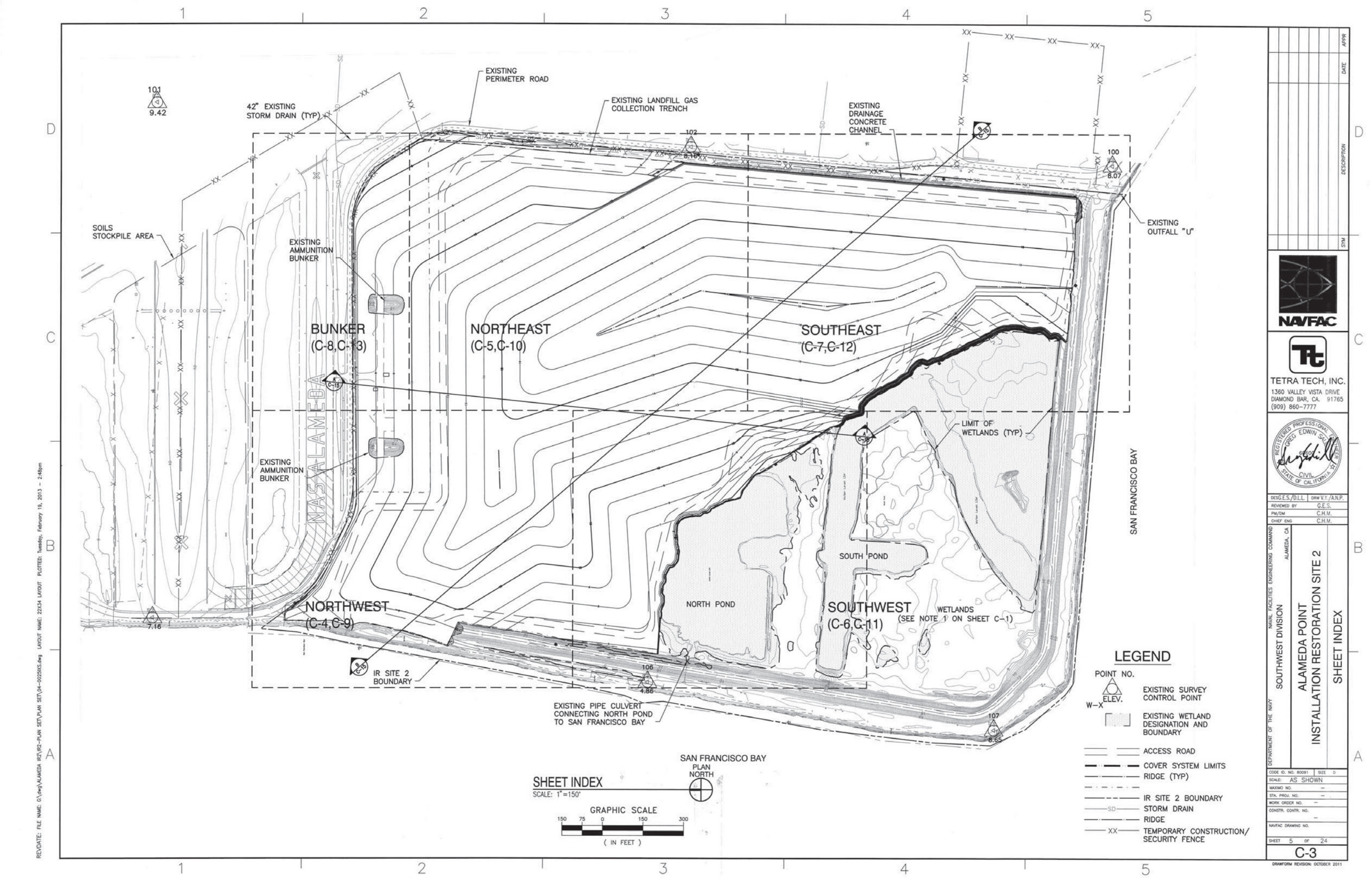
ACTION TAKEN: ______________________________

REMARKS: ______________________________

Signature

Operations Manager ______________________ Date ______________

Site Manager
(for annual inspection only) ______________________ Date ______________


EXISTING PERIMETER ROAD
42" EXISTING STORM DRAIN (TYP)
EXISTING LANDFILL GAS COLLECTION TRENCH
EXISTING DRAINAGE CONCRETE CHANNEL
EXISTING OUTFALL "U"
SOILS STOCKPILE AREA
EXISTING AMMUNITION BUNKER
BUNKER (C-8,C-13)
NORTHEAST (C-5,C-10)
SOUTHEAST (C-7,C-12)
LIMIT OF WETLANDS (TYP)
NASA ALAMEDA
EXISTING AMMUNITION BUNKER
SAN FRANCISCO BAY
SOUTH POND
NORTH POND
NORTHWEST (C-4,C-9)
SOUTHWEST (C-6,C-11)
WETLANDS (SEE NOTE 1 ON SHEET C-1)
IR SITE 2 BOUNDARY
EXISTING PIPE CULVERT CONNECTING NORTH POND TO SAN FRANCISCO BAY
SAN FRANCISCO BAY
PLAN NORTH
SHEET INDEX
SCALE: 1"=150'
GRAPHIC SCALE
(IN FEET)
LEGEND
POINT NO.
ELEV.
EXISTING SURVEY CONTROL POINT
EXISTING WETLAND DESIGNATION AND BOUNDARY
ACCESS ROAD
COVER SYSTEM LIMITS
RIDGE (TYP)
IR SITE 2 BOUNDARY
STORM DRAIN
RIDGE
TEMPORARY CONSTRUCTION/ SECURITY FENCE
NAVFAC
TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777
SOUTHWEST DIVISION
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SHEET INDEX
SCALE: AS SHOWN
SHEET 5 OF 24
C-3

SOP 002

LANDFILL SURFACE GAS MONITORING

1.0 GENERAL

Landfill surface gas monitoring is performed to evaluate the effectiveness of the landfill cover and the passive gas control system in controlling the movement of methane through the cover. The objective of this Standard Operating Procedure (SOP) is to monitor ambient air at 250 foot intervals around the perimeter of the landfill in order to identify specific locations or areas of the landfill surface with elevated emission rates greater than 50 ppmv. Selection and permanently identifying the monitoring stations will be the responsibility of the Operations and Maintenance contractor.

2.0 TASK DESCRIPTION

Surface gas monitoring will be conducted quarterly during landfill gas probe monitoring activities (SOP 008). Surface gas monitoring will be conducted buy a field technician using hand held instruments.

3.0 REQUIRED MATERIALS

The following equipment and supplies are needed:

- Methane monitoring instrument capable of measuring methane in the PPM range (such as the GasTech Innova or equivalent)
- Landfill map with monitoring stations
- Clipboard
- Portable wind speed (anemometer) meter
- Thermometer
- Pen with indelible ink
- Safety vest (orange)
- Surface Emission Data Sheet (Form SOP 002-1)

Note: Other safety-related equipment may be required when performing emissions monitoring.

4.0 TASK PERFORMANCE

4.1 EQUIPMENT STARTUP PROCEDURES

Calibrate instruments in accordance with manufacturer specifications.

4.2 MONITORING CONDITIONS

The average wind speed suitable for surface gas monitoring is less than 10 miles per hour (mph). Monitoring is terminated when the average wind speed exceeds 10 mph or the instantaneous wind speed exceeds 15 mph. Average wind speed is determined on 15 minute intervals. Suface gas monitoring is conducted when the landfill is dry and no rain is falling. The landfill is considered dry when there has been no rain (>.10 inches) for the preceding 72 hours prior to monitoring. Any delays due to excessive wind speeds, rainfall, construction activities, etc., should be noted.

4.3 SAMPLING PROCEDURES

At each monitoring locations, the field technician record the temperature, and the average and maximum wind speed. The methane monitoring instrument will be held approximately 3 inches from the landfill surface for 2 to 5 minutes or until methane concentrations (if any) is stabilize. Measurements will be recorded on the Surface Emissions Data Sheet (Form SOP 002-1).

For readings of 50 ppmv or greater description of the suspected cause of the exceedance (i.e., cracking, thin cover, exposed waste) will be recorded on the form.

4.4 EXCEEDANCE ACTION

If a location exceeds 50 ppmv, the location will reported to the Operations Manager for appropriate actions including possible cover repair or modifications to the passive gas collection system. Within 1 day after the repair, the area will be re-monitored to determine if additional remediation is required.

4.5 REPORTING REQUIREMENTS

In the event of an exceedance, report of findings will be submitted to the DON six weeks after completion of the survey.

Form SOP 002-1

SURFACE EMISSIONS DATA SHEET

Date ___________________________________ **Instrument Serial No.:** ______________________

Technician______________________________

Initial Calibrated _______________________ **Final Calibrated** ___________________________

Location ID	Temerature (Degrees F)	Sampling Time (min)	Methane (PPM)	Ave/Max Wind Speed (mph)	Barometric Pressur (in. Hg)	Observations

Notes:

SOP 003
ACCESS ROAD INSPECTION

1.0 GENERAL

The access roads provide all-weather access to the landfill. Each road is approximately 24 feet wide, constructed with 12 inches of compacted aggregate over geotextile fabric.

2.0 TASK DESCRIPTION

This SOP addresses the visual inspection of the access roads to note conditions that may require road maintenance and repair. Access Roads will be inspected annually by a registered civil engineer before the rainy season and in the event of heavy precipitation resulting in either .50 inch or more of rainfall within 24 hours or 0.25 inch or more within 1 hour.

3.0 REQUIRED MATERIALS

The following items are needed for a visual inspection:

- Copy of the access road system map
- Copy of the Access Road Inspection Form (Form SOP 003-1)
- Pen with indelible ink
- Clipboard
- Survey stakes
- Ribbons and markers
- Measuring tape
- Camera

4.0 TASK PERFORMANCE

Inspection observations are recorded on Form SOP 003-1. Inspection results will be evaluated against SOP 006 (Access Road Maintenance and Repair). The following are guidelines for conditions to be observed and recorded:

- Adverse grades (that may impede drainage)
- Cracks wider than ½ inch, and longer than 50 feet (cracks wider than 2 inches and deeper than 12 inches and longer than 50 feet shall be examined by a registered civil engineer)
- Localized depressions (that may cause ponding)

- Sloughing
- Excessive erosion (greater and 3 inches) of road surface
- Loss or deterioration of surfacing
- Debris (soil or vegetation) from upgradient slope
- Damaged or missing road signs
- Damaged drainage structures (see SOP 004 - Surface Water Management System Inspection and Maintenance).
- Deformation of the upgradient or downgradient slope that affects road use (see SOP 001 – Cover Inspection).
- Extensive cracking (deeper than 6 inches)
- Depressions (causing ponding)
- Deep erosion (deeper than 6 inches)
- Adjacent slope instability
- Exposure of a geotextile material or absence of granular road base material.

A registered civil engineer shall establish the need for additional observations, including but not limited to:

- Test pits
- Test trenches
- Settlement or deformation measurements

In addition to annual inspections, access roads shall be inspected after the following:

- Significant rainfall (as defined in 004 – Surface Water Management System Inspection). Note in particular erosion.
- Major earthquakes. Note in particular cracks, deformation, or zones of actual or incipient slope instability.
- Failure of the surface water management control system. Note in particular erosion, wet or saturated soils, ponding, or areas where there is a potential for increased infiltration.
- An emergency as defined in the Emergency Response Plan.

FORM SOP 003-1

ACCESS ROAD INSPECTION FORM

Type of Inspection: ☐ Annual ☐ Other **Inspector:** Name: ____________ Affiliation: _________

Date: ______________________ **Time** ______________________ **Weather** ____________________________

ROAD/LOCATION	NORMAL	ABNORMAL	STATION	DESCRIPTION *

* Use following codes for observed conditions: 1-adverse grades; 2-cracking; 3-depression; 4-sloughing; 5-erosion; 6-loss of surfacing; 7-debris form upgradient slope; 8-damaged/missing road signs; 9-damaged drainage structures; 10-slope deformation.

<u>Signatures</u>

Operations Manager ________________________________ Date ____________________

Registered Civil Engineer
(for annual inspection only) ________________________________ Date ____________________

SOP 004
SURFACE WATER MANAGEMENT SYSTEM
INSPECTION AND MAINTENANCE

1.0 GENERAL

The inspection and maintenance of the Surface Water Management (SWM) system are described in this Standard Operating Procedure (SOP). The SWM system provides for surface water drainage, and controls infiltration into and erosion of the landfill cover. SWM components include the concrete channel and three turf reinforced mat channels.

2.0 TASK DESCRIPTION

An annual survey of the SWM system will be conducted prior to the rainy season. The survey will be performed by a registered professional civil engineer or other qualified professional in addition to site personnel. In the event of heavy precipitation resulting in either .50 inch or more of rainfall within 24 hours or 0.25 inch or more within 1 hour, a site inspection will be conducted immediately following the storm event.

3.0 TASK PERFORMANCE

As part of the annual survey, complete Form SOP 004-1. Form SOP 004-2 should be completed during the routine inspections and inspections performed after rain events.

Any breakdown and subsequent repair of the SWM system shall be documented on Form SOP 004-3 and reported to the Operations Manager immediately. Below is a list of procedures associated with SWM system maintenance:

1. Concrete Channel
   - Clear debris or vegetation having a stem greater than 1 inch in diameter
   - Repair cracks and grout as required to maintain integrity of concrete
2. Turf Reinforced Mats
   - Clear debris or other drainage obstructions
   - Repair or remove and replace matting as needed due to base soil loss or washouts
   - Replace infill as needed to maintain proper grades and/or soil loss
   - Re seed to maintain vegetation cover
3. Drop Inlets
   - Adjust inlet riser to remain flush with top of geocell
   - Repair gaps between pipe and surface completion

4. Sediment Traps/Erosion Control
   - Remove silt buildup greater than 6 inches
   - Repair as necessary
   - Follow maintenance procedures outlined in the SWPPP for the BMPs for Erosion and Sediment Control
5. Discharge Outlets
   - Clear debris, vegetation, and other obstructions
   - Repair or replace discharge piping or structure as necessary
6. Drainage Pipe
   - Clear vegetation and debris
   - Remove silt when buildup exceeds 6 inches
   - Remove and replace pipe if the integrity of the pipe is impacted
7. Drainage Inlet
   - Clean and regrout areas of cracking or spalling
   - Remove debris and silt buildup inside box and weep holes
   - Clear debris or vegetation from debris rack or grate
   - Remove silt buildup greater than 6 inches

FORM SOP 004-1
Surface Water Management System Annual Inspection Checklist

Inspection Performed by: ______________________________________ Date: _______________

Component to Be Checked	Finding	Comment (Additional space end of form)
Sloping and Grading		
Slope of the top cover area > 1%?	Yes No	
Longitudinal slope of access and bench roads > 1%?	Yes No	
Cross slope of access and bench roads > 3%?	Yes No	
Storm Drain Pipe		
Slope of each pipe ≥ 3%?	Yes No	
Slip joints/joint displacement?	Yes No	
Anchor stability adequate?	Yes No	
Stress, leaks, or erosion in joints?	Yes No	
Cover erosion under pipe?	Yes No	
Misalignment, corrosion, loss of protective coating?	Yes No	
Blockage?	Yes No	
Erosion upstream or downstream of pipe invert?	Yes No	
Concrete Channel		
Has displacement of concrete occurred?	Yes No	
Debris, large bush, or vegetation > 1 inch in diameter present?	Yes No	
Grout or concrete integrity adequate?	Yes No	
Turf Reinforced Mats		
Longitudinal slope > 1%?	Yes No	
Integrity of matting walls adequate?	Yes No	
Debris or other drainage obstructions present?	Yes No	
Exposed liner present?	Yes No	

Have their been any washouts?	Yes No	
Drainage Inlets		
Debris or vegetation at inlet?	Yes No	
Silt buildup or other blockage present?	Yes No	
Corrosion?	Yes No	
Displacement? (Inlet should remain flush with surface)	Yes No	
Gaps between inlet and piping?	Yes No	
Culverts (Pipes)	Yes No	
Integrity of pipe adequate?	Yes No	
Sediment Trap/Erosion Controls		
Silt Build-up?	Yes No	
Missing or damaged sections?	Yes No	
Discharge Outlets/Outfalls		
Debris or oversized vegetation at structure?	Yes No	
Corrosion at facility?	Yes No	
Integrity of facility adequate?	Yes No	
Leaks and/or deterioration at piping connections?	Yes No	
Any conditions present which may impede flow capacity?	Yes No	

Comments____

____

____

____

FORM SOP 004-2
Surface Water Management System Inspection Checklist

Inspection Performed by: ______________________________________ Date: _______________

Component to Be Checked	Finding	Comment (Additional space end of form)
Storm Water/Erosion Control		
Runoff Inundation?	Yes No	
Gully washes, washouts, or overtopping of drainage system?	Yes No	
Areas of ponding? If yes, identify where.	Yes No	
Debris or clogging of drain inlets?	Yes No	
Integrity of double containment structures adequate?	Yes No	
Contaminated liquids present in double containment structures? If yes, determine nature of liquid.	Yes No	
Erosion along edge of concrete or turf mat channels?	Yes No	

Comments:____
____
____
____

FORM SOP 004-3
STORM WATER/EROSION CONTROL
BREAKDOWN AND REPAIRS FORM

Date:__________________________ Inspector:______________________________

Observations

1. Subsidence
2. Cracks
3. Obstructions
4. Washouts
5. Slope Condition
6. Damaged Materials
7. Silt Deposition
8. Vegetation

Personnel Notified:_______________

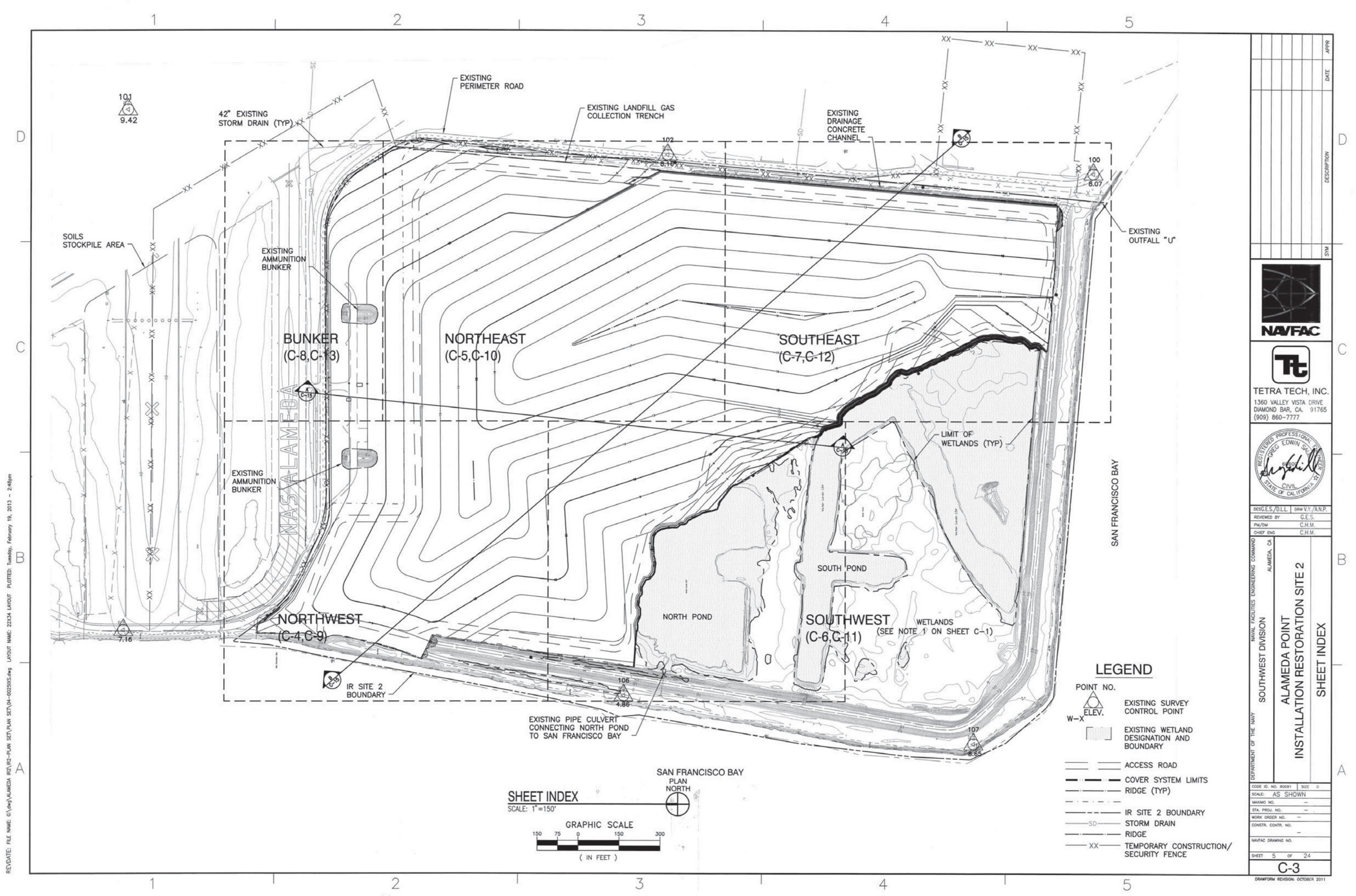
Type of Breakdown/Failure ____

Location (show on map)____

Action Requested____

Action Taken____

Comments____


EXISTING PERIMETER ROAD
42" EXISTING STORM DRAIN (TYP)
EXISTING LANDFILL GAS COLLECTION TRENCH
EXISTING DRAINAGE CONCRETE CHANNEL
SOILS STOCKPILE AREA
EXISTING AMMUNITION BUNKER
EXISTING OUTFALL "U"
BUNKER (C-8,C-13)
NORTHEAST (C-5,C-10)
SOUTHEAST (C-7,C-12)
NORTHWEST (C-4,C-9)
SOUTHWEST (C-6,C-11)
NASA ALAMEDA
LIMIT OF WETLANDS (TYP)
SAN FRANCISCO BAY
NORTH POND
SOUTH POND
WETLANDS (SEE NOTE 1 ON SHEET C-1)
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EXISTING PIPE CULVERT CONNECTING NORTH POND TO SAN FRANCISCO BAY
SHEET INDEX
SCALE: 1"=150'
GRAPHIC SCALE
(IN FEET)
PLAN NORTH
LEGEND
POINT NO.
ELEV.
EXISTING SURVEY CONTROL POINT
EXISTING WETLAND DESIGNATION AND BOUNDARY
ACCESS ROAD
COVER SYSTEM LIMITS
RIDGE (TYP)
IR SITE 2 BOUNDARY
STORM DRAIN
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ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SHEET INDEX
SCALE: AS SHOWN
SHEET 5 OF 24
C-3

SOP 005
VEGETATIVE COVER
INSPECTION AND MAINTENANCE

1.0 GENERAL

The vegetative cover provides moisture penetration control, erosion control, and visual enhancement across the landfill slopes and top deck. The vegetative cover selected to provide these results is comprised of California native plants.

Once established the vegetative cover will appear similar to local natural open space areas. The vegetative cover will turn green during the rainy season and is expected to fade to brown during the dry season.

2.0 TASK DESCRIPTION

The vegetative cover shall be visually inspected at the intervals listed in the Post Closure Operations, Maintenance and Monitoring Plan. The frequency of inspection and maintenance may be varied by the Operations Manager to respond to seasonal variations in precipitation and vegetation establishment and growth.

In addition to the landscaping covering the refuse, some areas along the periphery contain native growth areas and wetland that will require inspection which must be inspected and cut back as necessary.

3.0 REQUIRED MATERIALS

The following items are necessary:

- Copy of the Wetlands Mitigation Plan (attachment 7- of the Remedial Action Work Plan)
- Copy of Vegetative Cover Inspection Form (Form SOP 005-1)
- Copy of Landfill Map

4.0 TASK PERFORMANCE

Using the following as guidance record observations, on Form SOP 005-1(Vegetative Cover Inspection Form):

- Weed and fire control - Observe growth of nuisance weeds and plant materials after the end of the rainy season. Nuisance weeds include Mustard, Tumbleweed, Tree Tobacco, Castor Bean, Pompas Grass, Eucalyptus, Elm, and Bermuda Grass. Other plants that may naturalize should be verified for removal when they occur.

- Reseeding and Soil fertilization program - Determine locations of poor growth for soil analysis in late summer. Evaluate the establishment rate and appearance of the vegetation. Determine areas that require reseeding.
- Rodent control - Evaluate visible signs of burrowing rodents during routine inspections around the site.
- Erosion Control – check for soil erosion

5.0 MAINTENANCE

In cases where an inspection establishes a deficiency in the vegetation that could be repaired by immediate action, such action shall be taken in discussion with the Operations Manager.

Inspections recorded on Form SOP 005-1 shall be considered by the Operations Manager. He shall issue plans and instructions for ongoing vegetation maintenance or replacement. Examples are:

- Weed removal – Remove by hand at first signs of growth. If Mustard and Thistle has spread, removal options include mowing. Foliage removal is another option for Mustard.
- Reseeding and soil fertilization program – Reseed areas of poor growth in late fall or early winter using seed mix specification in Attachment 1 sheet C-12.
- Soil Erosion – Repair per SOP 004 (Surface Water Management System Inspection, Surveillance, and Maintenance Activities.
- After the end of the rainy season, and after grasses have produced seed, the crown of the landfill will be mowed to control weeds. Other areas of the landscaped portion of the site will be weeded or mowed if practical.
- Until coverage of seed mixes approaches design values, probably in the second or third growing season post mechanical completion, a landscape consultant will be used seasonally to recommend mixes, amendments, and reseeding techniques.

FORM SOP 005-1

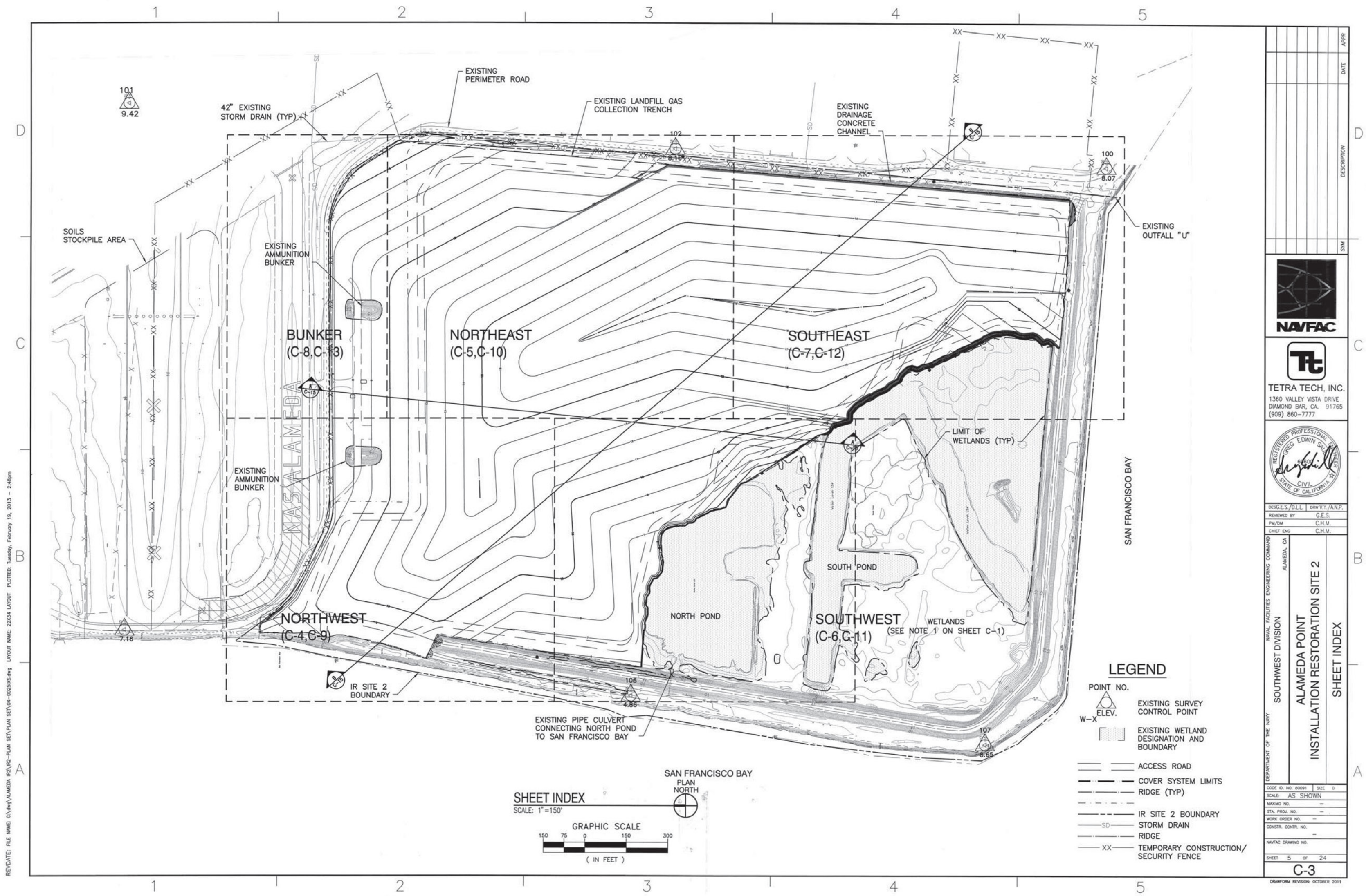
VEGETATIVE COVER INSPECTION FORM

AREA: ______________________________ DATE AND TIME: __________________

BOUNDARY ACCESS ROADS: ______________INSPECTOR: ________________________

GENERAL SOIL CONDITION: WET _____ DRY______ WEATHER: ________________

ITEM	COMMENTS	ACTIONS TO BE TAKEN
Grass		
Shrubs		
Weeds		
Soil Erosion		
Non-Native Plants		
Evidence of Burrowing Rodents		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SOILS STOCKPILE AREA
EXISTING AMMUNITION BUNKER
BUNKER (C-8,C-13)
NORTHEAST (C-5,C-10)
SOUTHEAST (C-7,C-12)
EXISTING OUTFALL "U"
LIMIT OF WETLANDS (TYP)
NAS ALAMEDA
SAN FRANCISCO BAY
SOUTH POND
NORTH POND
NORTHWEST (C-4,C-9)
SOUTHWEST (C-6,C-11)
WETLANDS (SEE NOTE 1 ON SHEET C-1)
IR SITE 2 BOUNDARY
EXISTING PIPE CULVERT CONNECTING NORTH POND TO SAN FRANCISCO BAY
SHEET INDEX
SCALE: 1"=150'
GRAPHIC SCALE
(IN FEET)
SAN FRANCISCO BAY PLAN NORTH
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POINT NO.
ELEV.
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EXISTING WETLAND DESIGNATION AND BOUNDARY
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SHEET INDEX
AS SHOWN
SHEET 5 OF 24
C-3

SOP 006
ACCESS ROAD
MAINTENANCE AND REPAIR

1.0 GENERAL

Standard Operating Procedure (SOP) 003 (Access Road Inspection) describes the access and road inspection procedures. The inspection findings are documented on Form SOP 003-1. Based on that information, the Operations Manager will implement maintenance and repair activities as described in this SOP.

2.0 TASK DESCRIPTION

Maintenance includes ongoing, routine, or regular activities necessary to keep the roads in a safe and functional state and protect the cover design.

Repair includes area specific work that may be required from time to time to restore or improve the state or functioning of the roads and the cover.

3.0 TASK PERFORMANCE

The Operations Manager shall review relevant inspection observations and monitoring data, and shall establish the need for and extent of maintenance and repair. Repairs will be done in accordance with RD Attachment 1specifications. The Operations Manager may consult with licensed/registered specialists to compile alternate repair plans or specifications.

4.0 GUIDELINES FOR MAINTENANCE AND REPAIR

Maintenance and repair procedures vary depending on existing conditions such as cracks, adverse grades, depressions, erosion gullies, sloughing or slope failures. Maintenance and repair of the access roads shall be documented on Form SOP 006-1.

1. Cracks
    - Cracks wider than ½-inch and longer than 20-feet shall be repaired. Surface cracks shall be evaluated for evidence of vertical displacement across the crack and depth of crack. If crack extends to full depth of road base, the geotextile layer separating the road base and underlying layer may have to be penetrated or removed to evaluate depth of crack. The location of cracks shall be mapped and documented. An up-to-date crack location map shall be maintained to identify areas of chronic cracking.

- Minor cracks less than 6 inches in depth shall be scarified to the depth of crack and recompacted.
- Cracks deeper than 6-inches and with no vertical displacement across the cracks shall be repaired by excavating a 2 to 3 foot wide zone to the depth of crack and replacing the excavated layer with aggregate base to RD Attachment 1 specifications.
- Major cracks (wider than 1 inches and deeper than 1 foot and longer than 20 feet), or cracks with vertical displacement across the crack may be indicative of slope deformation/sliding and shall be first evaluated by a registered civil engineer prior to implementing repair. The repair may include removal and recompaction of a relatively large section of the roads and adjacent slope to stabilize the area. (See also Section 4.0 of SOP 007 – Multilayer Cover Maintenance and Repair).
- In areas of chronic cracking (where cracks reappear on a regular basis) more extensive crack repair/control measures should be considered. Such measures may include but are not limited to excavating a wide area straddling the crack, constructing a reinforced foundation consisting of one or more layers of geogrid below the barrier.
- The designs for repair of major cracks, slope deformations/sliding and areas of chronic cracking as described above shall be prepared by a registered civil engineer. The engineer will develop a number of appropriate standard designs to repair such cracks and will recommend or approve use of same to repair the subject cracks.

2. Surface Depressions:

- Localized minor surface depressions, less than 1 foot deep, shall be repaired by backfilling with the compacted aggregate base per RD attachment 1 specifications.
- Large surface depressions, greater than 1-foot deep, shall be evaluated to determine if the barrier layer below this road subgrade has been impacted. A test pit may be excavated, geotextile removed, and the animal intrusion barrier inspected to determine evidence of excessive cracking or saturation. If the cover layer has been impacted, repair of the depression will include excavation of the area to the subgrade layer, preparation of cover, and replacement and reconstruction of the multilayered cover system to RD Attachment 1 specifications. If the compacted layer beneath the animal intrusion barrier is found to be intact, repair of the depression area shall include backfilling and compacting of the subgrade repair of geotextile fabric compaction of the aggregate base. At the completion of this repair, a survey of the repaired area shall be performed and recorded in the Record Drawings.

3. Erosion Damage:

- Erosion channels penetrating only the road surface materials shall be repaired by removal of material from the channel sides and bottom to competent material surface, and replacing with compacted aggregate The backfilling and compaction shall be performed in maximum 6-inch thick layers using the appropriate compactors for the size of the area being worked.

- Deep erosion channels extending to the geotextile and cover layer shall be repaired by excavation and replacement of the different layers of materials used in the original access road section. The cover layer, if affected, shall be excavated to its full depth and replaced with compacted material within design specifications.

4. When repairing the layered cover system below access roads, each layer shall be tied into existing layers of the corresponding material and constructed to project specifications. Replacement geotextile or geonet shall be overlapped a minimum of 24 inches over existing geotextile.

5. Adverse access road grades will be restored by placement of additional subgrade material and replacement of roads surfacing material over the reconstructed part.

FORM SOP 006-1

ACCESS ROAD REPAIR RECORD

Inspector ________________________ **Date:** ____________ **Time:** ______________

DEFICIENCY TYPE AND DETAILED DESCRIPTION: ______________________________

☐ Cracking ☐ Depressions ☐ Erosion ☐ Sloughing ☐ Adverse Grades ☐ Other

____

____

____

____

LOCATION OF REPAIR ACTIVITY (Show on map):______________________________

____

____

____

____

____

ACTION TAKEN (refer to repair detail or design drawings, as appropriate):_______________

____

____

____

ATTACHMENTS (As-Built drawings, compaction reports, etc., as appropriate): ____________

____

____

REMARKS: ____

____

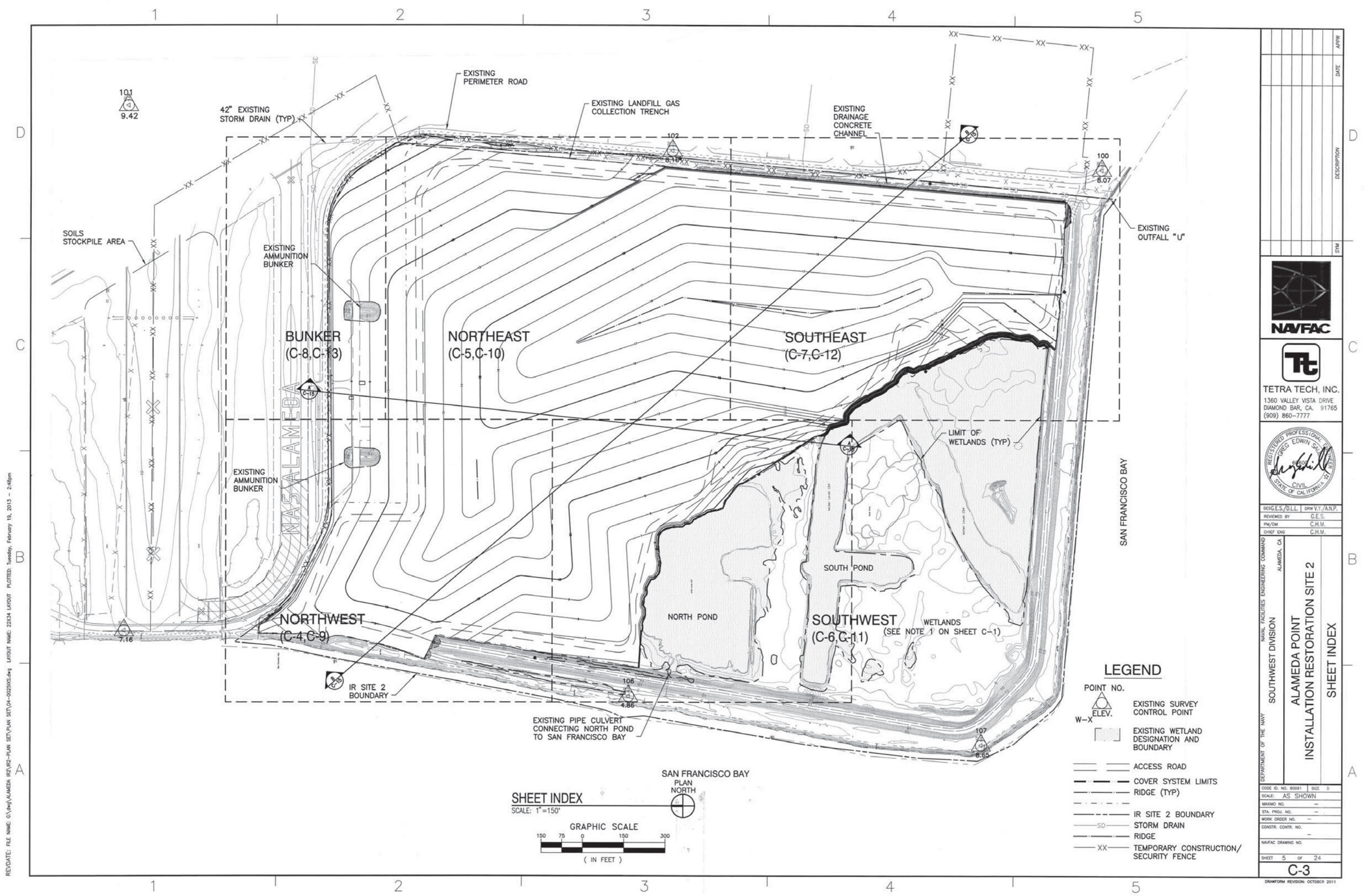
____

____

____

Signature

Operations Manager ______________________________ Date ________________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SCALE: AS SHOWN
C-3

SOP 007

MULTILAYER SOIL COVER MAINTENANCE AND REPAIR

1.0 GENERAL

The landfill multilayer soil cover consists of a minimum 6 inch compacted soil layer, an animal intrusion (geonet) barrier, an 18 inch compacted soil cover, and an 6 inch vegetative layer. The functions of the multilayer soil cover are to contain refuse, control infiltration, support vegetation, and control gas emissions. These functions are achieved if the cover is intact, free of significant cracking and erosion, maintains specified grades, and supports vegetation. This Standard Operating Procedure (SOP) describes the procedures to maintain or repair the cover.

2.0 TASK DESCRIPTION

The tasks covered by this SOP are maintenance and repair of the cover. Maintenance includes ongoing, routine, or regular activities necessary to keep the cover in a functional state. Repair includes area specific work that may be required from time to time to restore or improve the state or functioning of the cover.

3.0 TASK PERFORMANCE

Maintenance or repair of the landfill cover is undertaken as established pursuant to observations, inspections, or monitoring in accordance with one or more of the following:

- SOP 001 – Multilayer Soil Cover Inspection
- SOP 002 - Landfill Surface Gas Monitoring
- SOP 003 - Access Road Inspection
- SOP 004 - Surface Water Management System Inspection and Maintenance
- SOP 005 - Vegetative Cover Inspection and Maintenance
- SOP 006 - Access Road Maintenance and Repair

The Operations Manager shall review relevant inspection observations and monitoring data, and shall establish the need for and extent of maintenance and repair. Repairs will be done in accordance with Record Drawings and specifications. The Operations Manager may consult with licensed/registered specialists to compile alternate repair plans or specifications.

Repair that involves construction should be undertaken in conformance with construction drawings and specifications.

4.0 GUIDELINES FOR MAINTENANCE AND REPAIR

Maintenance and repair procedures vary depending on existing conditions such as cracks, depressions, erosion gullies, sloughing or slope failures. Maintenance of the cover shall be recorded in daily logs, notebooks, or other reporting formats as may be used on a regular basis.

Following repair to the cover, the repaired areas shall be revegetated in accordance with SOP 005 (Vegetative Cover System Inspection and Maintenance). Repair of the cover shall be documented on Form SOP 007-1. The DON will be notified of start and finish of major repair activities (i.e. those necessary to restore compliance with Performance Standards).

1. Vertical and Near-Vertical Cracks:
   - Surface cracks shall be evaluated for length, width, and depth of crack and evidence of any relative vertical displacement (vertical offset) across the crack. Significant cracking (cracks 1 inches or wider, deeper than 12 inches and longer than 20 feet) shall be repaired. Cracks in the cover longer than 20 feet and deeper than 1 foot and wider than 1 inches shall be examined by a registered civil engineer. The engineer will develop a number of standard designs to repair such cracks and will recommend or approve the use of same to repair the subject cracks. Other cracks, e.g., longer than 20 feet but less than 1 inches wide, will be repaired as necessary by the site forces.
   - For shallow cracks (not greater than 1 foot deep) with no vertical offset, the first response is to apply a small quantity of water (water truck application) to the cracked area and use tracked equipment to squeeze the cover materials into cracks and sufficiently repair them. If the cracks aren't repaired using this method, excavate a 2 to 3 foot wide area straddling the crack to the depth of cracking and replace with cover materials compacted to project specifications. Compaction may be achieved in horizontal lifts with hand compaction equipment or parallel to slope face with sheepsfoot rollers (winched from bench above or mounted on long-reach backhoe arm).
   - Deeper cracks (deeper than 1 foot) with no vertical offset shall be repaired as follows:
     - The lower portion of the crack below a depth of 1 foot shall be sealed by grouting.
     - The grout shall consist of a mix of fine or silty sand with approximately 5 percent by weight of bentonite mixed with water to mortar-like consistency. Grouting shall be done at 5-foot centers through a grouting pipe inserted into the crack. At each injection point, grouting shall be performed in 2-foot vertical stages proceeding from the bottom up. Grouting shall continue until a pressure of 5 psi is reached, ground surface movement is observed, the void is substantially filled, or grout is identified at the surface.
     - The upper 2 feet of cover over a 2 foot wide zone straddling the crack shall be reworked by compacting the existing cover to project specifications using compaction methods outlined above.

- Cracks and voids in the cover adjacent to concrete channels or swales shall be repaired by grouting in the same manner described above.
- Major cracks with vertical displacement across the crack, in particular on the slopes along the contours, may be indicative of slope deformation or sliding. The Operations Manager may consult with a specialist to evaluate such conditions and recommend appropriate repair measures. The repair may involve excavation of large areas of the cover material, possibly to the full depth of the multilayer cover including animal intrusion barrier replacement. The area affected shall be excavated making sure that the upper part of the slope showing cracks is excavated first to minimize potential for slope failure. The excavated area shall be backfilled with cover material in 6" thick horizontal lifts, moisture-conditioned, and compacted to project specifications using sheepsfoot compaction equipment. Animal intrusion barrier replacement should be performed according to specifications. The repair design shall be prepared by a registered civil engineer. The Operations Manager may consult with licensed/registered specialists to compile alternative repair plans or specifications.
- Surface Depressions: Surface depressions that could cause ponding shall be repaired by backfilling with cover material. Prior to backfilling, the area of the depression shall be cleared of vegetation and scarified to a minimum depth of 6 inches. Backfill materials shall be placed in 6-inch thick lifts, moisture-conditioned, and compacted to project specifications.
- Erosion Gullies:
- 0" to 6" deep: May warrant cosmetic raking or track walking prior to reseeding
- 6" to 12" deep: Remove loose soil, place cover soil in 6" thick lifts, moisture condition to project specifications, and compact parallel to slope face using sheepsfoot roller.
- >12" deep: Remove loose soil. Place cover materials moisture conditioned and compacted to project specifications in lifts ≤ 6" thick. Backfill should be benched into competent in-place fill. Compact with hand held temper or other means in horizontal lifts, tilted slightly into slope
- If the timely repair of the erosion gullies is not feasible due to continuing wet weather, temporary backfilling of erosion gullies may be performed to minimize potential for enlargement of channels. Such temporary backfilling may be performed using coarse rockfill or sandbags. The rockfill and sandbags shall, however, be removed prior to performing permanent backfilling with cover material.

4. Sloughing/Slope Failures:

- The Operations Manager may consult with a specialist to evaluate the cause of sloughing/slope failure and recommend remedial measures.
- Should sloughing of the cover be shallow (less than 12 inches thick) and occur due to saturation from rains, irrigation line or surface water facility failure, the sloughed material shall be removed and the affected area shall be repaired in a similar manner as surface depressions.

- Should sloughing occur on the slope along the contour, it may be indicative of slope failure. The remedial grading for slope failures shall be performed in a similar manner as for major surface cracks. Repair designs shall be prepared by a registered civil engineer.

FORM SOP 007-1
LANDFILL COVER REPAIR RECORD

Maintenance Technician: ________________ **Date:**__________ **Time:**____________

DEFICIENCY TYPE AND DETAILED DESCRIPTION:

☐ Erosion ☐ Sloughing/Sliding ☐ Cracks/Fissures ☐ Subsidence/Depression ☐ Other

LOCATION OF REPAIR ACTIVITY (Show on map):________________________________

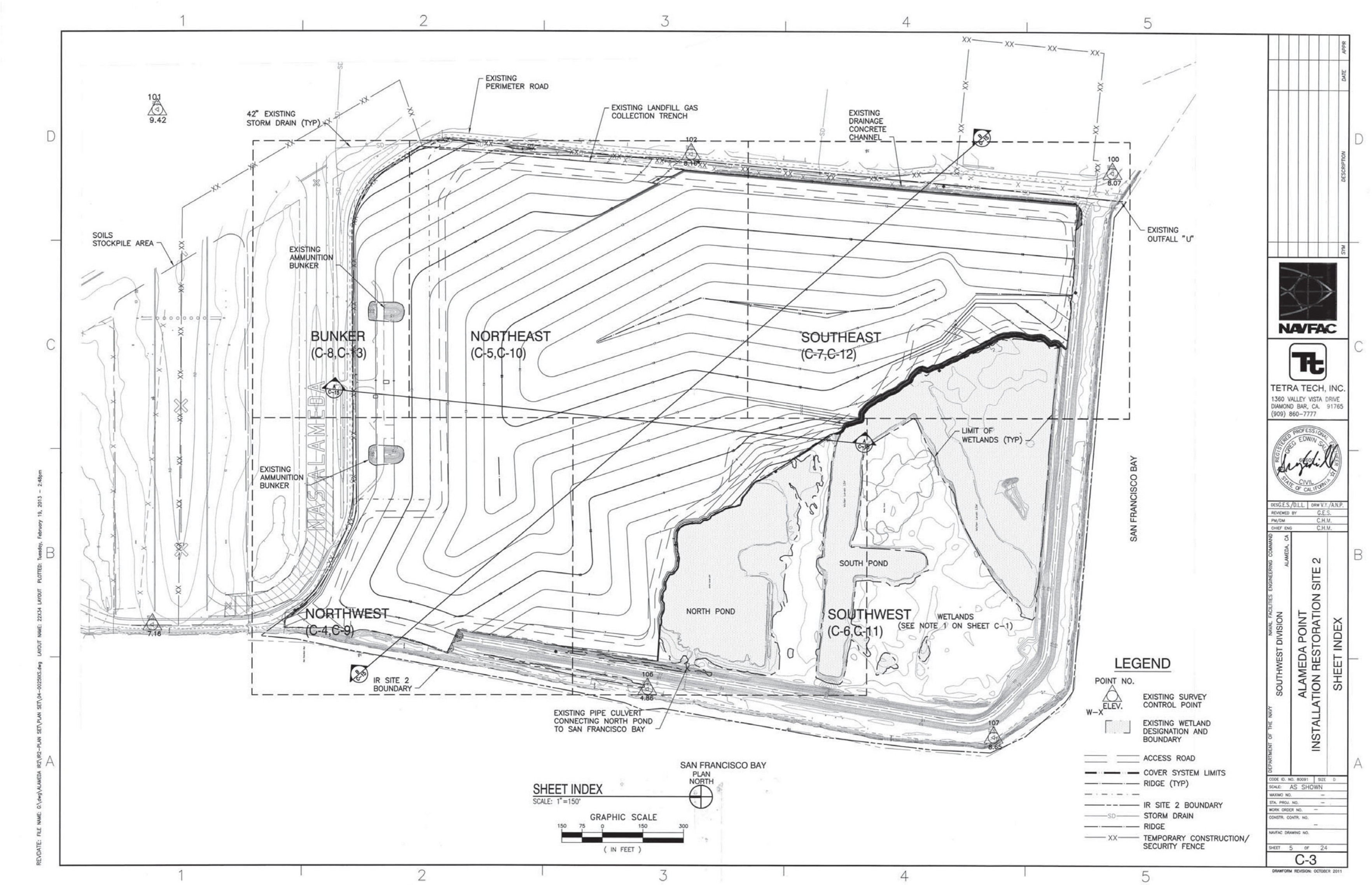
REPAIR ACTION TAKEN (refer to repair detail or design drawing as appropriate): __________

ATTACHMENTS (As-Built drawings, compaction reports, etc., as appropriate):____________

REMARKS: ____

Signature

Operations Manager ____________________________ Date ________________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SCALE: 1"=150'
GRAPHIC SCALE
(IN FEET)
LEGEND
POINT NO.
ELEV.
EXISTING SURVEY CONTROL POINT
EXISTING WETLAND DESIGNATION AND BOUNDARY
ACCESS ROAD
COVER SYSTEM LIMITS
RIDGE (TYP)
IR SITE 2 BOUNDARY
STORM DRAIN
RIDGE
TEMPORARY CONSTRUCTION/ SECURITY FENCE
NAVFAC
TETRA TECH, INC.
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765
(909) 860-7777
DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
ALAMEDA, CA
ALAMEDA POINT
INSTALLATION RESTORATION SITE 2
SHEET INDEX
AS SHOWN
SHEET 5 OF 24
C-3

SOP 008

LANDFILL GAS PROBE MONITORING

1.0 GENERAL

Landfill gas probes are monitored for both the pressure and methane gas to provide for the protection of public health and safety and the environment by demonstrating that methane migration is not occurring in the vadose zone, and that levels are in compliance within ambient air at the landfill perimeter. This Standard Operating Procedure (SOP) addresses routine probe monitoring.

2.0 TASK DESCRIPTION

Landfill gas probes will be monitored quarterly. The condition of the probes is physically inspected prior to monitoring. Probes are monitored for both gas pressure and general composition (i.e., methane – CH_4, carbon dioxide – CO_2, oxygen – O_2, and nitrogen – N_2) using the GEM-500 gas analyzer or equivalent. Probe monitoring is conducted quarterly.

Records will be taken for barometric pressure, atmospheric temperatures, and general weather conditions at the time of gas collection. It is recommended to collect landfill gas during barometric low pressures. Depending on the weather, this may be late in the morning or early in the afternoon.

3.0 REQUIRED MATERIALS

The following materials and equipment are required for this procedure:

- Landtech GEM-500 Gas Analyzer or equivalent
- Dwyer Magnehelic pressure gauge set (Ranges: 0-2 inches of water and 0-100 inches of water and 0-30 psi)
- Form SOP 008-1 (Probe Pressures)

4.0 TASK PERFORMANCE

Before conducting monitoring, inspect each probe for the following conditions:

- Confirm identity of probe.
- Laboratory stopcock or other flow restriction device is fitted and is effective.

- The laboratory stopcock appears to be leak-tight.
- Inventory of manufacturer quick connect fittings for ¼” PVC stopcock.
- Condition of tubing (holes, kinks, water, etc.).
- Condition of probe casing where present.

Adverse conditions are to be repaired if possible and reported to the Operations Manager. Maintenance actions may include the following:

- Replace or repair stopcocks or tubing that are missing or leaking. Record actions taken.
- Record probes that are filled with water. Measurements should not be collected from water-filled probes.
- Repair damaged casing.

Select the Dwyer Magnehelic pressure gauge that is appropriate for the probe by selecting the gauge with the lowest applicable pressure range based on recent pressure readings at the probe. The gauge selected should have the smallest scale range possible without exceeding the scale limit. If the observed pressure reading is outside the pressure range of the selected gauge, use the next larger scale range gauge. Connect the Dwyer Magnehelic pressure gauge to the stopcock with the appropriate tubing. Open the stopcock or flow restriction device. Read and record the pressure in the column marked **Static Pressure (in. of H_2O)** on the appropriate monitoring form when the gauge stabilizes. Record the time in the **Time (hrs)** column. Disconnect the Magnehelic gauge and close the stopcock after the reading is completed.

Calibrate the GEM-500 prior to the beginning of monitoring activities according to the manufacturers manual. Note: The GEM-500 should be recalibrated if the temperature changes 30°F from the initial calibration. Perform the following steps:

1. Turn the GEM-500 on and select the Monitoring Probe ID
2. Connect the clear tubing with the external filter/water trap assembly to the sampling port (top left corner) on the GEM-500. The shorter piece of tubing (from the water trap filter hosing) should be connected to the GEM-500. This allows visual of any liquid entering the hose, allowing time to shut the unit down.
3. Ensure inventory of quick connect fittings in order to take field readings from perimeter probes.
4. Connect the GEM-500 to the probe stopcock and turn the pump on to start analyzing for gas composition.
5. Open the probe stopcock and start the reading. The readings will be in percent CH4, CO2, O2, and balance gas. The balance gas is assumed to be N2. Typically the analyzer pump should run until the gas composition readings stabilize.

6. When the gas composition readings stabilize, record and store the data. Stabilization times should vary between 30 seconds and 2 minutes. Sampling period should not exceed 5 minutes.
7. If water is observed in the sample line during the evacuation process, record it in the comment and terminate the measurement
8. When the reading is completed, disconnect the sample line, allow the probe to purge for 30 seconds and close the stopcock valve.
9. Purge the sample train and the gas analyzer in between probe readings.

Do not shut down monitoring equipment unless sample interval between probes is more than 30 minutes.

FORM SOP 008-1
PROBE PRESSURES

DATE:______________ TECH:______________ INSTRUMENT:

PROBE ID	TIME	PRESSURE (in H_2O)	REMARKS

SOP 009
LANDFILL PERIMETER GAS VENT INSPECTION AND MAINTENANCE

1.0 GENERAL

The inspection and maintenance of the passive gas control system and components, which include monitoring probes, riser vents, collection pipe and barrier trench described in this Standard Operating Procedure (SOP). The system provides for protection of public health and safety and the environment by demonstrating that methane migration is not occurring in the vadose zone, and that methane levels are in compliance at the landfill perimeter.

2.0 TASK DESCRIPTION

Inspection of passive gas control system components will take place during quarterly gas probe monitoring events.

3.0 TASK PERFORMANCE

As part of the annual survey, complete Form SOP 009-1. Any breakdown and subsequent repair of the gas control system shall be documented on Form SOP 009-2 and reported to the Operations Manager immediately. Below is a list of procedures associated with maintenance:

Gas Monitoring Probe/Vent Riser Inspection and Maintenance

Inspect and Maintain

- Inspect and maintain monitoring probe components to ensure consistent and reliable operation.
- Ensure the integrity of the PVC riser vent including paint coating and caps.

Document and Repair

- Document damage and wear and tear. Repair components to function as intended. Document and include in quarterly report.

Inspection Frequency

- Inspect monitoring probe as part of each quarterly monitoring event.

Sample Ports

- Inspect sample port(s) and o-rings for cracks and damage. Replace if damaged.
- Check for tightness and tighten as necessary.

- Ensure sample ports are free of debris and clean as necessary.
- Inspect sample port caps for damage or deterioration. Replace if damaged or deteriorated. It is important that caps are in place on sample ports to prevent deterioration of port and dirt accumulation.

Monitoring Probe Well Casing

- Visually inspect above grade well casings and surrounding areas for signs of damage, deterioration, or potential problems.
- Use below grade inspection techniques when monitoring data warrants (non-routine work).

Surface Completion

- Inspect surface completion for above grade completion details (steel probe cover, well id tag, drain holes).
- Verify that seal between well casing and cement-grout seal is intact.

Surrounding Area

- Visually inspect the surrounding cover surface integrity.
- Pay special attention to the cover located directly around each well casing or riser vent, noting signs that the soil is desiccated or pulling away from the well casing or riser vent.
- Note surface water erosion, ponding, leachate breakouts or staining.

FORM SOP 009-1
PASSIVE GAS CONTROL SYSTEM
QUARTERLY INSPECTION CHECKLIST

Inspection Performed by: ___________________________________ Date: _____________

Component to Be Checked	Finding	Comment (Additional space end of form)
Gas Monitoring Probe		
Surface completion intact?	Yes No	
Sample port(s) and o-rings cracked or damaged intact?	Yes No	
Cover erosion adjacent to casing?	Yes No	
Seal intact between well casing and cement-grout seal?	Yes No	
Surface water or erosion surrounding probe completion?	Yes No	
Passive Gas Vent Riser		
Misalignment, loss of protective coating?	Yes No	
Leaks and/or deterioration at piping connections?	Yes No	
Seal between riser and cement-grout seal is intact	Yes No	
Surface water or erosion surrounding vent completion?	Yes No	
Liquid levels taken?	Yes No	

Comments____

____

____

____

FORM SOP 009-2
PASSIVE GAS CONTROL SYSTEM
BREAKDOWN AND REPAIR LOG

Date:___________________________ Inspector:______________________________

Observations
1. Missing Equipment
2. Damaged Materials
3. Erosion
4. Settlement

Personnel Notified:_______________
____
____
____
____

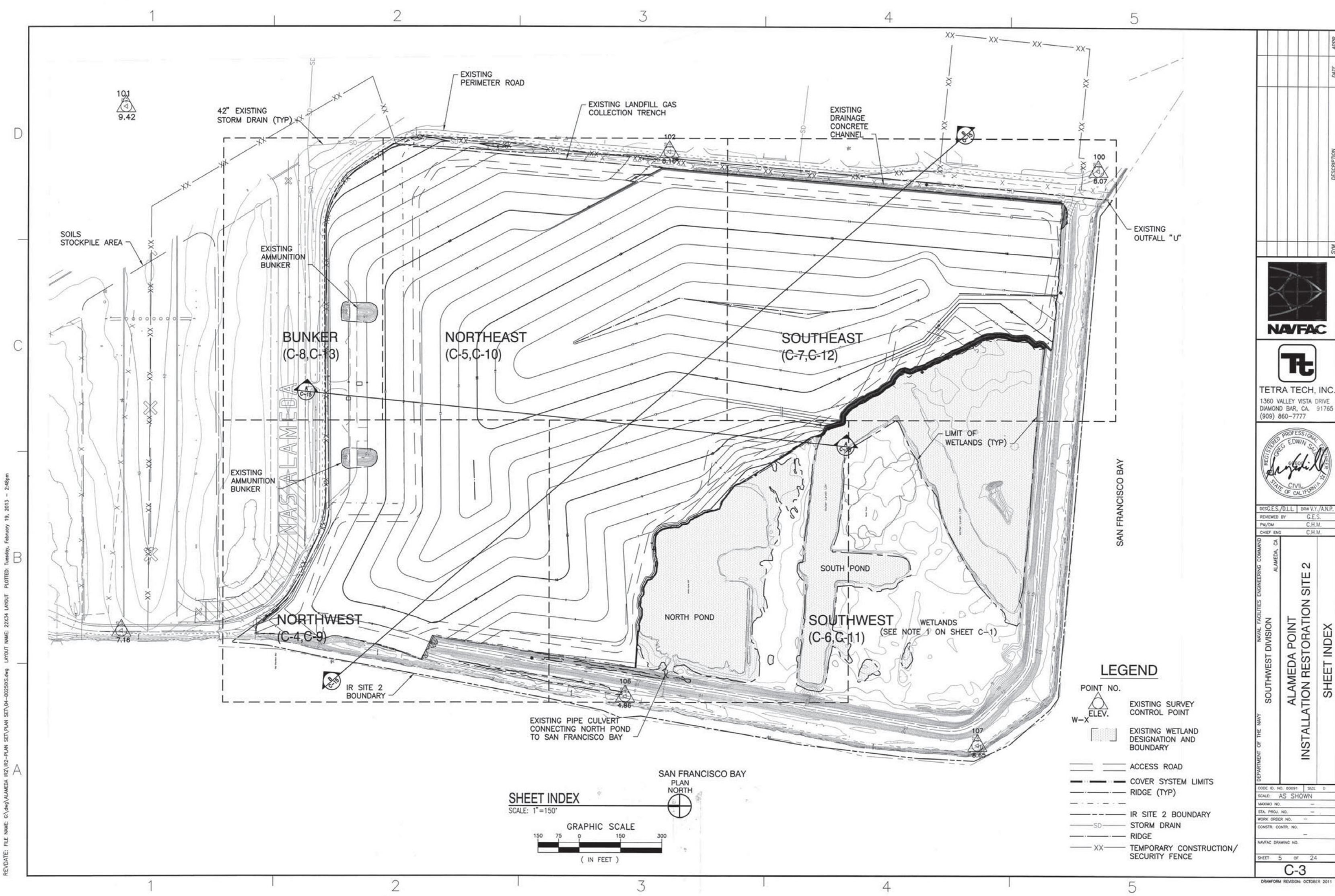
Type of Breakdown/Failure ____
____
____
____
____

Location (show on map)____
____
____
____
____

Action Requested____
____
____
____
____

Action Taken____
____
____
____
____

Comments____
____
____
____
____
____


EXISTING PERIMETER ROAD
EXISTING LANDFILL GAS COLLECTION TRENCH
42" EXISTING STORM DRAIN (TYP)
EXISTING DRAINAGE CONCRETE CHANNEL
SOILS STOCKPILE AREA
EXISTING AMMUNITION BUNKER
EXISTING OUTFALL "U"
BUNKER (C-8,C-13)
NORTHEAST (C-5,C-10)
SOUTHEAST (C-7,C-12)
NORTHWEST (C-4,C-9)
SOUTHWEST (C-6,C-11)
NAS ALAMEDA
LIMIT OF WETLANDS (TYP)
SAN FRANCISCO BAY
NORTH POND
SOUTH POND
WETLANDS (SEE NOTE 1 ON SHEET C-1)
IR SITE 2 BOUNDARY
EXISTING PIPE CULVERT CONNECTING NORTH POND TO SAN FRANCISCO BAY
SHEET INDEX
SCALE: 1"=150'
GRAPHIC SCALE
(IN FEET)
PLAN NORTH
LEGEND
POINT NO.
ELEV.
EXISTING SURVEY CONTROL POINT
EXISTING WETLAND DESIGNATION AND BOUNDARY
ACCESS ROAD
COVER SYSTEM LIMITS
RIDGE (TYP)
IR SITE 2 BOUNDARY
STORM DRAIN
RIDGE
TEMPORARY CONSTRUCTION/ SECURITY FENCE
NAVFAC
TETRA TECH, INC.
1360 VALLEY VISTA DRIVE DIAMOND BAR, CA. 91765 (909) 860-7777
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APPENDIX B

PLAN ITEMIZED COST ESTIMATE
(on CD only)

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TABLE B.1-1
Detailed Annual Operation and Maintenance Costs

Item No.	Description	Estimated Quantities	Units	Unit Price	Total Annual Cost
1	**Project Management**				$0
	Professional Labor	176	hrs	$96	$16,955
	ODC	1	ls	$3,033	$3,033
2	**Field Work**				$0
	Professional Labor	152	hrs	$119	$18,155
	Subcontractors				$0
	- Groundwater Sampling Subcontractor	1	ls	$6,863	$6,863
	- Surveying	1	ls	$6,863	$6,863
	- Equipment	1	ls	$1,373	$1,373
	- Biologist	1	ls	$8,693	$8,693
	- Analytical	1	ls	$7,032	$7,032
	- Data validation	1	ls	$2,905	$2,905
	ODC	1	ls	$7,025	$7,025
3	**Annual Report**				$0
	Professional Labor	224	hrs	$87	$19,423
	Material		ls		$0
	ODC	1	ls	$3,396	$3,396
				Total	**$101,715**

Basis of Estimate

Task No.	Assumption No.	Description
1	1	One year of PM/adminstrative support.
2	1	Twenty-two groundwater monitoring wells to be sampled annually.
2	2	The 2 replacement wells will be sampled semiannually for the first year and if the results are consistent with previous results, the well will be sampled annually.
2	3	Groundwater sampling will be completed for 5 years and a trend analysis conducted during the 5-year review.
2	4	Site inspections will be conducted quarterly and will include a biologist.
2	5	Monuments will be surveyed annually and a full survey of the site will be conducted every 5 years.
2	6	The 2 replacement wells will be surveyed during the final construction.
2	7	A biologist will conduct quarterly inspections.
2	8	Includes costs for two minor repair events.
3	1	Reports will be three versions: Pre-Draft, Draft, and Final.
3	2	The LTM contractor will adopt or modify existing basewide documents (SAP/QAPP and HSP) and procedures.
3	3	Ten copies of each version will be prepared.

APPENDIX C

EMERGENCY RESPONSE PLAN
(on CD only)

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

APPENDIX C

FINAL
EMERGENCY RESPONSE PLAN

April 2013

INSTALLATION RESTORATION SITE 2
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: RMAC-0809-0009-0004

Prepared by:

TETRA TECH EC, INC.

1230 Columbia Street, Suite 750
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Pete Everds
Project Manager

Roger Margotto, CIH
Program Health and Safety Manager

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ABBREVIATIONS AND ACRONYMS

Cal-OSHA	California Occupational Safety and Health Administration
CPR	cardiopulmonary resuscitation
DON	Department of the Navy
IR	Installation Restoration (Program)
NAS	Naval Air Station
OSHA	Occupational Safety and Health Administration
PESM	Project Environmental Safety Manager
PjM	Project Manager
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SSHO	Site Safety and Health Officer
TtEC	Tetra Tech EC, Inc.

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1.0 EMERGENCY RESPONSE PLAN

Tetra Tech EC, Inc. (TtEC) has prepared this Emergency Response Plan to cover the Post-Closure Operations, Maintenance, and Monitoring Plan (Plan) for Installation Restoration (IR) Site 2, former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California. This Plan was prepared for the United States Department of the Navy (DON), Base Realignment and Closure Program Management Office West, under Contract No. N62473-10-D-0809, Contract Task Order No. 0009.

There are numerous emergency services nearby in the civilian community. This plan describes response activities as they apply to NAS Alameda and as required by the HAZWOPER regulations 29 *Code of Federal Regulations* 19101.120 (l) and 8 *California Code of Regulations* 5192 (l).

1.1 PRE-EMERGENCY PLANNING

Prior to performing any work, the Superintendent or Project Manager (PjM) and the Site Safety and Health Officer (SSHO) will verify emergency action plans by ensuring that planned support facilities are available and that emergency contact numbers are valid. The Alameda Fire Department will be notified of planned activities by the SSHO or the Superintendent. As work proceeds, the SSHO will continue to ensure that plans specified in this section can be implemented at all times. Furthermore, the SSHO will ensure that plans are modified as necessary to accommodate changes. The SSHO will coordinate changes with the Project Environmental Safety Manager (PESM). Upon arrival at the site, the Superintendent will ensure that personnel know the system for communication of emergency situations and how to use a radio or nearby phone to summon emergency assistance. A vehicle must be available to transport personnel to a safe location or to a hospital. All personnel on this project will know how to use a portable fire extinguisher. All personnel will know the location of emergency equipment and supplies. The SSHO will ensure that emergency equipment is available in the work areas and that the equipment is inspected for compliance with the regulations:

- Fire extinguishers – monthly, annual refill and servicing, 12-year hydrostatic test.
- First aid kits – weekly as required by the Occupational Safety and Health Administration (OSHA).
- Eyewashes, capable of delivering 0.4 gallon per minute for 15 minutes – weekly (If preservative is used, eyewash water may be changed every 4 months; otherwise, water must be changed weekly.) Only potable water may be used for eyewashes.

1.2 PERSONNEL ROLES, LINES OF AUTHORITY, TRAINING AND COMMUNICATION

The Superintendent or PjM is the primary emergency coordinator for the project. In the absence of either or both the Superintendent and the PjM, the SSHO is the emergency coordinator. The emergency coordinator will take charge and determine, direct, and delegate personnel and resources to manage the emergency. Key responsibilities of the emergency coordinator are to:

- Initiate evacuation, if needed.
- Initiate emergency response agency notification.
- Evaluate and assess emergency situations to ensure that response activities are commensurate with the level of the emergency and, as discussed in this Plan, are implemented.
- Interface and coordinate with outside agencies responding to on-site emergencies.

Project supervisors and forepersons will account for all their personnel and report their count to the emergency coordinator. They will follow the directions of the emergency coordinator. If directed by the emergency coordinator, the supervisors will direct workers to evacuate the area and report to the assembly area.

All workers will follow the instructions of the emergency coordinator.

All workers have had training for various emergency situations. For this project, workers will have had training in spill containment and control, fighting incipient stage fires, use of eyewashes, and basic rescue techniques for moving and carrying personnel in danger situations. There will always be personnel at the work site who can provide cardiopulmonary resuscitation (CPR) and first aid.

Personnel will maintain verbal communication. The following communication systems will be available during site activities:

- Cellular telephone or access to a land phone for emergency purposes
- Handheld radios, as needed
- Compressed air horn (signals emergency evacuation only)
- Hand signals (if used, will be diagrammed and posted)
- Posted location of evacuation assembly area(s)
- Posted route to the hospital located nearest the project site
- Posted emergency phone numbers

1.3 EMERGENCY RECOGNITION AND PREVENTION

All personnel have received training on the potential hazards on this project. There are hazards that are commonly expected on any project site such as adverse weather, electrical hazards, traffic, and equipment hazards, chemical exposures, physical hazards, etc. These have been addressed in theSite Safety and Health Plan. If someone has been affected by a hazard, all personnel are trained on how to respond to an emergency. The first thing anyone is told to do is notify by radio or phone as noted above. There are other procedures to prevent emergencies by following the directions below.

1.4 FIRE PREVENTION AND PROTECTION

Fire prevention and protection measures require preplanning. At least one 20-pound dry chemical ABC fire extinguisher will be located at each work area. A mounted fire extinguisher is required in every vehicle including heavy equipment. Extinguishers mounted on heavy equipment will be a minimum 5-pound ABC dry chemical type. Fire extinguishers inside the cab of pickup trucks will be 2 ½-pound dry chemical ABC. Fire extinguishers in the cabs of all vehicles must be mounted or secured. Fire extinguishers in the beds of all pickup trucks must be mounted or secured. Employees will follow safe work practices to include proper storage of flammable and combustible liquids. Smoking is permitted only in those areas designated specifically by the PjM, Superintendent, or SSHO and posted as smoking areas.

Personnel will follow hot work procedures to ensure that work is performed in a safe environment. In the event of a fire or explosion, the Fire Department will be summoned immediately, a head count will be taken, and evacuation procedures will be implemented. Smoking is not permitted inside buildings.

1.5 SPILL CONTROL AND RESPONSE

All spills, leaks, and fires involving oil or hazardous substances at former NAS Alameda must be reported to the DON Remedial Project Manager (RPM) and the PESM. The person reporting the leak or spill is required to provide the following information:

- His/her name
- Location of spill and facility number, if known
- Number of injured personnel and nature of injuries, if known
- Substance spilled
- Estimated amount spilled
- Extent of spill
- Estimated rate at which the substance is currently being released
- Estimated time the spill occurred

- Any other pertinent information

The RPM, in coordination with the PjM, will manage notifications to regulatory agencies. In addition, all spills will be reported to the Environmental Compliance Manager or the PESM. Project personnel will not report spills directly to any agency unless specifically requested by the RPM or the Contracting Officer.

A minor spill would involve no immediate threat to human health or the environment. It would cause only minimal property damage and not exceed the reportable quantity for that material. In the event of a minor spill, the appropriate response action is for the responsible person to notify the RPM and the PjM and supply the responders with as much information as possible. In the case of a spill of contaminated or hazardous materials, the following procedures will be followed:

- Notify the Superintendent, the PjM, and the PESM.
- Identify protective clothing or equipment required to respond.
- Contain the spill.
- Neutralize and/or solidify any product.
- Transfer material into 55-gallon drums.
- Document the incident.

1.6 RELEASE PREVENTION AND MINIMIZATION MEASURES

In addition to training, the following procedures will be implemented to prevent and minimize releases of hazardous materials:

- Do not conduct hazardous materials operations when the weather could cause significant risk to the surrounding area if a spill should occur.
- Transfer all materials in or over a bermed or "protected" area. A protected area is one that is covered with an impermeable material, such as polyethylene.
- Dike temporary storage tanks containing hazardous wastes or potentially hazardous wastes to contain potential releases.
- Maintain a supply of basic spill response materials and protective equipment on-site to include:
  - Absorbent sheets, pillows, booms, or other absorbent material
  - Open top 55-gallon drums or other containers with lids
  - Brooms, shovels, and other tools, such as squeegees

1.7 SIGNIFICANT VAPOR RELEASE

Any project activity that releases significant amounts of vapor must be reported immediately, as described in the spill release procedure. Every attempt to mitigate the release must be taken if it can be safely performed. For example, during excavations, vapor releases may be controlled by simply replacing the cover on the excavation. Downwind evacuation procedures may be required. These will be initiated through coordination with former NAS Alameda emergency coordinators.

1.8 EARTHQUAKE RESPONSE

If an earthquake should occur during the course of site activities, take the following action:

- Stop working. Remain calm and do not panic.
- Do not use or do anything that might be a source of ignition (smoking, cutting, or welding).
- Avoid power lines, power poles, and windows.
- If in a vehicle, stay in the vehicle until the earthquake is over.
- If in a building, take cover under a heavy piece of furniture or leave the building if possible.

After the earthquake is over:

- Prepare for aftershocks. Stay out of severely damaged buildings.
- Meet for a head count at a location designated by the Superintendent.
- Check for injuries. Do not move seriously injured personnel, unless remaining where they are would create danger of further injury.
- Check vehicles, equipment, and buildings for any obvious damage. Do not enter buildings until their structural integrity has been evaluated.
- Check utility lines for damage. Switch off power, water, and gas until a utility official has inspected the buildings and operational area and determined it is safe.
- If driving, watch carefully for hazards created by the earthquake (undermined roads, weak bridges or overpasses, fallen power lines or poles, and so forth).

1.9 SAFE DISTANCES AND PLACES OF REFUGE

On this project, after an emergency inside the building is identified, the building will be evacuated. Only personnel authorized by the emergency coordinator will be allowed to return into the building depending on the nature of the emergency and whether the personnel have the training, the ability, and the need to return to the building. As noted below, personnel will assemble in the project trailer/offices. This area is several hundred feet from the buildings.

Immediately evacuate to an area located at least 50 feet from the building as an alternate area identified by the SSHO.

1.10 SITE SECURITY AND CONTROL

There are no buildings on-site. The site is secured by fencing on the north and east sides.

1.11 EVACUATION ROUTES AND PROCEDURES

In the event of an emergency situation such as fire or explosion, the SSHO or a supervisor will activate an air horn for approximately 15 seconds indicating the initiation of evacuation procedures. All personnel in both the restricted and non-restricted areas will evacuate and assemble near the support zone or other safe area identified by the SSHO. Prior to starting work, the SSHO will identify and mark the location of an evacuation assembly area. The location should be upwind of the site.

For efficient and safe site evacuation and assessment of the emergency situation, the Superintendent or SSHO will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The SSHO must ensure that access is provided for emergency equipment and that equipment that may cause combustion has been shut down once the alarm has been sounded. As soon as possible, and while the safety of all personnel is confirmed, emergency agency notification will commence. The SSHO will brief site personnel each day as to the location of the evacuation assembly area. After gathering at the local site assembly point, and depending on the nature of the emergency, workers will be given further instructions.

Before starting work, the SSHO will establish safe egress routes from the site to the evacuation assembly area. The SSHO will prepare a drawing or map that diagrams these safe egress routes. The SSHO will use this same map to diagram egress from the evacuation assembly area to the facility gate to be used as an exit.

An evacuation exercise will be practiced within 1 week of the start of the project and randomly during the course of the project. After the practice drill or after any actual evacuation, all involved site personnel will attend a briefing to evaluate the evacuation. The employees will discuss the evacuation and anything that could be done to improve or change future evacuations. The results of this briefing will be documented on a safety meeting attendance form. A copy of the evaluation report will be sent to the PESM.

1.12 DECONTAMINATION PROCEDURES

Any personnel requiring emergency medical attention will be evacuated immediately from exclusion zones and contamination reduction zones. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant.

For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving treatment. If decontamination does not interfere with essential treatment, it should be performed.

If decontamination can be performed:

- Wash external clothing and cut it away.
- Wrap the victim in a clean blanket or towel if necessary.

If decontamination cannot be performed:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination; instruct them regarding specific decontamination procedures.

Send along site personnel familiar with the incident.

1.13 EMERGENCY MEDICAL TREATMENT AND FIRST AID

The following procedures should be observed if an accident with injury occurs.

1.13.1 First Aid

Only qualified personnel will provide first aid and stabilize an individual needing assistance. Life support techniques such as CPR and treatment of life-threatening problems such as airway obstruction and shock will be given top priority. At least two persons certified in first aid techniques and CPR will be on each work site at all times; EHS 4-1, Bloodborne Pathogens, will be followed when first aid/CPR are administered. The SSHO will be current in first aid and CPR and bloodborne pathogen training. Professional medical assistance will be obtained at the earliest possible opportunity. Ensure that WorkCare® has been contacted at (800) 455-6155. The hospital and clinic located nearest to former NAS Alameda are shown on a map that is part of every Site Safety and Health Plan. A general map to the nearest clinic and hospitals is attached to this plan. Notify the PjM and the PESM.

1.13.2 Minor Injury

- Contact a supervisor or "buddy."
- Have qualified first aid personnel treat the injury.

- Record the injury and include the name of the injured person, nature of injury, and treatment given.
- Notify the PjM and the PESM.

1.13.3 Medical Emergency

In the event of a medical emergency when actual or suspected serious injury occurs, the following procedures will be implemented:

- Survey the scene and evaluate whether the area is safe for entry.
- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel after critical first aid is provided.
- Obtain paramedic services or ambulance transport to local hospital. This procedure will be followed even if there is no visible injury.
- Call 911 from phones at former NAS Alameda. Calling 911 from cell phones will notify California Highway Patrol who will notify county Emergency Medical Service. If using a cell phone, call Alameda (510) 337-2100. Preprogram cell phones with this emergency number.
- Identify the location by the number of the nearest building, request medical assistance, and provide a name and telephone number.
- Request assistance from emergency medical service and/or additional assistance.
- Other personnel in the work area will be evacuated to a safe distance until the Superintendent determines that it is safe for work to resume. If there is any doubt about the condition of the area, work will not commence until all hazard control issues are resolved.
- Notify the PjM and the PESM.
- Notify the Resident Officer in Charge of Construction (ROICC) of the incident and fill out accident reporting forms and associated documents.

1.13.4 Fatal Injury

If a fatal injury occurs, the following additional steps will be followed:

- Notify the Superintendent and PjM immediately.
- Notify the PESM, who will initiate contact with the California Occupational Safety and Health Administration (Cal-OSHA).
- Notify the ROICC.
- Stop all work activities on the project for 24 hours.
- Assist Cal-OSHA as directed.

1.14 EMERGENCY ALERTING AND RESPONSE PROCEDURES

This plan has identified the emergency alerting devices available to the project. While inside the buildings, the use of the air horn is most effective in alerting personnel. However, if personnel are located a distance from where the emergency occurred, the horn should be tested to ensure that personnel in all areas can hear the horn. When necessary, the on-site supervisor will give each work team an air horn. The supervisor will know the assigned area of each work team. The use of radios with each team can also provide information regarding the precise location of the emergency. Upon alarm, the first response is made by the emergency coordinators who will direct the activities required to respond to the emergency. This plan has described many potential response procedures.

1.15 PPE AND EMERGENCY EQUIPMENT

The following emergency equipment will be stationed near each work area:

- Fire extinguisher (minimum one 20-pound dry chemical ABC type in the contamination reduction corridor at the edge of the exclusion zone).
- Industrial first aid kit (outside the building entrance). The kit must be filled as required by EM 385-1-1, Table 3-1 (USACE 2008) and 8 CCR 5812.
- Portable eye wash (capable of supplying 15 minutes of water at 0.4 gallon per minute and protected from direct sunlight in the support area, at the edge of the support zone).
- Air horn (at the support area, at the edge of the support zone).
- Spill control material (absorbent pillows or absorbent material and shovels, plastic sheeting, and 55-gallon drum[s] in the support zone by the contamination reduction corridor entrance).

The following equipment will be available at the support trailer/offices for use in an emergency situation:

- Industrial first aid kit
- Blanket

The need for specialized personal protective equipment is not anticipated for this project.

1.16 PROCEDURES FOR HANDLING EMERGENCY INCIDENTS

This Plan has incorporated prevention procedures with procedures on how to handle the emergency event. After the emergency event is over, or during the course of the emergency when possible, the SSHO will notify the PESM by telephone. Should an accident or incident occur, the Superintendent or PjM and the SSHO will immediately investigate the cause, notify the PESM, and promptly complete the following:

- Incident Report Form – Details of the incident will be documented within 24 hours and copies of the report will be forwarded to the RPM and the PESM. Reports of serious incidents will also be faxed to the Program Manager by the Superintendent or PjM.
- Incident Investigation Report – The Incident Investigation Report will have the same distribution as the Incident Report Form and must be completed within 3 days of the incident.
- Contractor's Significant Incident Report – If the accident/incident involves injuries requiring more than first aid or property damage greater than $2,000, a Contractor Significant Incident Report will be prepared and submitted to the ROICC as soon as possible after the incident but no later than 5 days after. The originals will be sent to the TtEC records coordinator for maintenance and distribution. Copies will be distributed to the PESM, Superintendent, subcontractor employees, if appropriate, and the Contracting Officer. A copy of the completed forms will be kept in the project file.

Any recommended additional hazard control measures must be discussed with the Superintendent, SSHO, and PESM and meet their approval prior to implementation. Corrective actions will be implemented as soon as reasonably practical. Any occupational injuries and illnesses will be recorded, if applicable, on an OSHA Form No. 300. The SSHO will report immediately to the PESM any serious injury or illness requiring hospitalization, or death of an employee occurring in a place of employment or in connection with any employment. The PESM will immediately notify the closest CalOSHA office in Oakland at:

1515 Clay Street, Ste. 1301
Oakland, California 94612
Phone (510) 622-2916
Fax (510) 622-2908

Immediately means as soon as practically possible, but not longer than 8 hours after the incident. Records of all site accidents and first aid treatments will be maintained by the SSHO.

Emergency contact names and phone numbers will be posted. Maps showing egress routes, evacuation assembly areas, and the route to the clinic and hospitals will also be posted. The contact names, phone numbers, and maps will be placed on the dashboard of every project vehicle.

This plan also describes practice drills for emergencies. When there is an actual emergency event, similar to the practice drill, a project team debriefing will be held to review the event and discuss measures for improving or changing the response plan to correct deficiencies that may have been noted.

2.0 REFERENCES

USACE (U.S. Army Corps of Engineers). 2008. Safety and Health Requirements Manual. Engineering Manual (EM) 385-1-1. September 15.

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ATTACHMENT 12

LAND-USE CONTROL REMEDIAL DESIGN

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-10-D-0809
CTO NO. 0009

ATTACHMENT 12

FINAL
LAND-USE CONTROL REMEDIAL DESIGN
April 2013

**INSTALLATION RESTORATION SITE 2
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

DCN: RMAC-0809-0009-0004

Prepared by:

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, California 92101-8530

Hedy Abedi, PhD, PE
Project Manager

Pete Everds
Senior Project Manager

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APPENDICES

ABBREVIATIONS AND ACRONYMS

ARIC	area requiring institutional controls
Cal. Code Regs.	*California Code of Regulations*
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CRUP	Covenant to Restrict Use of Property
DoD	Department of Defense
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DDx (total)	sum of total dichlorodiphenyldichloroethane
DON	Department of the Navy
DTSC	California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
GIS	geographic information system
IC	institutional control
IR	Installation Restoration (Program)
LUC	land-use control
MOA	memorandum of agreement
MOU	memorandum of understanding
NAS	Naval Air Station
NCP	National Contingency Plan
OEW	ordnance and explosives waste
PCB	polychlorinated biphenyl
RD	remedial design
ROD	Record of Decision
Water Board	San Francisco Bay Regional Water Quality Control Board
yd^3	cubic yard

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1.0 PURPOSE

The Land-Use Control (LUC) Remedial Design (RD) for Installation Restoration (IR) Site 2, Alameda Point, Alameda, California, addresses the institutional controls (ICs) (including land use and activity restrictions) required by Section 2.9.2 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD) for IR Site 2 issued in August 2010. The ROD requires the implementation of land use and activity restrictions to limit exposure of future landowner(s) and/or user(s) of the property to hazardous substances, and to maintain the integrity of the remedial action until remediation is complete and remedial goals have been met.

This LUC RD is a component of the RD for IR Site 2, a primary document under the Alameda Point Federal Facility Agreement (FFA). This LUC RD was prepared in accordance with the *Navy Principles and Procedures for Specifying Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions* attached to the January 16, 2004, Department of Defense (DoD) Memorandum titled *CERCLA ROD and Post-ROD Policy*.

The Alameda Point "FFA Signatories" consist of the Department of the Navy (DON), the U.S. Environmental Protection Agency (EPA), the State of California through the Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board). If the FFA is amended to transfer responsibility for post-RACR Operation and Maintenance and monitoring of the remedy for IR Site 2 property from DON to another federal agency, the DON's responsibilities under this LUC RD shall be assumed by the federal transferee, and DON will no longer be responsible for them. In the event of such an amendment the term "FFA Signatories" as used in this LUC RD report shall be construed to include EPA, DTSC, Water Board, and the federal transferee.

The California Department of Public Health (CDPH) regulates activities related to remediation of radionuclides on non-federally owned property. CDPH is involved in the IR Site 2 remediation as described in the ROD.

The inspections and reporting requirements described herein will be effective immediately upon approval of this LUC RD by EPA, DTSC, and the Water Board. The IR Site 2 property ("the property") is currently owned by the DON and is not subject to a lease. The IC objectives will be met by access controls until the time of transfer of the property from DON ownership. The IC land use and activity restrictions described in this LUC RD report will be incorporated into a Memorandum of Understanding (MOU) or other agreement between the DON and the federal transferee if the property is transferred to another federal agency, or Quitclaim Deeds (deed[s]) and Covenant to Restrict Use of Property (CRUP) if the property is transferred to a nonfederal entity, and will take effect upon transfer of the property and issuance of those documents.

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2.0 SITE DESCRIPTION

IR Site 2 is located on the southwest corner of Alameda Point in Alameda, California (Figures 1 and 2). Alameda Point is approximately 2 miles long east-west and 1 mile wide, north-south, and occupies 1,734 acres of onshore land. IR Site 2 is approximately 110 acres in size (Figure 2-1).

The site consists of the former landfill, which occupies approximately 60 acres, and wetlands, which covers approximately 33 acres immediately south and west of the landfill. The remaining 17 acres within the IR Site 2 boundary is represented by areas known as the interior and coastal margins. The site is bounded to the south and west by the San Francisco Bay and to the east and north by runways and tarmacs. The former landfill was reportedly used for disposal of wastes generated by former Naval Air Station (NAS) Alameda activities from 1956 through early 1978. After landfill operations ceased in 1978, an earthen berm was constructed around the perimeter of the landfill site.

Previous site use has contaminated the soil with cadmium, chromium, lead, molybdenum, zinc, total DDx (sum of total dichlorodiphenyldichloroethane [DDD], dichlorodiphenyldichloroethene [DDE], and dichlorodiphenyltrichloroethane [DDT]), polychlorinated biphenyls (PCBs), benzo(a)pyrene, and radium-226 at concentrations that may pose a risk to human health and ecological receptors under a recreational use scenario, a proposed future reuse of IR Site 2. The selected remedy, a multilayer soil cover (cover) over the former landfill to isolate buried waste and soil contaminants, has been selected to protect human health and to address concentrations in soil and soil gas above the established remedial goals. The remediation strategy is described in the Proposed Plan (DON 2009) and in the Final ROD (DON 2010).

2.1 SITE BACKGROUND

Former NAS Alameda was an active military installation from the 1930s to the 1990s, which primarily provided facilities and support for fleet aviation activities. The area of present day IR Site 2 was originally open water until 1956 when a sea wall was constructed along the southern and western shorelines to confine and protect the area. Dredged fill was hydraulically placed within the seawall creating the area encompassed by IR Site 2.

The IR Site 2 landfill, also called the West Beach Landfill, was used as the main disposal area for the Alameda Point from approximately 1952 through 1978. An estimated 1.6 million tons of waste was deposited (E&E 1983). Historical waste disposal methods at the site generally consisted of trench-and-fill operations. Wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB)-containing liquids, batteries, low-level radioactive waste (LLRW) including but not limited to radioluminescent dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E 1983). Ordnance and explosives waste (OEW) may have also been deposited in the 2.5-acre (approximate) Possible OEW Burial Site located in the southern part of the landfill. Previously identified areas of buried waste are shown on Figure 2-1.

In 1978, the DON developed plans to close the landfill in accordance with the requirements of the Water Board's *Minimum Criteria for Proper Closure of Class II Solid Waste Disposal Sites* (Resolution No. 77-7). In 1983, the Water Board issued Order No. 83-35 to implement a final cover, leachate cutoff barrier, methane gas control, earthquake damage control, drainage control, and erosion control, and to generate compliance reports for the former landfill. Between 1983 and 1995, the DON responded by placing a partial clay-soil cover, installing an 820-foot-long, 2-foot-wide and 20- to 30-foot-deep slurry wall to restrict potential contaminant migration to San Francisco Bay. A gas venting system was installed for methane gas control, and repairs were made to the seawall also during this time period. In 1986, 20,000 cubic yards of imported fill soil was spread on the former landfill, which was insufficient in achieving a uniform cover layer of appropriate thickness over the landfill area. Also in 1986, the landfill was graded to prevent ponding, and an earthen perimeter berm was constructed around the landfill.

In August 1999, IR Site 2 was officially added to the EPA's National Priority List of Superfund sites and assigned Comprehensive Environmental Response, Compensation, and Liability Information System identification number CA2170023236.

2.2 CURRENT AND POTENTIAL FUTURE SITE USES

IR Site 2 was used as a landfill between the mid-1950s and the latter part of the 1970s. No land use occurred at the site prior to 1956 when the perimeter sea wall was constructed and the site was first formed using dredged fill. Due to its sole historical use as a landfill, no persons have resided or currently reside at the site. Because it has never been used for full-time residence or occupancy, no above- or belowground utilities (e.g., potable water, electric, or telephone) exist at the site.

As stated in the ROD, the future use of the Site is to be restricted to open space and recreational uses. Please refer to the ROD, Table 2-13, Land Use Restrictions, for specific land use prohibitions.

2.3 BASIS FOR REMEDIAL ACTION

Potentially significant risk to human and ecological receptors due to exposure to contaminants of concern (COCs) (cadmium, chromium, lead, molybdenum, total DDx, total PCBs, benzo[a]pyrene, and radium-226) for the landfill area and lead, zinc, and radium-226 in the wetland area in soil, a recreational use scenario is the basis for the CERCLA remedial action being undertaken by the DON. The FFA signatories considered the factors in accordance with the remedy selection criteria and concluded that a remedial action is necessary to minimize exposure of human receptors, sensitive habitats, and species to impacted soil at IR Site 2. The FFA signatories developed the following remedial action objectives to address the human health and ecological risk:

- Protect sensitive human receptors, avian species, and mammal species from exposure to COCs in surface soil in the landfill and wetland portions of the site
- Protect viable wetland area in the southwest portion of the site from impacts associated with the landfill
- Protect sensitive human receptors from exposure through external radiation from surface soil in the landfill and wetland portions of the site
- Protect beneficial uses of the surface water in the San Francisco Bay from the potential for discharge of site groundwater containing COCs

2.4 DESCRIPTION OF SELECTED REMEDY

The selected remedy identified in the ROD (DON 2010) consists of the placement of a cover to isolate buried waste and soil contaminants and to prevent animal burrowing. Prior to placing the cover, the surface will undergo scanning and removal of radiological hotspot material to prevent the spread of potential contamination during site grading. Engineering controls and ICs will be implemented to protect human health and the integrity of the cover; provide for any necessary wetlands mitigation, and monitor soil cleanup and wetlands mitigation; and conduct methane gas monitoring (as necessary).

The selected remedy for groundwater is monitored natural attenuation. Site groundwater will be monitored regularly using shoreline groundwater monitoring wells. Engineering controls will be in place to protect the monitoring wells from damage and/or to protect site users from harm. ICs will be implemented across the entire site, including the wetlands, to limit human exposure to contaminants in soil and to protect the integrity of the cover.

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3.0 INSTITUTIONAL CONTROLS

ICs are legal and administrative mechanisms used to implement land use and activity restrictions to limit the exposure to hazardous substances by current and future landowner(s) and user(s) of the property and to maintain the integrity of the remedial action. ICs are required on a property where the selected remedial cleanup levels result in contamination remaining at the property above levels that allow for unlimited use and unrestricted exposure. ICs will be maintained until the concentrations of hazardous substances in soil and groundwater are at such levels to allow for unrestricted use and exposure. Implementation of ICs includes requirements for monitoring, inspections, and reporting to ensure compliance with land use or activity restrictions.

3.1 FEDERAL-TO-FEDERAL PROPERTY TRANSFER

If the IR Site 2 property is transferred to another federal agency or department, the land use restrictions and activity restrictions set forth in Section 5.0 and the Remedy Implementation Actions set forth in Section 6.0 will be incorporated into an MOU or other agreement between the DON and the federal transferee. The MOU or other agreement will also require that 1) the transferee comply with all applicable federal and state environmental, public health, and cultural and natural resource protection laws following transfer; 2) any subsequent future transfer by the federal transferee to a federal agency shall incorporate the land use and activity restrictions set forth below into a subsequent MOU or other agreement and require the same for any further conveyances between federal agencies; and 3) if the federal transferee in turn transfers the property to a nonfederal entity, it shall comply with the requirements set forth in Sections 3.2, 5.0, and 6.0. If the FFA is amended to transfer responsibility for post-RACR Operation and Maintenance and monitoring of the remedial action selected for IR Site 2 from DON to another federal agency, the DON's responsibilities under this LUC RD shall be assumed by the federal transferee and DON shall no longer be responsible for them as provided in Section 1.0.

3.2 PROPERTY TRANSFER TO A NONFEDERAL ENTITY

If the IR Site 2 property is transferred from the DON or another federal transferee to a nonfederal entity, DON will rely upon proprietary controls in the form of environmental restrictive covenants as provided in the *Memorandum of Agreement (MOA) Between the United States Department of the Navy and the California Department of Toxic Substances Control* and attached covenant models (DON and DTSC 2000) (hereinafter referred to as the DON/DTSC MOA). More specifically, land use and activity restrictions will be incorporated into two separate legal instruments at the time of transfer as provided in the DON/DTSC MOA:

1. Restrictive covenants included in one or more Quitclaim Deeds from the DON to the property recipient

2. Restrictive covenants included in one or more "Covenant to Restrict Use of Property" entered into by the DON and DTSC as provided in the DON/DTSC MOA and consistent with the substantive provisions of *California Code of Regulations* Title 22, Section 67391.1.

The "Covenant to Restrict Use of Property" will incorporate the land use and activity restrictions into environmental restrictive covenants that run with the land and are enforceable by DTSC, EPA, and any other signatory state entity (such as CDPH) against future transferees. The Quitclaim Deed(s) will include the identical land use and activity restrictions in environmental restrictive covenants that run with the land and will be enforceable by the DON against future transferees.

ICs include land use and activity restrictions and will be applied to the property in the area requiring institutional controls (ARIC) (the entire area of IR Site 2 as described in Section 4.0). These IC's will be included in the Environmental Summary Document (for transfer to a federal agency), or a Finding of Suitability to Transfer/Finding of Suitability for Early Transfer, Covenant to Restrict Use of Property, and Quitclaim Deed(s) (for transfer to a non-federal entity).

4.0 AREA REQUIRING INSTITUTIONAL CONTROLS

The ICs, including all land use and activity restrictions selected in the ROD and described in Section 5.0, will be applied to the IR Site 2 area requiring institutional controls (ARIC). The ARIC is shown on Figure 2-1.

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5.0 INSTITUTIONAL CONTROL PERFORMANCE OBJECTIVES, LAND USE RESTRICTIONS, AND ACTIVITY RESTRICTIONS

The following sections describe the objectives to be achieved through land use and activity restrictions within the ARIC at IR Site 2. If the FFA is amended to transfer responsibility for post-RACR Operation and Maintenance and monitoring of the remedy for IR Site 2 from DON to another federal agency as provided in Section 1.0, the federal transferee shall also be responsible for compliance with the land use and activity restrictions set forth below after the IR Site 2 property is transferred to it.

5.1 LAND USE RESTRICTIONS

The IR Site 2 property shall be restricted to open space and recreational uses. In addition, the following land uses are specifically prohibited within the boundaries of the IR Site 2 ARIC:

- A residence, including any mobile home or factory-built housing, constructed or installed for use as human habitation
- A hospital for humans
- A school for persons under 21 years of age
- A daycare facility for children
- Any permanently occupied human habitation including those used for commercial or industrial purposes

5.2 GENERAL ACTIVITY RESTRICTIONS

The following activities are restricted within the boundaries of the IR Site 2 ARIC unless prior written approval for these activities is granted by the FFA signatories, prior to conducting them:

- Land disturbing activity is prohibited unless conducted pursuant to an approved soil management plan (SMP) (Note: Additional SMP requirements for addressing radiological activity restrictions are set forth below in Section 5.3). Land disturbing activity includes, but is not limited to, 1) excavation of soil and disturbance of the multilayer soil cover; 2) construction of roads, utilities, permanently occupied buildings, facilities, structures, and appurtenances of any kind; 3) demolition or removal of paved areas; 4) actions that may impair the multilayer soil cover or other exposure prevention barriers; 5) excavation and/or disturbance of soil or riprap areas; and 6) any other activity that involves movement of soil to the surface from below the surface of the IR Site 2 property.
- Alteration, disturbance, or removal of any component of a response or cleanup action (including, but not limited to, soil cover/containment systems); groundwater extraction, injection, and monitoring wells and associated piping and equipment; or associated utilities.

- Extraction of groundwater and installation of new groundwater wells.
- Removal of or damage to security features (e.g., locks on monitoring wells, survey monuments, signs, or monitoring equipment and associated pipelines and appurtenances).

ICs will be maintained until the concentrations of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure.

5.3 ADDITIONAL ACTIVITY RESTRICTIONS RELATED TO RADIONUCLIDES

Excavation within the IR Site 2 ARIC below a depth 1.9 feet is strictly prohibited unless approved in writing by the FFA signatories and CDPH. Any proposed excavation below this depth shall be described in a Soil Management Plan that will include but not be limited to a radiological work plan, the identification of a radiological safety specialist, soil sampling and analysis requirements, and a plan for off-site disposal of any excavated radionuclides by the transferee in accordance with federal and state law. This work plan must be submitted to and approved in writing by the FFA signatories and CDPH in accordance with procedures set forth in Section 7.0 of this LUC RD report.

The integrity of the cover must be restored upon completion of any excavation as provided in the IR Site 2 Operation and Maintenance Plan, this report, or similar document. A completion report describing the details of the implementation of the Soil Management Plan, the sampling and analysis, the off-site disposal, and the restoration of the integrity of the cover must be submitted to and approved in writing by the FFA signatories and CDPH in accordance with procedures and time frames detailed in Section 6.0 of this document.

5.4 ACCESS

The MOU or other agreement, if the property is transferred to another federal agency, or the deed(s) and CRUP(s) if the property is transferred to a nonfederal entity, shall provide that the FFA signatories and CDPH, and authorized agents, employees, contractors, and subcontractors shall have the right to enter IR Site 2 at Alameda Point to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary under the cleanup program, including monitoring wells, pumping wells, treatment facilities, and landfill cap/containment systems.

6.0 REMEDY IMPLEMENTATION ACTIONS

This section describes the responsibilities of the DON and future transferees for implementing ICs. If the DON transfers responsibility for post-RACR Operation and Maintenance and monitoring of the remedial action for IR Site 2 to another federal agency, that federal agency shall assume the DON responsibilities described in Sections 6.1 and 6.2.

6.1 RESPONSIBILITIES OF THE DON WITH RESPECT TO IC INSPECTIONS, REPORTING, AND ENFORCEMENT

The DON is responsible for implementing, maintaining, inspecting, reporting, and enforcing the land use and activity restrictions identified in Section 5.0 of this LUC RD prior to conveyance of the IR Site 2 property. The DON may later transfer these procedural responsibilities to another party (transferee) by contract, property transfer agreement, MOU, or other means. Although the DON may contractually arrange for third parties to assume responsibility for and perform any and all actions associated with ICs, the DON shall retain ultimate responsibility under CERCLA for successful implementation of ICs, including maintaining, monitoring, reporting on, and enforcing the controls as necessary to assure remedy integrity unless the FFA is amended to transfer responsibility for IR Site 2 from the DON to another federal agency at the time of transfer as described in Sections 1.0 and 6.0 above. Should any IC objectives fail, the DON, or another federal agency as appropriate, shall ensure that appropriate actions are taken to re-establish protectiveness of the remedy and may initiate legal action to either compel action by a third party(ies) and/or recover the DON's costs for mitigating any discovered IC violation(s).

6.2 DON RESPONSIBILITIES

The DON will undertake the following IC implementation actions to ensure that the aforementioned IC objectives and land use restrictions for IR Site 2 are met and maintained:

- **LUC RD Distribution:** Within 30 days of receiving EPA's, DTSC's, Water Board's, concurrence with this LUC RD, the DON will place the LUC RD in the Information Repository currently located at Alameda Point. A copy of the LUC RD will also be sent to EPA, DTSC, the Water Board, Alameda Reuse and Redevelopment Authority, and CDPH. Appendix A presents a list of agencies and mailing addresses.
- **Site Access:** Each deed (or MOU or other agreement with another federal department or agency) will contain a reservation of access to the property for the DON, EPA, DTSC, and Water Board, and their respective officials, agents, employees, contractors, and subcontractors for the purposes consistent with the Navy IR Program or the FFA.
- **Site Inspections:** Commencing upon concurrence upon this LUC RD by EPA, DTSC, and Water Board and continuing until the effective date of property transfer, the DON will undertake annual physical inspections of the site to confirm continued

compliance with all IC performance objectives and land use restrictions through the property transfer instruments described in Section 4.0. At the time of conveyance of the site, the DON and DTSC will require, via appropriate provisions to be placed in the MOU or other agreement if the property is transferred to another federal agency, or deed(s) of conveyance and CRUP if the property is transferred to a nonfederal entity, that the landowner(s) and subsequent transferees undertake continuing annual site inspections to ensure that all IC objectives and land use restrictions are complied with by all future user(s) as provided in Section 6.3 of this document.

- **Compliance Reporting:** Beginning upon approval of this LUC RD and continuing until the effective date of property transfer by the DON, the DON will provide to the EPA, DTSC, and Water Board, an annual IC Compliance Monitoring Report and Certificate for IR Site 2 consistent with the form located in Appendix B. The annual IC Compliance Monitoring Report will address, among other things, whether the land use and activity restrictions were communicated in the MOU or other agreement or deed(s) and CRUP whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, whether use of the property has conformed with such restrictions and controls, and will evaluate the status of the ICs. In addition, should any deficiencies be found during the annual inspection, the DON will provide the EPA, DTSC, and Water Board with a separate written explanation with the IC Compliance Certificate indicating the specific deficiencies found and what efforts or measures have or will be taken to correct those deficiencies. Copies of a completed and signed IC Compliance Monitoring Report and Certificate shall be sent to the EPA, DTSC, and Water Board by Certified Mail, Return Receipt Requested annually. Upon conveyance of fee title for the site to a nonfederal entity, the DON will require, via appropriate provisions to be placed in deed(s) of conveyance and CRUP, that the landowner(s) and subsequent transferees respond to IC violations as required by compliance reporting and provide to the FFA signatories an IC Compliance Monitoring Report and Certificate for IR Site 2 consistent with the form located in Appendix B unless and until all ICs are terminated at the site.
- If the transferee fails to provide an annual compliance monitoring report as described previously to the DON, the DON will notify EPA, DTSC and Water Board soon as practicable. If the EPA, DTSC, or Water Board do not receive the annual monitoring report from the transferee, it will notify the DON as soon as practicable. The DON shall ensure appropriate measures have been taken to verify the status of the ICs and that an annual compliance monitoring report is submitted to the EPA, DTSC, or Water Board within 90 days after the report's due date.
- **CERCLA 5-Year Reviews:** The DON shall conduct 5-Year Reviews of the IR Site 2 remedy as required by CERCLA Section 121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The 5-Year Reviews will evaluate, among other things, implementation and compliance with the ICs to determine whether the remedy is or will be protective of human health and the environment in the future. The annual monitoring reports prepared by the DON and transferee will be used in preparation of the 5-Year Review reports to evaluate the effectiveness of the remedy.

- **Notice of Planned Property Conveyances:** The DON will provide notice to the EPA, DTSC, and Water Board at least 6 months prior to any transfer or sale of IR Site 2 by the DON so that all FFA signatories can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective ICs. If it is not possible for the DON to provide notification at least 6 months prior to any transfer or sale, then the DON will notify as soon as possible but no later than 60 days prior to the transfer or the sale of any property by the DON. In addition to the land transfer notice and discussion provisions in this LUC RD report, the DON further agrees to provide the FFA signatories with similar notice, within the same time frames, as to federal-to-federal transfer of property. The DON shall provide a copy of executed deed(s) of conveyance or CRUP or MOU or similar agreement to the EPA, DTSC, and Water Board.

- **Opportunity to Review Text of Intended Deed Restrictions:** Prior to conveyance of the site, the EPA, DTSC, and Water Board will be given reasonable opportunity to review and comment upon the applicable deed(s) and CRUP language related to all ICs and associated rights of entry for the FFA signatories for purposes of IC oversight and enforcement. The provisions in the deed(s) or other enforceable document(s) will be consistent with the IC objectives in Section 5.0.

- **Notification should Action(s) that Interfere with IC Effectiveness be Discovered:** The DON or transferee will notify the FFA signatories as soon as practicable, but no longer than 10 working days after the DON's or transferee's discovery of any activity that is inconsistent with the IC objectives or use restrictions or any other action that may interfere with the effectiveness of the ICs. The DON or transferee will notify the FFA signatories regarding how a breach will be addressed or has been addressed as soon as practicable, but no later than 10 working days after notification of the breach. This reporting requirement does not preclude the DON from taking immediate action pursuant to its CERCLA authorities to prevent any actual or perceived risk(s) to human health of the environment.

- **IC Enforcement:** The process of addressing any activity that is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs will be initiated by the landowner as soon as practicable, but no longer than 60 days after the landowner becomes aware of the breach. If a violation of a land use restriction is identified and/or documented by the FFA signatories, or in an owner's annual IC Compliance Monitoring Report, the entity identifying the violation will notify the others within 10 working days of identifying the violation. The FFA signatories and CDPH will then consult to evaluate what, if any, action(s) should be taken, who shall take the action(s), and when they shall be undertaken. These actions may range from informal resolution with the owner or violator of an IC provision(s) as described in this LUC RD, to the pursuit of legal remedies or enforcement action to enforce deed or CRUP restrictions under the auspices of state property law or CERCLA if the property is transferred to a nonfederal entity. Alternatively, the DON may choose to exercise its response authorities under CERCLA and seek cost recovery from the person(s) or entity(ies) who violate a given IC objective/land use restriction set forth in the deed(s) transferring the property. Should the DON become aware that any future owner or user of the property has violated any IC requirement over which a local agency may have independent jurisdiction, the DON will notify these agencies of such violation(s) and work cooperatively with them to reachieve owner/user compliance with the ICs.

DTSC and the DON as signatories to a CRUP (and EPA as a third-party beneficiary) will have independent authority to enforce violations of restrictions, requirements, and obligations under a CRUP. While DTSC may agree to consult with other parties before taking any enforcement action under a CRUP, it will not waive its authority to take action as necessary in the event of violations.

- **Modification of Restrictions in Quitclaim Deed(s) and DTSC CRUPs:** Modifications to the ICs may be required based on changes in site conditions (e.g., reduction in ARIC) during the expected duration for the ICs. When the DON or future property owner(s) determines, with EPA, DTSC, and Water Board concurrence, that modifications to the ICs are appropriate, the IC modifications shall be documented in accordance with procedures consistent with applicable laws and regulations. The DON or future property owner(s) shall be responsible for providing pertinent information on the IC modifications to the Alameda Reuse and Redevelopment Authority and will also advise the additional interested parties listed in Appendix A. The FFA signatories, in consultation with CDPH, shall determine whether a ROD Amendment, Explanation of Significant Differences (ESD), or some other procedure consistent with the NCP is required to support the modification of the IC. The DON shall not modify or terminate LUCs, implementation actions, or modify land use without EPA, DTSC, and Water Board concurrence. The DON or transferee shall seek prior concurrence before any action anticipated by the DON or transferee that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.
- **Termination of ICs:** When the DON determines, with EPA, DTSC, and Water Board concurrence, in consultation with CDPH, that one or more of the ICs at IR Site 2 are no longer needed for protection of human health and the environment because the property is remediated to levels of contamination that allows for unrestricted use, the DON and DTSC shall provide to the current landowner(s) of the property an appropriate release of the restriction (DON for the deed[s] and DTSC for the CRUP) in accordance with state law for recordation with the deed(s) pertaining to the site and will also timely advise the additional interested parties listed in Appendix A. Termination of restrictions contained in the ICs may be possible; however, most ICs (such as those that require protection of the soil cover) will continue in perpetuity to provide protection of human health and the environment. ICs will be maintained until the concentrations of hazardous substances in soil and groundwater are at such levels as to allow for unrestricted use and exposure.
- **Survey Plat:** Prior to transfer, the DON will survey the ARICs at IR Site 2 to define the legal metes and bounds for inclusion in the property transfer documents. The DON will forward copies of the survey to the EPA, DTSC, and Water Board and will place a copy in the Administrative Record.

6.3 RESPONSIBILITIES OF THE PROPERTY OWNER(S) AND SUCCESSORS WITH RESPECT TO IC INSPECTIONS AND REPORTING

By including appropriate provisions in the MOU or other agreement if the property is transferred to another federal agency, or in deed(s) and CRUPs if the property is transferred to a nonfederal entity, the DON will cause the future property owner(s) to assume the following IC implementation responsibilities upon the DON's conveyance of the property to ensure that the aforementioned IC objectives and land use restrictions for IR Site 2 are complied with after property transfer:

- **Site Inspections:** The property owner(s) will conduct annual physical inspections of the site to confirm continued compliance with all IC objectives and land use restrictions in the MOU, or deed(s) and CRUPs unless and until all ICs at the site are terminated with FFA signatories' and CDPH approval.
- **Compliance Reporting:** The property owner(s) will notify the FFA signatories and CDPH within 5 working days of the property owner(s)' discovery of any violation of an IC and include in the notification a written explanation indicating the specific IC violations found and what efforts or measures have or will be taken to correct those violations. The property owner(s) will also provide to the FFA signatories and CDPH an annual Compliance Monitoring Report and IC Compliance Certificate for IR Site 2 consistent with the form attached hereto as Appendix B unless and until all ICs are terminated at the site. In addition, should any IC violations be discovered during the annual site inspection, the property owner(s) will provide to the FFA signatories and CDPH, along with the required IC Compliance Monitoring Report Certificate, a separate written explanation indicating the specific IC violations found and what efforts or measures have or will be taken to correct those violations. The annual Compliance Monitoring Report and Certificate shall be sent to the DON, EPA, DTSC, Water Board, and CDPH by Certified Mail, Return Receipt Requested annually. The need to continue to provide such inspections and certifications on an annual basis will be re-evaluated by the FFA signatories and CDPH using the CERCLA five-year review process.
- **Monitoring Well Protection:** Prior to conveyance, to preclude damage to the monitoring well network at IR Site 2, the DON will provide appropriate information regarding monitoring well locations and necessary ICs to the future property owner, including, if available, any well coordinates maintained in a geographic information system (GIS) database and/or applicable maps and drawings. This will enable the future property owner and other entities responsible for planning and development of future projects within the ARIC to add the well coordinates to their GIS database and/or applicable maps and drawings.

  Whenever the DON proposes to transfer real property where monitoring wells are located, the DON shall include appropriate information regarding monitoring well locations and necessary ICs in transfer documents to assure nondisturbance of the monitoring well network and prevent interference with IC effectiveness.

The future property owner(s), or other entity responsible for review and approval of any development plans prepared for projects within the ARIC, shall identify any potential for the project to impact the IC effectiveness and coordinate with the FFA signatories to prevent interference with the IC effectiveness. The DON and other FFA signatories reserve the right to deny approval of projects within the area requiring ICs ARIC deemed to interfere with IC effectiveness. This process will be evaluated during the CERCLA 5-Year Review to determine whether any changes need to be implemented.

- **Notification of Proposed Changes in Land Use:** Prior to seeking approval from the FFA signatories and CDPH for restricted activities within the ARIC, the recipient of the property must notify and obtain approval from the DON of any proposals for a land use change at a site inconsistent with the use restrictions and assumptions described in the final ROD.

7.0 DOCUMENT REVIEWS

Various documents may be prepared by the DON or the transferee during the implementation of ICs (e.g., Soil Management Plans). These documents are subject to review and approval by the FFA signatories (and CDPH for documents required by Section 5.3, Additional Activity Restrictions Related to Radionuclides).

Draft documents will be subject to a review period of 45 days. Reviewing parties may request extension of the review period for up to an additional 45 days from the party submitting the document. The party submitting the document will have 45 days to revise the document to address the comments received.

Draft final documents will be subject to a review period of 30 days. Reviewing parties may request extension of the review period for up to an additional 30 days from the party submitting the document. The party submitting the document will have 45 days to revise the document to address the comments received. Draft final documents will be considered to be final if no comments are received within the 30-day comment period.

All parties preparing or reviewing documents will adhere to the scheduled document preparation and review times to the maximum extent practicable.

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8.0 REFERENCES

Battelle and BBL (Blasland, Bouck, and Lee, Inc.). 2008. Final Feasibility Study Report IR Site 2, West Beach Landfill and Wetlands Alameda Point, California. October.

DON (Department of the Navy). 2009. Final Proposed Plan for IR Site 2, Former NAS Alameda. August.

——————. 2010. Final Record of Decision (ROD) for IR Site 2, Former Naval Air Station Alameda, California. August.

DON and DTSC (California Department of Toxic Substances Control). 2000. *Memorandum of Agreement Between the United States Department of the Navy and the California Department of Toxic Substances Control*. March 10.

E&E (Ecology and Environment, Inc.). 1983. Initial Assessment Study, Naval Air Station, Alameda, California. Prepared for the Department of the Navy, Navy Assessment and Control of Installation Pollutants Department, Naval Energy and Environmental Support Activity, Port Hueneme, CA.

Weston Solutions, Inc. 2007. Historical Radiological Assessment, Alameda Naval Air Station, Use of General Radioactive Materials 1941–2005.

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FIGURES

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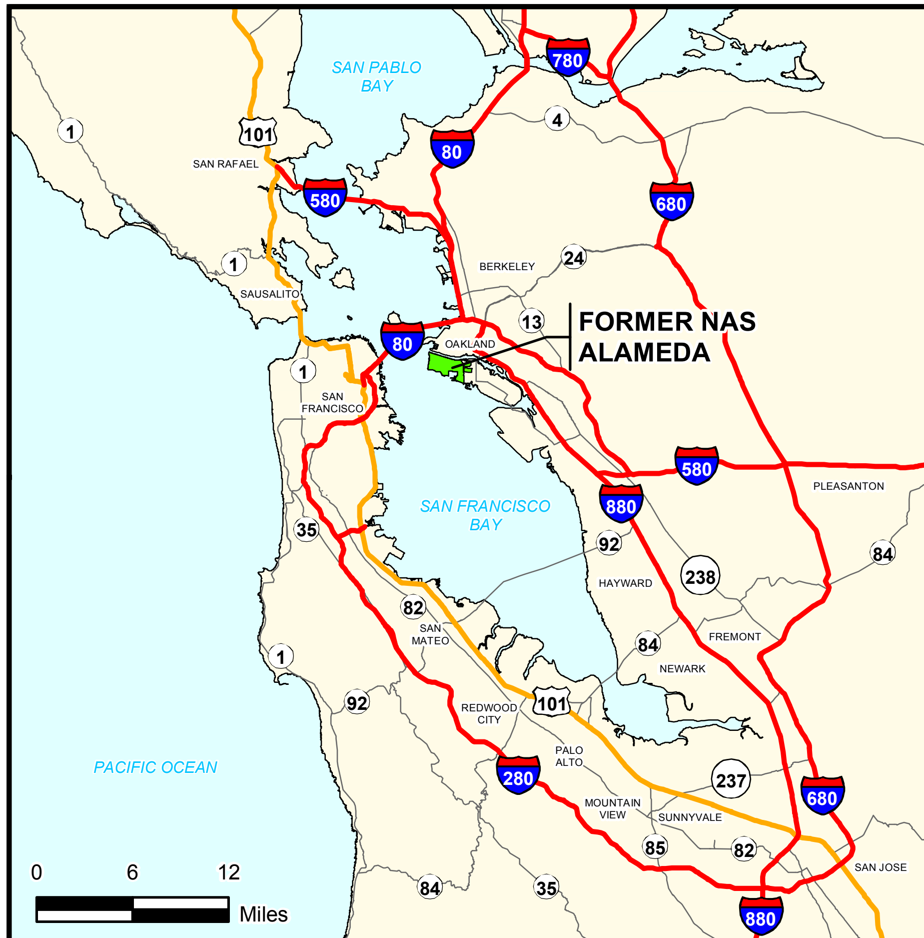

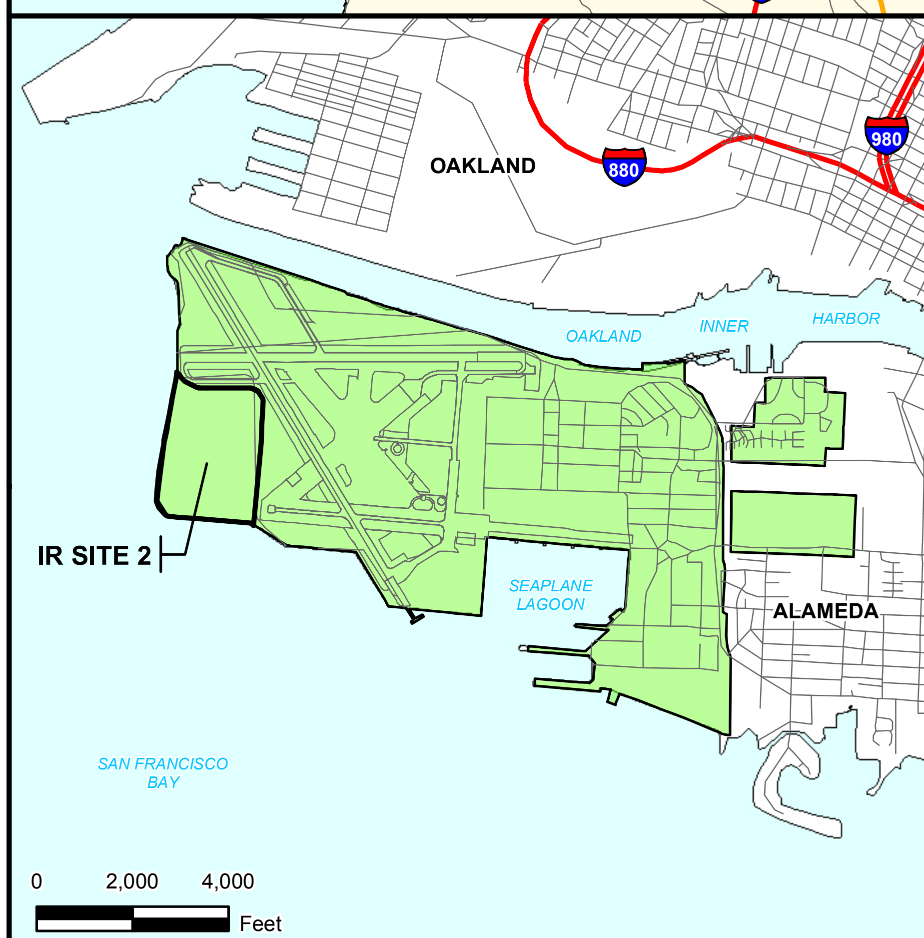

LEGEND

- ROAD/RUNWAY
- 1 STATE HIGHWAY
- 101 US HIGHWAY
- 280 INTERSTATE HIGHWAY
- FORMER NAS ALAMEDA
- IR SITE 2 BOUNDARY (AREA REQUIRING INSTITUTIONAL CONTROLS)

NOTES:
IR - INSTALLATION RESTORATION

N

225 0 225 450
Feet

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

LAND USE CONTROL REMEDIAL DESIGN
INSTALLATION RESTORATION SITE 2

FIGURE 2-1

SITE LOCATION MAP

ALAMEDA POINT, ALAMEDA, CALIFORNIA

REVIEW: 0
AUTHOR: MS
FILE NUMBER: 120025S7357.mxd

TETRA TECH EC, INC.

APPENDIX A

LAND-USE CONTROL REMEDIAL DESIGN DISTRIBUTION LIST

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Land-Use Control Remedial Design Distribution List
IR Site 2, Alameda Point, Alameda, California

1. United States Environmental Protection Agency Region IX
   75 Hawthorne Street
   San Francisco, CA 94105

2. Department of Toxic Substances Control
   700 Heinz Avenue
   Berkeley, CA 94710

3. Regional Water Quality Control Board
   San Francisco Bay Region
   1515 Clay Street, Suite 1400
   Oakland, CA 94612

4. Department of Veterans Affairs (VA)
   VA Sierra Pacific Network
   Capital Asset Managers Office
   201 Walnut Ave
   Mare Island, CA 94592

5. California Department of Public Health
   Environmental Management Branch
   1616 Capitol Avenue, MS 7405
   Sacramento, CA 95899-7377

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APPENDIX B

INSTITUTIONAL CONTROLS COMPLIANCE MONITORING REPORT AND COMPLIANCE CERTIFICATE

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Institutional Controls Compliance Monitoring Report
IR Site 2, Alameda Point, Alameda, California
EPA ID No. CA2170023236

Property Owner: ____

This evaluation is the final Navy certification immediately prior to site conveyance (Yes or No)

If for an annual inspection, this evaluation covers the period from _________ through _________

Certification Checklist

	Compliance Item	In Compliance	Non-Compliance	See Comment
1	No use of IR Site 2 for residence, including any mobile home or factory-built housing, constructed or installed for use as residential human habitation, a hospital for humans, a school for persons under 21 years of age, a daycare facility for children, a playground or any permanently occupied human habitation including those used for commercial or industrial purposes.	☐	☐	☐
2	No extraction of groundwater or installation of new groundwater wells of any type within the area requiring institutional controls.	☐	☐	☐
3	No use of groundwater for any purpose (no evidence of tampering with existing wells, no evidence of new subsurface penetrations) within the area requiring institutional controls.	☐	☐	☐
4	No alteration, disturbance, or removal of any component of groundwater response or cleanup action, including monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment within the area requiring institutional controls.	☐	☐	☐
5	No removal or damage to security features (such as monitoring well locks, or signs) or to survey monuments, monitoring equipment, piping or other appurtenances.	☐	☐	☐
6	Notification provided for any unauthorized change in land use.	☐	☐	☐
7	Any violations of these LUCs were reported within 10 business days of discovery and an explanation provided of those actions taken or to be taken was provided within 10 days of notification of discovery.	☐	☐	☐
8	No surface or subsurface activity that causes or could cause the preferential movement of contaminated groundwater.	☐	☐	☐
9	No excavation unless approved by FFA signatories and CDPH.	☐	☐	☐

I, the undersigned, hereby certify that the above-described land use restrictions have been complied with for the period noted. Alternately, any known deficiencies and completed or planned actions to address such deficiencies are described in the attached Explanation of Deficiencies.

____ ____________________

Signature Date

Comments:

Future property owners may provide plans to the DON, EPA, DTSC, and Water Board for review and approval if the plans do not impact land use restrictions provided in the LUC RD.

Mail completed form(s) to the DON, EPA, DTSC, Water Board, and CDPH in January of each calendar year.

IR SITE 2 SOIL ANNUAL INSTITUTIONAL CONTROLS COMPLIANCE CERTIFICATE

Installation Restoration Site 2
Alameda Point, Alameda, California
EPA ID No. CA2170023236

I, ____, hereby certify that the attached IR Site 2 Soil Land Use Control Compliance Monitoring Report is complete and accurate. The requirements of LUC RD Section 5.0 have been met. I further certify that a copy of this compliance certificate and the attached IR Site 2 Soil Land Use and Groundwater Use Control Compliance Monitoring Report have been sent by Registered Mail to the following addressees:

____
(Name and title)

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ATTACHMENT 13

RESPONSE TO COMMENTS ON THE DRAFT REMEDIAL ACTION WORK PLAN, DATED MAY 4, 2012

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RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from James R. Fyfe, PE Department of Toxic Substances Control (DTSC) Project Manager California Environmental Protection Agency Comments Dated: July 13, 2012	
GENERAL COMMENT	**RESPONSE**
Comment 1. Studies indicate that due to sea-level rise, mean sea level in the San Francisco Bay is projected to be at least three feet higher in 2100 than it is today. Please provide information on how the remedial action for IR Site 2 will remain protective of human health and environment in the face of rising sea level.	**Response 1.** The Post-Closure Monitoring Plan has been revised to address the comment. The current Bay Plan promulgated by BCDC states sea level rise needs to be addressed with adaptive management and innovation. From the 2011 Bay Plan, "Approaches for ensuring public safety in developed vulnerable shoreline areas through adaptive management strategies (that) include but are not limited to: (1) protecting existing and planned appropriate infill development; (2) accommodating flooding by building or renovating structures or infrastructure systems that are resilient or adaptable over time." (Bay Plan, 3/2012, page 33, Section o) As gradual sea level rise occurs, quarterly inspections and the mandated CERCLA 5-Year Review are existing tools to monitor and report sea level. Using adaptive management, a decision can be made as to the optimum course to take for maintaining the integrity of the soil cover. Gradual inundation of the landfill itself should not increase groundwater contamination as the waste is already inundated (i.e., below the current water table).

RESPONSE TO COMMENTS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

James R. Fyfe, PE, DTSC Project Manager
California Environmental Protection Agency

Comment 2. DTSC shares the concerns of the public and of other agencies that the planned fence at IR Site 2 should not prevent public access to the entire site, especially to the anticipated San Francisco Bay Trail.

Response 2. The Navy has revised the RD/RAWP to remove the permanent cyclone fencing and barbed wire from the project design. Consistent with active construction projects, the site will be temporarily fenced during construction to protect equipment and ensure public safety. Once construction is complete and the soil cover has been hydroseeded, the fencing will be replaced with simple signage and symbolic fencing, examples provided below. The purpose is to protect the cover and allow the vegetation to establish.

The Navy's design and CERCLA requirements for this project do not preclude future use of the site for limited public access or passive recreational purposes. It is understood a future Bay Trail may be constructed by property recipients and/or land managers that would traverse the western and southern boundaries of the site. The Navy will not be involved in the construction or management of the proposed future Bay Trail and interposes no objection to the use of simple exclusionary or symbolic fencing as shown in the examples above to require pedestrians to remain on the established pathway or trail.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
James R. Fyfe, PE, DTSC Project Manager California Environmental Protection Agency	
SPECIFIC COMMENT	**RESPONSE**
Comment 1. Section 1.3 Points of Contact: Under the heading of "entity" on the list of key personnel, for Cal/EPA, please correct the entry as follows: Cal/EPA DTSC 700 Heinz Avenue Berkeley, CA 94710 The remainder of the entry is correct. Also, please delete the entry for Cal/EPA CDPH altogether. As a side note, CDPH is not a part of Cal/EPA.	**Response 1.** The address for Cal/EPA DTSC has been corrected and the entry for CDPH has been corrected.
Comment 2. Attachment 1 90% Remedial Design, Design Drawings, Sheet C-3: The legend shows -----XX----- as "temporary construction fence". On the drawing there is also -----X----- around the perimeter of the site that is not included on the legend. Construction notes indicate that this is the new permanent fence. Please indicate in the drawing legend what -----X----- represents.	**Response 2.** See response to DTSC General Comment 2. The symbol ----X---- has been removed from the design drawings and from the legend.
Comment 3. Attachment 1, 90% Remedial Design, Design Specifications, Section 31 11 00, Clearing, Subsection 3.1.4, Species and Habitat: Toward the end of the paragraph it is stated (based on California Fish and Game Code 3511 and 2080) "If nests are found, the birds will be allowed to fledge before excavation. If this is not possible, the eggs/chicks will be taken to a licensed wildlife rehabilitator for captive rearing. The Navy will consult with the US Fish and Wildlife. Approval of the US Fish and Wildlife is not required before proceeding with CERCLA remedy." Please also consult with California Department Fish and Game before removing any eggs or checks from their nest.	**Response 3.** The Navy will coordinate through the DFG-OSPR prior to implementation of reasonable measures that ensure adequate protection of ecological receptors during response action construction at IR Site 2.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
James R. Fyfe, PE, DTSC Project Manager California Environmental Protection Agency	
Comment 4. Attachment 4, Sampling and Analysis Plan, SAP Worksheet #3 – Distribution List, page 18 of 204: Please delete the entry for Mr. Robert Wilson, Cal/EPA DPH. Also please add the following entry: Ms. Michelle Dalrymple Engineering Geologist Cal/EPA DTSC (510) 540-3926 700 Heinz Avenue Berkeley, CA 94710	**Response 4.** The entry for Cal/EPA CDPH has been corrected to list Robert Wilson, CDPH. The CDPH is one of the regulatory agencies designated in the ROD and will remain in the contact list. Ms. Dalrymple has been added to the distribution list on SAP Worksheet #3.
Comment 5. Attachment 5, Project Contractor Quality Control Plan, Section 2.18 Points of Contact, page 2-11: Please make the same changes as in Specific comment 1, correcting the address and deleting the CDPH entry.	**Response 5.** The Points of Contact list in the PCQCP (Attachment 5), Section 2.18 has been updated to correct the CDPH entry. See Response 4 regarding the deletion request.
Comment 6. Attachment 11, Post-Closure Operations, Maintenance, and Monitoring Plan, Section 1.3 Future Use, page 1-2: It is stated: "A permanent 6-foot-high chain-linked fence with three strands of barbed wire will be placed on the eastern and northern boundary of IR Site 2 at the completion of all work activities, restricting access to the landfill. Access to the shoreline trail south and west of the landfill will remain open." This statement does not make sense. A fence on only two sides of Site 2, the northern and eastern boundary that also allows access to a shoreline trail south and west of the landfill cannot possibly restrict access to the landfill. Design drawings indicate that the permanent fence will be on the northern and eastern boundary of IR Site 2 all the way to the shoreline. This will not allow access to a shoreline trail. Please correct this inconsistency and indicate whether or not there will be access to the shoreline trail. Also, Construction Note 4 on Design Drawing D-6	**Response 6.** Please see response to General Comment #2. Attachment 11 has been revised to reflect changes.

James R. Fyfe, PE, DTSC Project Manager
California Environmental Protection Agency

states that "Barbed Wire shall be used only when specified." Is the statement above in the Post-Closure Operations, Maintenance, and Monitoring Plan specifying barbed wire on the entire fence? If so, then why not just show the barbed wire on Design Drawing Site Details?	
Comment 7. Attachment 11, Post-Closure Operations, Maintenance, and Monitoring Plan, Section 6.1, Scheduled Inspection: Please add a requirement to notify and invite regulatory agencies for scheduled site inspections.	**Response 7.** The Navy interprets this request to require a Navy invitation as a pre-condition for allowing access to the site. The Navy suggests that a better approach would be to rely upon the existing access requirements of CERCLA and Section 18 of the FFA.
Comment 8. Attachment 12, Land-Use Control Remedial Design, Appendix A, Land-Use Control Remedial Design Distribution List: Please correct the address in the second entry as follows: Department of Toxic Substances Control 700 Heinz Avenue Berkeley, CA 94710 Also, please correct the address in the fifth entry as follows: California Department of Public Health Environmental Management Branch 1616 Capitol Avenue, MS 7405 Sacramento, CA 95899-7377	**Response 8.** The entries for DTSC and CDPH in Attachment 12 have been corrected.

RESPONSE TO COMMENTS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

Comments from James M. Polisini, Ph.D.
Senior Toxicologist
Office of Human and Ecological Risk (HERO)
Ecological Risk Assessment Section (ERAS)

Comments Dated: June 15, 2012

GENERAL COMMENT	RESPONSE
Comment 1. DTSC comments dated October, 21, 2011 and California Department of Fish and Game comments dated November 9, 2011 on the Intermediate Draft Remedial Design Report, Installation Restoration Site 2, Alameda Point Alameda, California transmitted through James Fyfe, DTSC Project Manager, received no response as the ‘two sets of comments were received after the comment period’ (Attachment 13, Response to comments on the Intermediate Draft, page 32 of 32). The response indicated that each comment will be evaluated and, as appropriate, the Draft RAWP will address these comments. Please indicate which specific comments were addressed and which were not addressed.	**Response 1.** Navy reviewed the DTSC comments dated October 21, 2011. Many of those comments overlap comments received for this 90% document. Resolution of October 21, 2011 comments is now superseded by the current IR Site 2 RAWP comment and response document. DFG-OSPR’s requests for Navy to reconsider ARARs and comply with more than CERCLA requirements are declined. However, DFG-OSPR will be a part of the process, as required.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
James M. Polisini, Ph.D., Senior Toxicologist HERO, ERAS	
SPECIFIC COMMENT	**RESPONSE**
Comment 1. Future use of IR Site 2 is outlined as 'includes low-impact recreational uses such as a recreational trail around the site' (Section 2.3, page 2-9). IR Site 2 has been designated for federal agency (DON) transfer to federal agency (Office of Veterans Affairs). One potential future use, discussed in the past, was as an Office of Veterans Affairs long-term care facility. Because the human health risk assessment for IR Site 2 did not include a residential use scenario, Institutional Controls should be included to preclude development of a long-term care facility and require IR Site 2 'is limited to recreational uses such as a recreational trail around the site' and specifically reference the Land Use Restrictions outlined in the Land-Use Control Remedial Design (Attachment 12, Section 5.1, page 5-1) which prohibit hospitals, day care and residences. In addition, the Environmental Protection Plan (Attachment 6; Section 3.0, page 3-1) indicates that portions of IR Site 2 have been proposed for transfer to the US Fish and Wildlife Service (USFWS) as a National Wildlife Refuge. Therefore, 'low impact recreational use' does not completely describe the potential future use. Please revise Section 2.3 of the main text to completely describe potential future uses and restrictions.	**Response 1.** The reference to USFWS has been deleted from Section 3.0 of Attachment 6. The ROD and the LUCRD (Attachment 12) both state that future use for IR Site 2 is recreational, and residential or other occupied structure development is prohibited. Refer to DTSC Response 2.
Comment 2. The Draft Work Plan indicates that mobilization is 'expected to begin in the Spring of 2012' with earthwork anticipated to begin shortly thereafter (Section 5.1, page 5-1). As this is a 90 percent completion document, and earthwork has not yet begun, HERO suggests the projected initiation date be revised.	**Response 2.** Section 5.1 has been revised to state that mobilization is expected to begin in early 2013.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
James M. Polisini, Ph.D., Senior Toxicologist HERO, ERAS	
Comment 3. The barge unloading area is described as to the north of IR Site 2 and references Figure 5-1 (Section 5.1.2, page 5-1). The referenced figure shows an additional unloading area to the south. The text and/or the figure should be amended so that they are correct and agree.	**Response 3.** The location of the barge offloading area has since been revised to the southern location only due to access limitations at the northern location. Section 5.1.2 has been revised to reference the southern offloading areas and is in agreement with the location as shown on Figure 5-1 which has been revised.
Comment 4. A biological survey conducted one week prior to earth moving activities (Section 5.2, page 5-1), will identify only terrestrial natural resources with fixed locations (i.e., plants) or small home ranges and will not be sufficient to identify all the protected, listed and/or threatened biological resources requiring protection during the entire length of the project. Later description of the biological survey (Attachment 6, Environmental Protection Plan, Section 6.3.2, page 6-6) indicates that the pre-construction biological survey will consist of four separate visits in the 30 days prior to construction. The latter description is sufficiently detailed. Please amend the main text and Attachment 6 so that they are correct and agree.	**Response 4.** Section 5.2 of the main text has been changed to be consistent with similar text in Attachment 6.
Comment 5. Demolition of the ammunition bunkers and the associated guard towers are not planned (Section 5.5, page 5-2). Ammunition bunkers on at least one other closed Department of Defense (DoD) base in the San Francisco Bay area have been locations of trespass and disturbance. Please provide the rationale for not removing all attractive nuisances in an area planned for recreational use in this section of the document.	**Response 5.** The bunkers (Bldgs 353 and 354) may be used for storage in the future by the property recipient. Section 5.5 of the RAWP has been revised to include tack-welding the bunker doors shut to ensure public safety and security until the future property recipient decides to use the buildings.
Comment 6. The Department of Fish and Game should be consulted to determine whether the 220-mil un-seamed layer of HDPE geonet with half-inch openings proposed as animal penetration control, rather than a rock cover (Section 5.6.6.2, page 5-7), is sufficient.	**Response 6.** Please see Response to Polisini Specific Comment #1 dated 12/17/12 (Attachment 14).

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
James M. Polisini, Ph.D., Senior Toxicologist HERO, ERAS	
Comment 7. Ground elevations from the final topographic survey (Section 5.11.1, page 5-12) should be entered into a Geographic Information System (GIS) to facilitate monitoring of post-remedial settling. NAS Alameda had a functional GIS in the mid-1990s.	**Response 7.** Topographic survey reports regarding monitoring for subsidence are part of the post-closure monitoring plan reporting requirements.
Comment 8. Please amend the text to reference to 'recent wetland delineation recently conducted at IR Site 2' by CH2M Hill Kleinfelder (Attachment 6, Environmental Protection Plan, Section 6.1.2, page 6-2) as included in Attachment 7, Appendix A of this Draft RAWP. This wetland delineation is described as following the Army Corps of Engineers (ACE) methodology. The California DFG and the USFWS interpret the results of the wetland survey differently from the ACE. Specifically, wetlands are identified by DFG and USFWS by the presence of any of the three (water, vegetation and soil) criteria: a) presence of water; b) presence of hydrophytic vegetation; and, soils typical of permanent or intermittent inundation, not the ACE requirement for all three for wetland designation. Use of the DFG and USFWS wetland identification process could significantly increase the area of wetlands in IR Site 2.	**Response 8.** A reference has been made to the KCH Delineation report (2011) in the RAWP, Section 5.10. The Navy will continue to rely on the ACE methodology as it has done at other CERCLA IR sites in California.
Comment 9. The DFG and the USFWS should be contacted prior to the surveys conducted by the 'specified' biological monitor to assess the presence of special status plan and animal species and the focused survey of nesting birds and nests to determine if they wish to send representatives to participate in the biological surveys (Attachment 6, Environmental Protection Plan, Section 6.3.1, page 6-5, first bulleted item; Attachment 6, Environmental Protection Plan, Section 6.3.2, page 6-6).	**Response 9.** Concur. The DFG and USFWS will be contacted prior to conducting the surveys. Sections 6.3.1 and 6.3.2 in Attachment 6 have been revised.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
James M. Polisini, Ph.D., Senior Toxicologist HERO, ERAS	
Comment 10. Any written notification of the accidental death or injury of any state-listed or Federal-listed species received by the Department of the Navy (DON) (Attachment 6, Environmental Protection Plan, Section 6.3.1, page 6-5, sixth bulleted item; Attachment 6, Environmental Protection Plan, Section 6.3.4, page 6-7) should be forwarded to the DFG or USFWS as applicable.	**Response 10.** Concur. Attachment 6, Section 6.3.1, page 6-5, sixth bullet has been revised.
Comment 11. The proposed replacement ratio for 'lost' tidal wetlands and non-tidal wetlands is 1:1 (Attachment 6, Environmental Protection Plan, Section 6.3.3, page 6-7). Wetland replacement at the former Mare Island Naval Shipyard (MINSY) was initially proposed at a replacement ratio of 1:5 to 1, but finalized at 1.15 to 1 (http://www.denix.osd.mil /awards/upload/Environmental-Restoration-Individual-or-Team-MANSY.pdf). The DFG and USFWS should be contacted to confirm agreement with the proposed 1:1 replacement ratio for IR Site 2 wetlands.	**Response 11.** Section 2.9.2.1 of the CERCLA ROD for IR Site 2 provides: "If impacts to wetlands occur, an equivalent acreage of similar wetland habitat will be constructed onsite at Alameda Point, the details of which will be presented in a Wetlands Mitigation Plan to be developed during the remedial design phase." Section 3.0 of the draft Wetland Mitigation Plan included as Attachment 7 of the draft Remedial Action Work Plan is consistent with the ROD. The Navy will respond to any comments provided by DFG and USFWS addressing this issue.

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HERO, ERAS</td></tr>
<tr><td>Comment 12. Several radiological issues have been forwarded to Valerie Chenoweth-Brown, Senior Health Physicist, HERO-CalCenter for review and potential comment:

a. All radiological components of the IR Site 2 RA will be performed under a valid NRC or California Agreement State license maintained by TtEC. Appropriate and timely notification will be given to the NRC or CDPH, as applicable, that the corresponding TtEC NRC or California Agreement State license will be invoked in support of the IR Site 2 RA (Section 3.2, page 3-2).

b. Trees, shrubs, and grasses will be cut flush with the land surface. Vegetation that has been radiologically-screened and cleared (Section 5.6.1, page 5-4) will be disposed of off-base at a local composting facility. Trucks hauling cleared vegetation will be passed through the radiological portal monitor prior to leaving the site. The radiological portal monitor will be operated in accordance with the Radiological Work Plan (RadWP; Attachment 2) and the appropriate SOPs. Vegetation that fails radiological screening will be handled and disposed of per procedures described in the RadWP and the WMP (Attachments 2 and 10, respectively).

c. Radiological survey activities (Section 5.7, page 5-9) will be conducted in accordance with the guidelines in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NRC NUREG-1575.</td><td>Response 12a–c. Noted.</td></tr>
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This comment is meant for the DTSC Project Manager and no response is required from the Navy or Navy contractors. Any further HERO comment on these radiological issues will be transmitted under separate cover.	

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from Xuan-Mai Tran Remedial Project Manager Federal Facilities and Site Cleanup Branch U.S. Environmental Protection Agency, Region IX Comments Dated: July 5, 2012	
GENERAL COMMENT	**RESPONSE**
Comment 1. While a tidal influence study was conducted in 2004 at Installation Restoration (IR) Sites 1 and 2 to quantify the influence of tides on water levels in Alameda Point wells, Section 2.1.3 (Hydrogeology) states that, "Wells distal from the shoreline and in the vicinity of the landfill were not included in the tidal study." As a result, it is unclear if the tidal influence study is representative of IR Site 2 conditions. Please revise the Draft Remedial Design Remedial Action Work Plan, Installation Restoration Site 2, Alameda Point, Alameda, California, dated May 4, 2012 (Draft RD/RA WP) to clarify how the tidal influence study provided is representative of IR Site 2 conditions when interior wells at IR Site 2 were not evaluated.	**Response 1.** Interior wells and wells along the eastern boundary of IR Site 2 were included as a part of the 2004 tidal study (Shaw, 2005). See Figure 7 of the referenced report. Section 2.1.3 of the RAWP has been revised to reflect this correction and the sentence in question has been removed.

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Comment 2. Maintaining the interconnection with the SF Bay is critical to the preservation of the saltwater wetlands habitat. As described in the ROD, the connection is provided by the existing pipe culvert connecting the North Pond to the San Francisco Bay. The Navy has asserted in its Response 18 in Attachment 13 (Response to Comments on the Intermediate Draft Remedial Design Report, dated August 2011), that the existing pipe culvert will be retained, however there is no evaluation of the culvert to demonstrate that the culvert is appropriately sized or constructed to minimize the potential for future blockages, nor is there any provision for the periodic inspection and maintenance. Either the connection to the Bay needs to be reconstructed to reduce the potential for blockage or an obligation to periodically inspect the culvert and clear blockages needs to be included in the O & M plan. The details for the inspection and maintenance should be reviewed with BCDC as part of the Navy's compliance with the substantive provisions of Bay Plan.	**Response 2.** The Navy agrees with the comment that the culvert is critical to the health of the tidal wetlands at IR Site 2. Text has been added to Wetlands Mitigation Plan (Attachment 7) as follows: *The Navy recognizes that the existing culvert (Figure 2) is critical to the life of these IR Site 2 tidal wetlands, as without the culvert, there would be no tidal circulation. As a part of defining successful hydrology for the tidal wetlands, the Navy will have a qualified structural engineering evaluation of the culvert (as it is known to be significantly rusted and damaged) as soon as is practical during cover construction activities. Further, the Navy will make necessary repairs, modifications or replacement to maintain tidal circulation as recommended by the structural assessment of the culvert, and do so during remedy construction if warranted. In the potential event that tidal circulation is inhibited or blocked due to culvert failure, the Navy will restore tidal circulation within 7 days of the failure).* The Post-Closure Operations, Maintenance, and Monitoring Plan (Attachment 11) has been modified to include Culvert Inspection as part of regular visual inspections defined in Attachment 11, Appendix C, SOP 001 Multilayer Soil Cover Inspections.
Comment 3. The Draft RD/RA WP does not include a plan to address munitions and explosives of concern (MEC). Since MEC was disposed in the Site 2 landfill and only the top foot has been cleared, a plan to address MEC if it is exposed during site grading or while making "cuts" into the subsurface should be included. Note that although the text refers to the MEC as "inert ordnance" (e.g., Section 2.5), this cannot be determined without physically inspecting each item. Items buried below 1 foot below ground surface have not been inspected, so it cannot be concluded that all of the items are inert. Please revise the text to delete the phrase "inert ordnance" and provide a plan to address MEC.	**Response 3.** The text has been revised to delete reference to inert ordnance. Cuts into the soil cover have been eliminated in the 90% design and the only excavation will be removal of radiological anomalies. A UXO tech will be on call in the unlikely event that MEC is encountered during excavation of radiological anomalies.

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Comment 4. The text (e.g., Sections 2.0 and 2.2.2) and Figure 2-1 use the obsolete term ordnance and explosive waste (OEW). This term should be replaced with MEC. Please revise the text and figures to replace "OEW" with "MEC."	**Response 4.** The term OEW is used to be consistent with historical references. The text of Section 2 has been revised to replace OEW with MEC.
Comment 5. Site grades are stated to be established at 1.5 percent (%) slope; however, several areas exist where steeper slopes are proposed. While the results of Table 7, Summary of Slope Stability and Permanent Seismic Deformation Analyses, of Attachment 1, Draft Geotechnical Report (DGR), to Attachment 1 (90% Remedial Design) indicate that the interior slope between the landfill and wetlands is relatively stable, the overall impact of the steeper slopes identified below on the overall slope stability analysis is not discussed. The following represent areas where steeper slopes are proposed: - A 2.5% slope is proposed on Drawing C-4 (Subgrade Plan - Northwest) of Attachment 1 (90% Remedial Design) - A 5:1 and a 2:1 slope are proposed on Drawing C-6 near the North Pond (Subgrade Plan - Southwest) of Attachment 1 - A 2:1 slope is proposed on Drawing C-7 near the North Pond (Subgrade Plan - Southeast) of Attachment 1 - A 3:1 slope and a 10% slope are proposed on Drawing C-10 (Final Grading and Cover Plan - Northeast) - A 2:1 slope, 2.5% slope, and 6% slope, and 5:1 slope are proposed on Drawing C-11 (Final Grading and Cover Plan - Southwest) - A 2:1 slope is proposed on Drawing C-12 (Final Grading and Cover Plan - Southeast) Please revise the Draft RD/RA WP to discuss the implications of steeper slopes on the slope stability analysis provided in Attachment 1 (Draft DGR) of Attachment 1 (90% RD).	**Response 5.** The 1.5% slope is a minimum slope and steeper slopes are acceptable to facilitate drainage. The critical Section C-C' considered for the interior slope between the landfill and wetlands has a slope height of approximately 12 feet and an average slope of 1.4(H):1(H), taken from the bottom of the submerged pond to where the slope breaks to being relatively flat, i.e., sloped only for drainage at 1.5% minimum. Section C-C' analyzed is considered to be critical in relation to the 5(H):1(H) to 2(H):1(V) slopes shown on the Drawings. The slope provided for drainage above the steeper slope directly adjacent to the wetlands margin is not considered to be critical with respect to stability and permanent seismic deformation predictions.

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Comment 6. The Draft RD/RA WP does not state whether the remedial design addresses the possibility of a rise in sea level, and there is no analysis of the consequences of future expected sea level changes. Please revise the Draft RD/RA WP to address these issues.	**Response 6.** Please see response to DTSC General Comment #1.
Comment 7. The Draft RD/RA WP does not discuss how penetrations of the geonet (e.g., for monitoring wells or gas monitoring probes) will be done to maintain the integrity of the geonet. If monitoring wells are installed with a hollow stem auger or rotary drill rig through the geonet, significant damage to the geonet could occur. Please provide detailed procedures to ensure geonet integrity when it must be penetrated.	**Response 7.** Detail 4 on sheet D-3 of the RD (Attachment 1) includes a detail for a typical geonet penetration if necessary. As shown in the detail, a geonet boot would be installed around a pipe penetrating the geonet layer.
Comment 8. Section 5.8.1 (Installation of Access Roads) indicates that travel on unpaved portions of the cover will be restricted to eliminate the formation of preferential drainage channels that would erode the cover in a manner that would impact the cover performance; however, Section 5.8.2 (Installation of Groundwater Monitoring Wells and Landfill Gas Monitoring Probes) indicates that replacement groundwater monitoring wells will be drilled in the interior of the cover once the cover has been completed. As such, it is unclear how travel on unpaved portions of the cover will be prevented. Please revise the Draft RD/RA WP to eliminate any travel on unpaved portions of the cover, or expand the current network of paved portions of the landfill cover to allow for full access to all monitoring locations without exiting a paved roadway and submit an updated access road and monitoring location figure.	**Response 8.** Section 5.8.1 of the main text has been revised to include gravel access roads leading to groundwater monitoring wells within the footprint of the cover. Associated sheets in the RD (Attachment 1) have been revised to add the monitoring well access roads.

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Comment 9. An outline of the contents of the Remedial Action Completion Report (RACR) has not been provided. In addition to the items typically provided in a Navy RACR, the estimated and actual costs for this remedy should be provided. Further, the RACR should state how many tons or yards of materials were disposed off-site and where the material was disposed.	**Response 9.** The RACR will follow streamlined EPA guidance and will include estimated costs and discussion of materials disposed off-site, if any.
Comment 10. Table 2-1, Summary of Previous Investigations and Reports for IR Site 2, indicates that soil cement gravity wall and stone columns were determined to be the most feasible remedial option to address geotechnical hazards at IR Site 2; however, the text does not discuss why these remedial options were not incorporated into the remedial design. Please revise the Draft RD/RA WP to specifically discuss why previous geotechnical recommendations were not incorporated into the remedial design.	**Response 10.** The Geotechnical Report included in Attachment 1 of the 90% Remedial Design (May 4, 2012) indicated that a wide range of permanent seismic deformations and liquefaction-induced flow failures were predicted for a potential MCE event at IR Site 2. This report recommended ground improvement including a soil cement gravity wall and stone columns to mitigate the predicted seismic deformation and flow failure. In order to confirm that these ground improvements provided best value for this project, the Navy performed additional analyses and focused modeling of permanent seismic deformations and flow run-outs to better and more accurately quantify the impact of an MCE event. The additional analyses indicated that ground improvements were not required because: Solid refuse is not anticipated to be released into the SF Bay by the predicted permanent seismic deformations and /or flow run-outs; and The site will remain isolated from and will not be flooded by waters of the SF Bay. The predicted nature and magnitude of the seismic displacements and deformations are quantified in the revised version of the Geotechnical Report and summarized in Section 12 of that report. Since the waste will still be isolated from the SF Bay following an MCE event and therefore the cover integrity to act as a pathway interruption between the landfill waste and human and environmental receptors is

Xuan-Mai Tran, Remedial Project Manager
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	expected to remain effective; the MCE would not compromise the CERCLA remedy and ground improvements such as cement gravity walls or stone columns are not warranted. However, some level of damage to the cover and seawall should be anticipated after an MCE event, and will be repaired. It is common for landfills in southern California to have stockpiled cover soil in the event that repairs are required due to earthquake, storm water runoff, and/or subsidence. Section 5.9 Geotechnical Recommendation of the Draft RD/RAWP has been revised to include this discussion.
Comment 11. Figure 1-3, Revised Schedule, includes an "Onsite Preparation/Procurement of Concrete for Animal Intrusion Barrier (if necessary)" remedial action; however, the Draft RD/RA WP text does not discuss this remedial action. As such, it is unclear what criteria would trigger the onsite preparation/procurement of concrete for the animal intrusion barrier. Further, it is unclear how this action will impact the overall remedial design. Please revise the Draft RD/RA WP to include details related to the onsite preparation/procurement of concrete for the animal intrusion barrier and clearly show its footprint on a scale drawing to allow for full assessment of its overall impact on the design.	**Response 11.** Concrete barrier was replaced with HDPE geonet and the schedule has been revised accordingly. Plans do not currently include the use of crushed concrete for an animal intrusion barrier. The animal intrusion barrier extends to the soil cover boundary.

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<tr><td>Comment 12. Sections 6.2.7 [Soil-Mixing Improvement Zone (Western Coastal Margin)] and 6.2.8 [Jet-Grouting Improvement Zone (Southern Coastal Margin)] of Attachment 1 (Draft Geotechnical Report) of Attachment 1 (90% Remedial Design) discuss cement deep soil mixing and jet-grouting in the western and southern coastal margins of IR Site 2; however, further discussion of these remedial actions is not provided elsewhere in the Draft RD/RA WP. Table 7 (Summary of Slope Stability and Permanent Seismic Deformation Analyses) of Attachment 1 (Draft Geotechnical Report) of Attachment 1 (90% Remedial Design) indicates that the southern coastal margin and the western coastal margin would liquefy under seismic conditions without ground improvement. As such, it is unclear from the Draft RD/RA WP if the Navy has determined that the risk of failure of the perimeter slopes at the western and southern coastal margins which could result in permanent seismic deformation or flow failure is an acceptable long term risk resulting in electing not to perform the ground improvement. Please revise the Draft RD/RA WP to discuss the use of cement deep soil mixing and jet-grouting as part of the remedial action, if applicable, or revise the cement deep soil mixing and jet-grouting discussion to clearly indicate that they were not selected for use and the associated risk of failure as a result of this decision.</td><td>Response 12. The Geotechnical Report has been revised and reviewed subsequent to these comments. Please see Attachment 14 for Response to Comments on the latest version of the Geotechnical Report.</td></tr>
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Comment 13. Section 8.2 (Liquefaction Induced Lateral Spreading) of Attachment 1 (Draft Geotechnical Report) of Attachment 1 (90% Remedial Design) states that, "It should be noted that based on the presented analyses the seawall along the southern coastal margin which is founded on liquefiable hydraulic fill and coarse-grained Young Bay Mud is prone to edge failure and lateral spreading;" however, no remedial actions are proposed in the Draft RD/RA WP to address these issues. As such, it is unclear how edge failure and lateral spreading will be addressed. Further, the integrity of the seawall is used in the second paragraph of Section 8.2 of Attachment 1 of Attachment 1 to indicate that lateral spreads will be localized; however, if the seawall is prone to failure and lateral spreading, it is unclear how further lateral spreading will be localized and will not distort the cover and result in depressions, drainage reversals or similar effects. Please revise the Draft RD/RA WP to address the potential edge failure and lateral spreading of the seawall along the southern coastal margin or clarify where it will be addressed. In addition, clarify how the integrity of the seawall will impact its ability to prevent further lateral spreading at IR Site 2.	**Response 13.** The Geotechnical Report has been revised and reviewed subsequent to these comments. Please see Attachment 14 for Response to Comments on the latest version of the Geotechnical Report..

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Comment 14. Section 10.1, Summary of Results, of the DGR indicates that the likelihood of landfill solid waste reaching the San Francisco Bay is considered to be remote given the width of the coastal margin; however, it is unclear whether the coastal margin is a thin strip of land or a stretch of land sufficiently wide to prevent landfill solid waste from reaching the San Francisco Bay should failure occur. Section 2.1 of the Draft RD/RA WP and Section 6.1.1, Upland, of Attachment 6 (Environmental Protection Plan) describe the coastal margin as a "thin strip of land." For example, Section 6.1.1 states, "A coastal margin composed of the perimeter dike and riprap seawall is present between the landfill and/or wetland, and the bay, and is characterized as a thin strip of land that acts as a buffer for the landfill and the wetland." Please clarify whether the coastal margin is a thin strip of land or a stretch of land wide enough that landfill solid wastes are unlikely to reach the San Francisco Bay.	**Response 14.** The width of the coastal margin is taken from the back of berm to the top of the seawall and is on the order of 100 feet wide at its narrowest. The likelihood of solid waste reaching the current limits of the Bay as a result of permanent seismic deformations in excess of 100 feet is considered to be remote. Section 2.1 of the main text and Section 6.1.1 of Attachment 6 have been revised to clarify that the Coastal Margin embankment is 100 feet wide at its narrowest.

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<tr><td>Comment 15. Additional subsurface evaluation and laboratory testing were not proposed to address uncertainties related to subsurface conditions (e.g., geotechnical samples). The recommendations and opinions expressed in the DGR are based on background documents and historical field explorations and the laboratory testing. As such, it is unclear if the geotechnical recommendations presented in the DGR are representative of current site conditions as site conditions can change with time as a result of natural processes or anthropogenic activities at Site 1 or at nearby sites, as stated in Section 11 (Limitations) of the DGR. No examples of such conditions are provided. While it is understood that any site development or structural modifications would apply, the statement implies that the mere passage of time could alter conditions so as to make the recommendations provided no longer valid. Presumably, this includes subsidence that may occur as waste degrades. Please revise the Draft RD/RA WP to clarify why an updated subsurface evaluation and more recent laboratory tests results were not performed to address uncertainties related to subsurface conditions, and include examples of the range and type of natural and anthropogenic processes that would render the recommendations invalid.</td>
<td>Response 15. The subsurface site conditions have not changed enough since data collection to affect the closure design. Geotechnical recommendations have been replaced by a new analysis in a revised Geotechnical Report dated October 29, 2012 (Attachment 1). See Response 10.

The previous geotechnical field and laboratory results are sufficient to support the conclusions presented in the report. Natural processes would typically be limited to changing groundwater conditions and settlement resulting from waste decomposition, but in this case, given the predictable groundwater conditions due to the proximity to the Bay and the age of the waste, natural processes are unlikely to invalidate the conclusions presented in the report. Only human activities such as site modifications would be anticipated to appreciably impact the conclusions presented in the report.

The conclusions provided in Section 12 of the revised Geotechnical Report predict a more specific range of deformation for the berm and soil cover.</td></tr>
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Comment 16. The soil classification properties for the coastal margin are not distinctly defined in Section 6.2.1 (Landfill Cover and Perimeter Berm Fill) of the DGR; instead the landfill cover and perimeter berm fill parameters are defined based on an assumed typical value for compacted fill characterized as sand with some fines. Based on Section 6.1.1 (Upland) of Attachment, "A coastal margin composed of the perimeter dike and riprap seawall is present between the landfill and/or wetland, and the bay, and is characterized as a thin strip of land that acts as a buffer for the landfill and the wetland. Materials identified in the coastal margin differ from those in the landfill and wetlands." Since the materials are different, it is unclear if the soils within the coastal margin have been appropriately characterized and whether the resulting slope stability analysis is representative of site conditions. Please revise the Draft RD/RA WP to specify collection of site-specific values representative of the landfill cover and perimeter berm area to be utilized in the slope stability analysis for the landfill cover and perimeter berm in place of the assumed typical values.	**Response 16.** The Geotechnical Report has been revised and reviewed subsequent to these comments. Please see Attachment 14 for Response to Comments on the latest version of the Geotechnical Report.

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Comment 17. The Draft Radiological Work Plan, IR Site 2 (RWP) in Attachment 2 states that the time-critical removal action (TCRA) previously performed at the IR Site 2 did not completely remove Radium-226 (Ra-226) contamination. The highest concentration of Ra-226 detected from collection of random soil samples at the bottom of the excavation was 7.59 picoCuries per gram (pCi/g), but the full nature and extent of contamination had not been identified. While the RWP states that a previous time critical removal action did not completely identify the horizontal and vertical extent of contamination, no reference is provided for the levels of contamination (particularly for Ra-226) that are anticipated to remain at the IR Site 2. For completeness and clarity, it is recommended that the RWP provide some information about previous sampling events that gives a reference to the potential levels of radiological contaminants remaining at the site. Please revise the RWP accordingly.	**Response 17.** Although historical documents and prior remediations performed at IR Site 2 qualitatively indicate that Ra-226 contamination concentrations are potentially greater, the RWP (Attachment 2) presents 7.59 pCi/g as the largest concentration detected during the TCRA (i.e., soils outside of the embankment and landfill cover) because that is the most elevated soil sample on record. All other sample data from that TCRA indicated contamination concentrations less than 7.59 pCi/g. The full nature and extent of contamination within the bermed and fenced bunker areas of IR Site 2 are unknown and will remain unknown as no records indicating quantity of radioactive material deposited in the area have been discovered. Sampling beneath the top 12 inches of material will not occur as the RWP states that a surface scan will be conducted to remove surface radioactive anomalies, followed by surface soil sample collection for dose and risk modeling, and the subsequent capping of the area with radiologically clean fill material. Note that the decision to provide a soil cap of the area was largely based on the fact that the nature and extent of contamination within IR Site 2 are undefined.

Xuan-Mai Tran, Remedial Project Manager
Federal Facilities and Site Cleanup Branch, U.S. Environmental Protection Agency, Region IX

Comment 18. Section 1.0, Introduction, of the RWP does not clearly state the remedial goals or release limits are required to be achieved for the remedial action at the Site 2. Section 2.2.1 (Radiological Investigations) in the main body of the document, and Section 2.1 (Radiological History) in the RWP states that the 2009 TCRA had a primary objective "to mitigate the potential risk posed by material potentially presenting an explosive hazard and radiological contamination and threatened release of hazardous substances to the environment." Radiological removal action objectives for the TCRA were established as follows: "1) prevent ingestion, dermal contact, or inhalation of radiological anomalies with concentrations that significantly exceed background concentrations of 6.000 counts per minute; and 2) to ensure the total effective dose equivalent received through all potential pathways from the radium-impacted waste to any member of the public does not exceed 15 millirem per year." Neither the main sections of the Draft RD/RA WP nor the RWP in Attachment 2 clearly presents this information or states whether these objectives meet the requirements of the RD/RA WP. Please revise the RWP to clearly present the objective of the remedial action and associated remedial goals.	**Response 18.** A bullet in the third paragraph of Section 1.0, Introduction, of the RWP (and the Objectives section of the Executive Summary of the SAP) has been added stating the following: *Providing modeling, based on analysis of soil samples collected from the subgrade surface, to demonstrate that with the 2-foot cover installed, the maximum annual dose to an individual of 15 mrem, and the excess lifetime cancer risk (ELCR) at 3×10^{-4} for the critical group, are not exceeded.* This is consistent with Section 2.7 of the ROD (DON, 2010).
Comment 19. Sections 7 through 11 of the RWP describe the formulas and general procedural requirements of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) surveys planned as part of the remedial action at IR 2, but do not provide the project-specific information which demonstrates how the surveys will be implemented. For instance, the text in Sections 7 through 11 do not state which radiation survey instruments will be selected from those listed in Table 10-1 (Portable Survey Instruments) or what the achievable minimum counts per minute (cpm) or Minimum Detectable Concentration (MDCs) will be achieved for this project based on site-specific background levels	**Response 19.** Sections 7.0 through 11.0 of the RWP describe the formulas and general procedural requirements of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) surveys planned as part of the remedial action at IR Site 2. Site specific MDCs and other equipment parameters have not been calculated as site-specific reference background areas have not been sampled and analyzed. Sampling and analysis associated with IR Site 2 will not be conducted until the RWP has been approved. As stated in Section 8.3.3, Final Status Surveys: "Although the FSS of IR Site 2 is not intended to provide for radiological release of IR Site 2, the sample density is designed to ensure data commensurate with a Class 1 survey is

and the selected radiation survey instrumentation. Further, text in Section 8.3.3, Final Status Surveys (FSS), does not provide specific calculations for determining the required number of definitive/confirmation samples that will be collected in the FSS. The RWP should include this project-specific information for all planned radiological surveys. Please revise the RWP to include this information.	collected. Derived concentration guideline levels (DCGLs) for each ROC are based on the exposure pathways and parameters presented in the Final Remedial Investigation Report IR Site 2, West Beach Landfill and Wetlands (Battelle and BBL 2006), and limit the maximum annual dose to an individual to 15 mrem and the ELCR to 3×10^{-4} for the critical group." These DCGLs used in conjunction with conservative assumptions of approximate background concentrations of the radionuclides of concern result in a minimum of 9 samples from the reference area and 9 from the survey unit area. The number of calculated samples (9) was based on an assumed mean concentration for the specific radionuclides of concern based on gamma spectroscopy results from previous work at Alameda and Hunters Point Naval Shipyard. This calculation included a 20% increase in samples, as recommended in MARSSIM section 5.5.2.2, to obtain sufficient sample points to attain the desired power level with the statistical tests and allow for possible lost or unusable data. Note that losing or having unusable gamma spectroscopy data is highly unlikely, as the DON has used gamma spectroscopy data extensively in final status survey reports at Alameda Point and Hunters Point Naval Shipyard in the past 4 years, and has not had a single instance of unusable gamma spectroscopy data. Additionally, as the Rad Work Plan requires that all areas be remediated such that all samples are beneath the DCGLs for each respective radionuclide of concern, and each sample point must have a maximum annual dose to an individual less than 15 mrem and an ELCR of less than 3×10^{-4} for the critical group. As such, the power level for any statistical test will easily be met. In summary, the additional sample collected from each survey unit is a further level of conservatism above and beyond an extremely conservative calculation of required samples. In the interest of conservatism, these sample number values are increased to 10 in each respective area. The remedial action completion report will include the specific calculations

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	used to derive the number of required samples at the IR Site 2 for purposes of demonstrating defensibility in the conclusions regarding the levels of contamination remaining within the area sampled. Note that as stated in NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys", Section 10.4, the retrospective power calculation is only necessary when the null hypothesis is not rejected. As stated above, each sample point result will demonstrate that each sample point has a maximum annual dose to an individual less than 15 mrem and an ELCR of less than 3 x 10^{-4} for the critical group, so that the null hypothesis must statistically be rejected as shown in MARSSIM Section 8.2.5, Table 8.2.
Comment 20. Attachments 2 and 3 do not provide sufficiently detailed information about project-required dosimetry. Section 5.3 (Personnel Dosimetry) on Page 5-2 in the RWP states that any personnel working in the Radiological Control Areas (RCA) will be required to wear personal dosimetry. Section 3.10 (Monitoring and Measuring External Exposure) on page 3-5 of the Radiation Protection Plan (RPP) in Attachment 3 states that a vendor accredited by the National Voluntary Laboratory Accreditation Program will be used to provide dosimetry services. However, neither section discusses which vendor has been selected or specifies the kind of dosimetry/detector(s) that will be used. This information is important for demonstrating that the types of dosimetry that will be used are appropriate for the site-specific radiological hazards. Additionally, the RWP and/or RPP should clarify whether the same vendor or project personnel will oversee the air monitoring program to demonstrate compliance with the 10% Derived Air Concentration (DAC) limits and/or in the unlikely event of an internal exposure, the bioassay program. Please revise the RWP and RPP to provide this information.	**Response 20.** The RPP commits to providing external dosimetry from a vendor accredited by the National Voluntary Laboratory Accreditation Program. A specific vendor has not been named as the contractor reserves the right to change external dosimetry contractors based on performance of the vendor. The dosimetry selected will be appropriate for quantifying dose from the beta and gamma energy spectrum for radium-226 and its progeny, as the most prominent radionuclides of concern. Additionally, project personnel will oversee compliance with the 10% DAC limits in accordance with SOP 9, "Air Sampling and Sample Analysis."

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Comment 21. The Draft RD/RA WP includes an Environmental Protection Plan in Attachment 6 and Wetland Mitigation Plan in Attachment 7; however, sections of each of these documents present information that could be corroborated by cross-referencing the other to support these plans. For example, Section 6.0 of the Wetland Mitigation Plan identifies special status species but does not mention that ecological surveys will be performed before starting work in the project areas, nor does it discuss results of historical surveys, which are presented in Section 6.2 of the Environmental Protection Plan. Please ensure that these documents cross-reference each other to support implementation of the remedial action at IR Site 2 and environmental compliance requirements.	**Response 21.** The EPP and the Wetlands Mitigation Plan (Attachments 6 and 7, respectively) have been revised to better cross-reference each other.
Comment 22. Attachment 8 (Stormwater Pollution Prevention Plan) uses inconsistent terminology to define a rain event. For example, Section 4.3, Site Inspections, defines a qualifying rain event as 0.5 inch of rain or more per 24 hours while Section 4.5, Water Quality Sampling and Analysis, defines a qualifying rain event as at least 0.5 inch of rain. Further, Attachment 8 frequently refers to "extended storm events" but does not define or quantify the term. Please revise the Draft RD/RA WP to clearly define a qualifying rain event and an extended storm event, ensuring that the definitions are based on documented, appropriate, site-specific conditions.	**Response 22.** A qualifying rain event is defined in Appendix 5 (Glossary) of the General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities as "*Any event that produces 0.5 inches or more of precipitation with a 48 hour or greater period between rain events.*" This definition will be added to Sections 4.3 and 4.5 of the SWPPP (Attachment 8). An extended storm event is a storm that lasts longer than 24 hours. This definition will be added to the two places in the text of the SWPPP that refer to "extended storm events."

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Comment 23. Inconsistent terminology is used in Attachments 8 and 9. For example, Section 3.3 (Dust Control Measures) of Attachment 9 states that chemical soil stabilizer will be applied to on-site storage piles of soil or sediments while Attachment 8 (Stormwater Pollution Prevention Plan) states that soil tackifier will be used to provide dust control and prevent runoff of stockpiled soils. In addition, Section 5.0 (Mitigation Contingencies) of Attachment 9 indicates that a nontoxic lockdown material will be used to suppress dust. It is unclear if these references are to the same product. In addition, a material safety data sheet (MSDS) should be included for this (these) product(s). Please revise the Draft RD/RA WP to use consistent terminology throughout the document and include a MSDS for the intended dust mitigation media.	**Response 23.** The terminology in Attachments 8 and 9 has been revised to consistently reference a "soil tackifier (SoilTac or equivalent)" when discussing stabilization of stockpiled soil/sediments or dust control measures. A MSDS has been included in Attachment 9.
Comment 24. The integrity of the cover system is dependent upon the cover system profile and the ability of the cover components to work together; however, Section 3.6 (Access Roads) of Attachment 11 (Post-Closure Operations, Maintenance, and Monitoring Plan) states that inspection and repair of the access roads is not critical to the integrity of the cover system. However, the potential exists for standing water to accumulate in access road ruts resulting in an increased potential for surface water to infiltrate the cap. Alternatively, the access road could allow surface water runoff to transverse the cap surface at greater flow rates potentially inducing a higher scour threat along roadways. Please revise the Draft RD/RA WP to clarify how the condition of the access roads is not critical to the integrity of the cover system, especially since it appears that the roadway will be treated as a part of the cap.	**Response 24.** Access roads will be easier to maintain than the remainder of the cover as they will be the easiest to inspect and the easiest to repair. That being said it is an important part of the cover system and Section 3.6 of Attachment 11 has been revised to indicate that access roads will be maintained.

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Comment 25. Appendix A of the Sampling and Analysis Plan (SAP) in Attachment 4 of the Draft RD/RA WP indicates that laboratory specific standard operating procedures (SOPs) will be provided in the Final SAP, but laboratory SOPs should be submitted for regulatory review and approval prior to finalizing the SAP so that the adequacy of the information contained in the SOPs can be assessed. For example review of the laboratory SOPs is necessary to evaluate the information presented in the SAP Worksheet 19. During the June 2012 BCT meeting, in order to address the same concern that has been raised for every SAP, the Navy has agreed to add clarification language to current and future SAPs that the laboratory will meet the EPA's analytical methods or the Navy's SAP, whichever is more stringent. Please add this clarification language to the SAP. Laboratory SOPs should be submitted once every two years for each analytical method for each laboratory being used at Alameda for regulatory review and approval. This submittal would be sufficient so that the Navy does not have to submit the SOPs for each SAP.	**Response 25.** The following has been added to Worksheet #19 under the notes section: *The laboratory will meet the analytical requirements in the EPA methods listed above or the requirements in this SAP, whichever is more stringent.* The laboratory SOPs for this SAP will be submitted to the agencies along with the Draft Final RD/RA WP.

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Comment 26. The objectives listed in the Executive Summary of the SAP are not consistent with the scope of work presented in Section 1.2 of the Draft RD/RA WP. Section 1.2 of the Draft RD/RA WP indicates that soil samples will be collected from the subgrade surface for radiological dose and risk modeling and a radiological surface scan will be performed on the finished cover to document effectiveness of the remedy. The objectives in the SAP indicate that the radiological survey of the cover will be used to establish final risk and dose estimates and does not mention the collection of samples for radiological testing. Please revise the Draft RD/RA WP to resolve this discrepancy.	**Response 26.** Two bullets in the Objectives section of the Executive Summary of the SAP have been added stating the following: • *Collecting of soil samples from the subgrade surface for radiological dose and risk modeling* • *Providing modeling, based on analysis of soil samples collected from the subgrade surface, to demonstrate that, with the 2-foot cover installed, the maximum annual dose to an individual of 15 mrem, and the excess lifetime cancer risk (ELCR) at 3×10^{-4} for the critical group, are not exceeded* Additionally, the final bullet has been changed to: *Performing a final radiological survey of the cover to document effectiveness of the remedy*
Comment 27. The items and questions listed on pages 14 and 15 of the Workbook for Unified Federal Programs for Quality Assurance Project Plans (UFP-QAPP Workbook) are not addressed in these worksheets. Please revise Worksheets 10 and #11 to address each of the items and questions listed on pages 14 and 15 of the UFP-QAPP Workbook.	**Response 27.** The information provided in Worksheets #10 and 11 are meant to be used in conjunction with each other according to the NAVFAC SW SAP template. The "If…, then…" statements are provided in Worksheet #11. However, Worksheet #11 has been revised to include answers to questions in the UFP-QAPP workbook that were not addressed.
Comment 28. The SAP does not discuss manual integrations for chromatographic analyses. If manual integration is required, please ensure that supporting information for manual integrations (i.e., chromatograms before and after manual integration as well as a brief explanation for the manual integration) will be included in the data package deliverables and evaluated during data validation.	**Response 28.** SAP Worksheet #29 has been revised to clarify that if manual integration is required, supporting information for all manual integrations (i.e., chromatograms before and after manual integration as well as a brief explanation for the manual integration) will be included in the data package deliverables and evaluated during data validation.

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Comment 29. There are several analytes for which a project action limit (PAL) has not been established. It is unclear how results for analytes without defined PALs will be assessed. For example, the table for alpha spectroscopy in soil in Worksheet #15.1 does not provide a PAL for any of the analytes listed except for Uranium-238. Please revise the SAP to define PALs for all analytes, or alternatively, discuss how these analytes will be assessed.	**Response 29**. Chemical analytes in SAP Worksheet #15.1 that have "Not Established" for the Project Action Limits (PALs) will be reported along with the analytes that have non-hazardous criteria or ROD criteria and this will be sufficient for evaluating analytical results to determine 1) if material is suitable for use as subgrade or cover material or 2) waste classification prior to disposal. The laboratory results will be provided to the regulatory agencies as soon as they are available. The chemical analytes in Worksheet #15.2 that have "Not Established" for the PAL have been deleted and the analytes that remain have STLC or TCLP CCR Title 22 criteria listed which will be sufficient for determining waste classification of material prior to disposal. If a compound with no PAL is reported, the data will be evaluated to determine if additional screening is warranted. The Table in Worksheet 15.1 will have a footnote to that effect. As Uranium-238 is the only radionuclide of concern listed for alpha spectroscopy, all other analytes have been deleted from the alpha spectroscopy table in SAP Worksheets #15.1 and 15.2. In addition, the following has been added to SAP Worksheet #17: Uranium-238 is the only analyte of interest to be analyzed by alpha spectroscopy, because all other radionuclides of concern are easily quantified through gamma spectroscopy.

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Comment 30. The SAP does not provide copies of the data validation checklists. Since the SAP references multiple sources for data validation procedures in Worksheet #36, a checklist describing the criteria that will be used to evaluate the quality control (QC) measures, how samples will be qualified (e.g., the qualifiers that will be used, when samples will be qualified as estimated/rejected, and if individual or all samples in a batch will be qualified) should be provided. Please revise the SAP to provide data validation checklists.	**Response 30.** SAP Worksheet #36 has been revised to include a reference to the data validation checklists for each method that will be provided as Appendix C and that all samples in a batch will be qualified based on the checklists. In addition the following text has been added after the reference to Appendix C in Worksheet #36: *In addition to the checklists in Appendix C, the following criteria will be evaluated by the validator and flagged as indicated:* • *Manual integration will be evaluated during data validation for the organic methods (i.e., volatiles, semivolatiles, pesticides, PCBs and herbicides). If the manual integration is not calculated appropriately, the validator will flag the associated results with a "J" for estimated.* • *Second column confirmations for pesticides and herbicides analyses and DDT/Endrin breakdown for pesticides will be evaluated during data validation. If results between primary and second column confirmations have an RPD ≥ 40%, the associated results will be flagged with a "J" for estimated. If the DDT/Endrin breakdown is ≥ 15%, the associated results will be flagged with a "J" for estimated.* • *For radiological methods, if the calibration criteria listed in SAP Worksheet #24 is not met, the associated results will be flagged with a "J" for estimated.*
Comment 31. The SAP does not indicate that EPA will be notified of any significant corrective action or changes to the SAP, or provide the timing for notification. Please revise the SAP to provide this information as well as the method of communication that will be used to notify EPA.	**Response 31.** SAP Worksheets #6 and 32 have been revised to include that the Navy will communicate with the EPA regarding corrective actions or significant changes and a timeframe has been provided for this notification in SAP Worksheet #32.

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Comment 32. The SAP discusses document control procedures but does not provide sufficient detail regarding the management of all project files. It is unclear where field documents, such as logbooks, surveillance reports, and change requests will be stored (i.e., address), who will manage them, how long they will be stored, and that the records will be offered to the Navy prior to disposal. Please revise the SAP to provide this information.	**Response 32.** Worksheet #29 has been revised to include the following: *Project files are maintained at the project site under the oversight of the PQCM until completion of the project. Files are then sent to the TtEC San Diego for storage. Once the CTO is complete and closed out, the files are sent to an off-site archive for 10 years.*
Comment 33. The SAP discusses background levels of radiological analyses but does not provide sufficient detail indicating how background levels will be determined. For example, step five in Worksheet #11 indicates that if the initial gamma survey identifies areas greater than twice background, then each of these areas will be excavated. No further information is provided for how background will be determined. Additionally, the notes for the tables located in Worksheet #15.2 indicate that background levels are used to determine project quantitation limits and minimum detectable activities for radiological analyses. Please revise the SAP to discuss background levels and their sources for radiological analyses.	**Response 33.** Background levels will be determined by conducting gamma scan surveys of a reference area approximately 1,000 square meters, as agreed upon by the project team. The mean of all readings for the respective survey instrument (Vehicle Towed Array or Ludlum 2350-1 survey meter with 44-10 2" by 2" NaI detector) will be used to calculate the mean reference area gamma background rate. Verbiage describing this process has been added to the first paragraph in Step 7 of Worksheet #11 of the SAP. Background levels from footnote a) in both Worksheet #15.1 and 15.2 refer to instrument background radiation in the area of the detectors. This background value is distinct from the reference area background and is unique to the radioanalytical laboratory radiological background resulting from naturally occurring radioactive materials that are inherent in the laboratory. Footnote a) in Worksheets #15.1 and 15.2 has been changed to refer to "instrument" background.

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Comment 34. The SAP does not provide all of the QC samples and criteria as detailed in Section 3.4.2 of the Uniform Federal Policy for QAPPs Manual, dated March 2005 (UFP QAPP Manual). Examples include: - Internal standards should be included for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polycyclic aromatic hydrocarbons (PAHs). - Dichlorodiphenyltrichloroethane (DDT)/Endrin breakdown check and second column confirmation for pesticides. Please revise the SAP to include all of the required QC samples.	**Response 34.** Worksheets 28.1 and 28.2 have been revised to include applicable laboratory QC samples and criteria.
Comment 35. During the review of this Draft RD/RA WP, the public has identified issues about the installation of permanent fencing. The Draft RD/RA WP states, "At the completion of all work activities, a permanent 6-ft high chain-linked fence with three strands of barbed wire will be placed on the eastern and northern boundary of the IR Site 2." Although fencing is an important element for the protection of the landfill soil cover and associated components (e.g., monitoring wells, settlement monuments, landfill gas probes), other alternatives could also serve similar purpose in lieu of proposed chain-link fence (topped with three strands of barbed wire) around the property boundary which would be consistent with its indented use as open space/refuge. Protection of human health and the environment is the primary goal of CERCLA actions; however, we request that other alternatives should be evaluated to address public concerns regarding the appearance of the landfill.	**Response 35.** See Response to DTSC General Comment #2.

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Comment 36. Similar public concerns have also been raised regarding the visual impact of the proposed height and number of vertical gas venting pipes. The number of vertical gas venting pipes could be reduced through the use of horizontal wells, which are capable of redirecting/conveying landfill gas to larger vertical venting pipes. An evaluation of the current landfill gas conditions should be completed prior to finalizing the passive landfill gas system. Again, we request the Navy look into other alternatives so public concerns can be addressed.	**Response 36.** The existing methane venting system was constructed to comply with California Air Quality Management District requirements for protection of human health and the environment. Design and construction of a different replacement system is cost prohibitive. The existing system will be left in place to the maximum extent possible. If vent risers or other venting system components are required to be removed during cover construction, the components will be replaced. Then after cover construction, as a part of Operations and Maintenance, methane monitoring will be performed to determine the minimum venting system required, which may reduce the number and height of vents. Visual impacts will also be reduced to the extent possible by using materials and colors that blend with vegetation and landscape.
SPECIFIC COMMENT	**RESPONSE**
Comment 1. Section 2.2.2 Ordnance Explosives Waste Investigation, Page 2-7: This section notes that a "20 millimeter (mm) target practice projectile" was found during the surface characterization. It then notes that, "the 20mm round was subsequently demilitarized…" As a projectile is a component of a round, and a round is all of the components necessary to fire the associated weapon once (i.e., projectile, cartridge case, propellant, primer, and fuze), the two items noted appear to be different munitions. Please review the cited verbiage and determine if the term "round" is being used incorrectly to refer to a projectile. If that is the case, please correct the term "round" to read "projectile."	**Response 1.** The word "round" was cited in error and has been replaced with the word "projectile" in Section 2.2.2.

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Comment 2. Section 5.1.1, Field Support Facilities, Page 5-1: The location where potable water will be acquired is not specified. The text states that, "Potable water will be acquired from a nearby water hydrant," but the location is not described or shown on a figure. Please revise Section 5.1.1 to specify the location and distance from IR Site 2 where potable water will be acquired and provide a figure with the location of the hydrant.	**Response 2.** Water for site construction activities will be provided by running a temporary pipeline from a water hydrant located to the southeast of IR Site 2. Drinking water will be supplied by a water service. Section 5.1.1 has been revised to discuss the location of the hydrant.
Comment 3. Section 5.3, Utility Location, Page 5-2: The criteria that will be utilized to determine a geophysical utility survey is necessary to confirm the depths and location of utilities is not provided. It is unlikely that Underground Service Alert of Northern California has much information about the Site 2 subsurface utilities. Further, since subsurface utilities have been identified in the vicinity of the former ammunition bunkers, it appears a geophysical utility survey will be necessary. Please revise the Draft RD/RA WP to require a geophysical utility survey or to clarify the criteria that will be utilized to determine that a survey is necessary to confirm the depths and location of utilities.	**Response 3.** Geophysical utility surveys have been conducted in association with the numerous historic site investigations at the site and that data, along with generator's knowledge, confirm the area free of energized utilities. Underground Service Alert of Northern California have been notified regarding fieldwork by TtEC in 2002, 2004, and 2007 and for each notification they have confirmed that there are no municipal services in the area. Additionally, the Caretaker Site Office for Alameda has also confirmed that there are no energized Navy utilities in the area. Aboveground vaults and exposed conduits in the area have been investigated in the past and confirm the lack of energized systems. Although historic geophysical investigations by others may have identified lineaments suspected to be utility lines, these likely represent abandoned utility conduits. TtEC will not perform additional geophysical surveys prior to excavations based on historic findings and the fact that the site is a former landfill area and abundant documentation exists indicating the site contains metal debris that interferes with geophysical surveys. There are known aboveground and subsurface stormwater conveyance channels in the area that have been identified by past surveys. These systems will be protected and maintained during the construction period. Section 5.3 has been revised to reflect this response.

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Comment 4. Section 5.5.1, Soil Gas and Groundwater Monitoring Well Destruction, Page 5-3: To maintain data continuity, monitoring wells M-024A and M-024E should be retained. Replacement wells rarely provide the same data as the original wells. Also, the text and project schedule do not state when the existing wells will be destroyed or how long it will be before groundwater samples can be collected in replacement wells (i.e., when stabilization occurs after well development). Please revise the Draft RD/RA WP to require preservation of monitoring wells M-024A and M-024E. In addition, please specify the timeframe between destruction of the other wells and the time samples could be collected.	**Response 4.** The RAWP has been revised to include preservation of all existing monitoring wells pending potential changes based on the results of the Groundwater Monitoring Evaluation (GME). Any changes to the existing groundwater monitoring network will be identified in the Remedial Design Addendum which will include the GME and associated recommendations. The first sampling event post-cover construction is anticipated to be in January 2014.
Comment 5. Section 5.6.4, Barge Delivery and Stockpile of Soils, Page 5-5: The text does not indicate that soil and rock material imported from off-base will be tested for geotechnical properties and compared with the design specifications to confirm suitability as fill. As such, it is unclear if the materials are appropriate for use. Please revise Section 5.6.4 to provide and/or reference the design specifications that the fill material will meet to show that the materials are appropriate for this use.	**Response 5.** Section 5.6.4 will be revised to indicate moisture density (ASTM D 1557), sieve analyses (ASTM D 1140), Atterberg limits (ASTM D 4318), and soil classification (ASTM D2487) will be performed daily or for every 8,000 cubic yards for the first week, and weekly or every 40,000 cubic yards after the first 5 consecutive passing tests (except for continuous Visual Inspection per ASTM D 2488) thereafter per Article 3.11 of Specification Section 31 00 00. Visual inspection will be conducted continuously.

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Comment 6. Section 5.6.5, Reuse of Material from Previous Alameda Projects, Page 5-6: The text states that fill material from previous Alameda projects will be available for use and will be tested for geotechnical properties and compared with the design specifications to confirm suitability as fill; however, design specifications for fill materials are not provided or referenced. Without a comparison of geotechnical properties, it is unclear if the reuse of material from previous Alameda projects is appropriate, especially given the magnitude of the slope stability concerns. Please revise Section 5.6.5 to provide and/or reference the design specifications for the fill material and provide a comparison of the fill materials to show that the materials are appropriate for use and consistent with the material properties of the layers evaluated during the slope stability analysis.	**Response 6.** Section 5.6.5 will be revised to reference Article 3.11 of Specification Section 31 00 00 in the RD. All fill material will undergo testing to determine the suitability for use at the site. Material from previous Alameda or other projects will be compared to this specification.
Comment 7. Section 5.6.6, General Site Grading and Multilayer Soil Cover Construction, Page 5-6: The second paragraph indicates that grading in the ammunition bunker area will occur around the structures without any modifications being made to the structures themselves; however, it is unclear if the grading and compacting in the vicinity of the structures will have any structural impact. As such, it is unclear if any reinforcement measures should be made prior to grading and compacting in the vicinity of the structures. Please revise Section 5.6.6 to clarify that an assessment will be made to determine whether any structural reinforcement measures will be necessary prior to grading and compacting in the vicinity of the structures.	**Response 7.** Section 5.6.6 has been revised to state that the structural integrity of the structures in the ammunition bunker area will be assessed prior to commencing site grading in that area.

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Comment 8. Section 5.6.6.4, Vegetative Layer, Page 5-8: The text states that the vegetative layer will be protected from erosion by hydroseeding the surface with native vegetation and indicates that the hydroseed mixture will be applied during the rainy season; however, the rainy season is not formally defined. As such, it is unclear when the hydroseed mixture will be applied. Further, it is unclear what temporary erosion measures will be implemented should the vegetative layer be completed prior to the rainy season. Please revise Section 5.6.6.4 to clearly define the rainy season and clarify how the vegetative cover will be protected from erosion should the cap construction be completed during the dry season (i.e. before the vegetation has been established).	**Response 8.** Rainy season is generally November through April. Based on the schedule, hydroseeding will occur during rainy season. Erosion mats or other appropriate controls will be used as necessary. In addition erosion damage, if it occurs, will be monitored and repaired as part of O&M. Section 5.6.6.4 will be revised to add text as such.
Comment 9. Section 5.8.2 Installation of Groundwater Monitoring Wells and Landfill Gas Monitoring Probes, Page 5-11 and Figure 5-2, Groundwater and Soil Gas Monitoring Wells Proposed for Destruction: The locations of replacement wells for M-037A, M-37E, and M-039A have not been provided. The locations of these replacement wells should be optimized to monitor for potential discharges to the wetlands. Please provide a figure that depicts proposed optimized locations for these wells.	**Response 9.** The RAWP has been revised to include preservation of all existing monitoring wells pending potential changes based on the results of the Groundwater Monitoring Evaluation (GME). Any changes to the existing groundwater monitoring network will be identified in the Remedial Design Addendum which will include the GME and associated recommendations. Figure 5-2 has been updated to show the existing monitoring well network.

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Comment 10. Section 5.11.2, Site Inspection, Page 5-12: The Regulatory Agencies should be invited to attend the site inspection. Please revise the text to include the Regulatory Agencies in the Site Inspection.	**Response 10.** The text has been revised to include regulatory agency participation.
Comment 11. Section 6.4, Water Conservation, Page 6-2: Although the source moisture conditioning (i.e., at the quarry that will provide backfill materials), moisture will be lost if soil is stockpiled on site prior to use. "Just-in-time delivery" to minimize the number of stockpiles and the time they are on site should be attempted. Please revise the text to explain how stockpiling can be minimized.	**Response 11.** Section 6.4 has been revised to add that stockpiling will be minimized by matching delivery rates with production rates to the extent practicable.
Comment 12. Attachment 1, Drawing C-4, Subgrade Plan - Northwest: Drawing C-4 indicates that the ammunition bunker door will be welded shut; however, details regarding this action are not included elsewhere in the Draft RD/RA WP. As such, it is unclear when and how the door will be welded. Please revise the Draft RD/RA WP to include details and specifications to accomplish the welding of the ammunition bunker door.	**Response 12.** Section 5.5 of the RAWP has been revised to include tack welding of the bunker doors. Tack welding will be one or two spot welds to provide security without fencing until the VA chooses to use the bunkers.

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Comment 13. Attachment 1, Draft Geotechnical Report, Section 8.1, Liquefaction Induced Settlements, Page 25: The text appears to be inconsistent with the Tetra Tech Foster Wheeler (TT FW) Report and may not accurately predict the settlement potential. Section 8.1 states that, "The KCH report predicts liquefaction induced settlements of generally less than 4 inches, with the exception of the southern coastal margin and the center of the landfill where 10 to 12 inches of liquefaction induced settlements are predicted, respectively." However, the TT FW report indicates that transverse cracks up to 4 inches wide and 3 to 4.5 feet deep were reported as a result of liquefaction during the 1989 Loma Prieta earthquake. Therefore, it is unclear if the predicted liquefaction induced settlements accurately predict the settlement potential given the wide variation between calculated and actually documented liquefaction induced settlements. Please revise the Draft RD/RA WP to clarify how the predicted liquefaction induced settlements are appropriate given their wide variation from actual recorded liquefaction induced settlements, ensuring that the Draft RD/RA WP documents and supports any site-specific conditions which changed as a result of the 1989 Loma Prieta earthquake so as to limit the anticipated settlement.	**Response 13.** The Geotechnical Report has been revised and reviewed subsequent to these comments. Please see Attachment 14 for Response to Comments on the latest version of the Geotechnical Report.

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Comment 14. Attachment 1, Draft Geotechnical Report, Section 10.1, Summary of Results, Page 27: The text states that, "The proposed final cover includes a geonet as a biotic barrier, which effectively acts as soil reinforcement. The surficial manifestation of liquefaction will be therefore somewhat reduced;" however, information to support this statement is not provided and/or referenced. Thus, it is unclear how effective the geonet will be for reducing surficial manifestation of liquefaction. Further, specifications for the geonet to show the material's property capabilities are not provided. Also, it is unclear how the geonet will be tied into soil at the base of slopes surrounding the landfill and whether liquefaction could extrude materials beneath the edge of the geonet. Please revise the Draft RD/RA WP to provide and/or reference information to substantiate that geonet will be effective at reducing surficial manifestation of liquefaction. In addition, please revise the Draft RD/RA WP to include specifications for the geonet and calculations to show the material will be effective as soil reinforcement. Also, please clarify how the geonet will be tied into soil at the base of slopes surrounding the landfill and whether liquefaction could result in extrusion of soil beneath the edge/bottom of the geonet.	**Response 14.** The geonet is intended to function as a biotic layer. Any other benefits incidental to use of a geonet as a biotic layer described in the report were not considered in the design analysis. The geonet biotic layer is not intended to provide soil reinforcement, as such, they have not been evaluated for performance in a liquefaction scenario. Specifications for the geonet have been prepared, but do not include any parameters for soil reinforcement, as this was not part of the selection criteria for the geonet layer. The geonet is a component of the multilayer soil cover and its sole function is an anti-burrowing barrier. As such the geonets lateral limits coincide with the lateral limits of the soil cover which typically do not extend to the toe of the perimeter berm slopes. The geonet has no function to mitigate or control the effects of liquefaction.

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Comment 15. Attachment 2, Section 5.4, Air Monitoring, Page 5-3: The text states that 10% of the DAC values for Thorium 232 (Th-232) and Strontium 90 (Sr-90) will be used to determine whether the area is no longer safe to work in, but does not specify the air volume that must be collected. While Table 5-1, Derived Air Concentration, has been provided, neither the text nor the table state how much air volume will need to be collected to correspond to achievable detection limits for identifying the 10% DAC limit for these radionuclides. The amount of air volume required will affect how long the air sampler must run before a sample can be counted. This information is important in identifying the length of time a worker may be exposed to unacceptable air concentrations before the radiological hazard is identified. Please revise Section 5.4 to provide this information.	**Response 15.** Section 5.4 has been revised to reflect that a minimum volume of 1.4×10^8 milliliters must be collected to ensure the 10% DAC value for Th-232 is met.
Comment 16. Attachment 2, Section 5.5, Bioassays, Pages 5-3, 5-4: The text states that in the unlikely event that the results of air monitoring suggest an intake of radiological contamination has occurred, bioassay measurements will be collected as necessary to determine the potential dose to the affected personnel, but procedures should be in place to address this situation should it arise. Text in this section does not state what contingency plan or procedures are in place in such an event. This would include information pertaining to what lab the samples will be sent to, who will be responsible to ensure the proper bioassay samples are collected, how the data will be reported, and others. Please revise this section to reference the SOP or contingency plan that will guide actions in the event of an internal exposure or to state how the program will be administered through an outside vendor.	**Response 16.** NRC regulation 10CFR20.1502 does not require internal monitoring unless (at a minimum for minors or declared pregnant workers) an individual is likely to receive an annual committed effective dose equivalent of 0.1 rem (which is equivalent to 40 DAC-hrs). For other radiation workers, this limit is 10% of the ALI (which is equivalent to 200 DAC-hrs). As continuous air monitoring will be provided, internal monitoring is not required, and since previous TCRA work did not indicate elevated airborne concentrations of radionuclides, the need for bioassay is highly unlikely. As such, committing to a bioassay provider and detailed bioassay procedure is unnecessary. However, the RSO will ensure the proper dosimetry samples are collected, and the data reported for required individual personal dosimetry reports.

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Comment 17. Attachment 2, Section 6.3, Initial MARSSIM Survey of Subgrade Prior to Installation of Cover, Page 6-2: The criteria for final cover installation are not specified in this section. The text states that subgrade areas will be surveyed with a sodium iodide scintillation detector and areas that exceed twice the background during the survey will be remediated to a depth of 1 foot. The text subsequently states that once the gamma surveys and any remediation are performed, a number of samples will be collected so as to perform a baseline dose and risk assessment using the RESRAD model prior to installation of the cover. However, it is unclear what dose or risk level will be considered acceptable for proceeding with the installation of the cover. This should be based on a risk of 1x10-6. Please revise this section to state what acceptance criteria for ceasing soil removal and installing the final cover have been established.	**Response 17.** The remedial goal is to remove radioactive anomalies greater than twice background within the first 12 inches of the surface and to demonstrate that, with the 2-foot cover installed, the maximum annual dose to an individual of 15 mrem, and the excess lifetime cancer risk (ELCR) at 3×10^{-4} for the critical group, are not exceeded. No subgrade surface release criteria or remedial goals are specified. Note that the intent of the 2-foot cover design was to adequately shield and contain radionuclides of concern such that the cover surface remediation goals are met regardless of the concentrations of the radionuclides of concern beneath the cover.
Comment 18. Attachment 2, Section 6.5, Final MARSSIM Survey of the Cover, Page 6-3, and Table 2-1 (Release Criteria): The text states that the cover material will meet the release criteria in Table 2-1. Table 2-1 lists the release criteria for Ra-226 as 1.0 pCi/g, with a footnote indicating that the remediation goal is 1 pCi/g above background. However, neither the text in Section 6.5 nor Table 2-1 provides the background concentration of Ra-226 in pCi/g. This information will be required in the final reporting of the data so that quantitative value from the laboratory (as total Ra-226) can be evaluated to determine if the 1 pCi/g above background criteria has been met.	**Response 18.** A reference area and background concentration for Ra-226 based on gamma spectroscopy analysis (EPA Method 901.1M) of soil samples collected from the reference area will be established when the work plan has been approved. This information will be provided in the final reporting of the data to demonstrate that the quantitative value for the cover material from the laboratory (as total Ra-226) is less than 1 pCi/g above background concentrations.

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Comment 19. Attachment 4, Worksheet #3, Distribution List, Pages 17 to 19: This worksheet is missing key personnel including the TtEC field crew and Ms. Sabina Sudoko, TtEC Project Chemist. Since these roles involve responsibilities related to adherence with the SAP, they should be included in the distribution list. Please revise Worksheet #3 to include these key personnel.	**Response 19. SAP** Worksheet #3 has been revised to include the Project Chemist. A footnote has been added to SAP Worksheet #3 that states: *The PQCM, Vincent Richards, who is listed above, will have multiple copies of the final SAP on-site for field crews to reference while sampling.*
Comment 20. Attachment 4, Worksheet #11, Step 5, Develop the Analytic Approach, Pages 44 and 45: Under step 5c, the calculated total excess lifetime cancer risk (i.e., from all constituents, not just radionuclides) should not exceed 1x10-4 as EPA is moving away from a dose-based approach to a risk-based approach. Please revise the text to specify that the calculated total risk should not exceed 1x10-4.	**Response 20.** The calculated total risk of 3×10^{-4} as listed in the SAP is based on recommendations from OSWER 9200.4-18, "Establishment of Clean Up Levels for CERCLA Sites with Radioactive Contamination" from August 22, 1997. This calculated total risk value limit has been accepted for recent radiological remediations of Navy properties. As such, no change to the SAP will be made.

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Comment 21. Attachment 4, Worksheet #11, Step 7, Develop the Plan for Obtaining Data, Pages 45 and 46 and Worksheet #17, Sampling Design and Rationale, Page 96: The SAP does not explain why 10 samples are sufficient for a survey unit or define the survey unit size (in square feet); this information should be provided under Worksheet #11, Step 7 and in Worksheet #17. Further, it is unclear whether 10 samples is sufficient under MARSSIM. Also, Step 7 and Worksheet #17 do not explain why 2 samples per 40 cubic yards is sufficient after excavation has been done or if this was based on MARSSIM calculations. Finally, the basis for 10 backfill samples per source has not been provided. Please revise Worksheet #11, Step 7 and Worksheet #17 to explain why 10 samples per survey unit, 2 samples per 40 cubic yards of excavated soil and 10 backfill samples per source are sufficient, including whether these sample numbers were based on MARSSIM calculations. Also, please provide the survey unit size in square feet.	**Response 21.** Information regarding the survey unit size of a maximum of 2000 square meters or 21,780 square feet and number of samples collected per survey unit is described in the RWP (Attachment 2), specifically in Section 8. As such, this information need not be included in the SAP. The basis for the collection of 10 samples in the survey unit and the reference area is from using MARSSIM calculations for a statistically significant number of samples for free releasing a Class 1 survey unit, despite the fact that these are not free release surveys and is therefore conservative. Also, conservative assumptions about the radionuclide of concern median values and standard deviations were used in the calculation of sample numbers. Note that the number of samples to be collected will be re-calculated based upon actual radionuclide of concern medial values and standard deviations from soil samples collected in the selected reference area. As 10 samples per survey unit were calculated for each survey unit and the reference area, 10 backfill soil samples were deemed appropriate. Although not based on a MARSSIM calculation, the 2 samples per 40 cubic yard sampling of soil excavated as the result of exceeding twice the background level, and subsequent to an additional survey in 6-inch lifts has been standard practice for previous Navy radiological survey and removal actions. (Note that this is approximately 1 sample per 100 square meters.) No changes were made to the SAP based on this response.

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Comment 22. Attachment 4, Worksheet #11, Step 7, Develop the Plan for Obtaining Data, Page 46: There is an apparent contradiction between the requirements described in the first and second paragraphs on page 46. The first paragraph states that 1 of 10 samples will be analyzed for total strontium and/or Sr-90, but the second paragraph states that samples that exceed the release criterion for Cesium-137 (Cs-137) will be analyzed for total strontium and/or Sr-90. The first paragraph does not appear to require analysis for Cs-137 and it is unclear if the analysis for total strontium and/or Sr-90 will be done for 1 of every 10 samples, if it will be done for additional samples if the release criterion for Cs-137 is exceeded, or if it will only be done for samples when the release criterion for Cs-137 is exceeded. Please revise the text to clarify when analyses for total strontium and/or Sr-90 will be done. In addition, please include Cs-137 in the discussion about the 10 samples that will be collected per survey unit.	**Response 22.** Paragraphs 3, 4, and 5 in Step 7 on SAP Worksheet #11 were deleted and replaced with the following: *Details on collection and analysis of samples are in SAP Worksheet #14.*
Comment 23. Attachment 4, Worksheet #13, Secondary Data Criteria and Limitations Table, Page 49: Worksheet #13 states that no secondary data for this project will be used; however, the Work Plan references other documents for previous site work that appear to be relevant to the current investigation. Additionally, Worksheet #11 indicates that previous chemical and radiological analytical results for soil stockpiles that may be used for fill material will be reviewed against criteria in this SAP. Please revise Worksheet #13 to include all secondary data that will be used for decision making for this project.	**Response 23.** Worksheet #13 has been revised to included references to previous documents that are relevant to the current investigation.

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Comment 24. Attachment 4, Worksheet #14, Summary of Project Tasks, Page 51: The second paragraph states that "Radiological control technicians (RCTs) will periodically scan the cut areas," but it is unclear what criteria will be used to determine when these scans are necessary. For example, scans could be done once a day, once a week, once a month, when a 6-inch lift is excavated, when a 12-inch lift is excavated, randomly, etc. Specific criteria to determine when these scans will be done are necessary. Please revise Worksheet #14 and any other text discussing the periodic scans of cut areas to provide specific criteria that will be used to determine when the scans are necessary.	**Response 24.** The third sentence in the second paragraph under the Building Up to Subgrade section of Worksheet #14 in the SAP has been revised as follows: *Radiological Control Technicians (RCTs) will periodically scan the cut areas on a frequency based on the professional judgment of the RSOR taking into consideration the previous survey results, accessibility of the affected areas, and soil movement in the area. At a minimum, the affected area will be surveyed each time a lift is excavated, a new surface area is exposed, or when personnel entry is required into the affected area.* *These radiological scans will be performed for health and safety reasons during soil moving operations to ensure that radiological contaminants are not disturbed. The radiological scans will be documented in the field and in the remedial action completion report if a radiological scan identifies an area greater than twice background using a Ludlum 2350 meter with a Ludlum 44-10 NaI detector or equivalent.* Establishing a firm periodicity for all radiological surveys is not recommended, as each "cut area" may present varying degrees of radiation safety hazards.
Comment 25. Attachment 4, Worksheet #14, Summary of Project Tasks, Pages 52 and 53: The numbered soil sampling procedures do not specify the sampling equipment that will be used to collect the samples so it is unclear if disposable equipment (e.g., scoops or trowels) or equipment that requires decontamination between samples will be used. The sampling equipment is specified in the procedures for fill material sampling. Please revise the soil sampling procedures to specify the sampling equipment that will be used to collect the samples, including whether decontamination will be necessary.	**Response 25.** The numbered soil sampling procedures have been revised in Worksheet #14 to include the following: *A disposal scoop or equivalent may be used to fill the containers.*

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Comment 26. Attachment 4, Worksheet #14, Summary of Project Tasks, Page 55: The SAP does not discuss how qualifiers uploaded to the database will be verified. Please revise the SAP to discuss how data qualifiers will be verified in the database.	**Response 26.** Worksheet #14 under Data Management Tasks has been revised as follows: *After receipt of the validated data, the validation qualifiers will be uploaded into the TtEC database and will be checked against the hardcopy validation report for accuracy.*
Comment 27. Attachment 4, Worksheet #15.1, Reference Limits and Evaluation Table for Soil Samples, Page 71: Footnotes "e" and "f" provide conflicting information and need further clarification. Footnote "e" states that if a result exceeds the PAL, the toxicity characteristic leaching procedure (TCLP) must be performed. Footnote "f" states that if a result exceeds the PAL, the waste will be considered "non-RCRA hazardous" and sent off-site for disposal; if the results do not exceed the PAL, the results will be evaluated to determine if soluble threshold limit concentration (STLC)/TCLP testing is required. It is unclear why samples with results exceeding PALs are considered "non-RCRA hazardous" according to footnote "f", or if these samples will be shipped to a hazardous waste disposal facility. If the results do not exceed the PAL, it is unclear why STLC/TCLP analyses need to be considered. Further, it is unclear if both tests will be performed. Finally, for both footnotes, it is unclear how the PALs were established. Please revise Worksheet #15.1 to clarify how the PALs were established and provide the decision criteria for sending the material to a hazardous waste facility for disposal or performing STLC and/or TCLP testing.	**Response 27.** TCLP criteria is used to classify waste as RCRA hazardous. STLC criteria is used to classify waste as non-RCRA (or state of California) hazardous. According to the regulations, some analytes only have TCLP criteria and no STLC criteria and some analytes have both TCLP and STLC criteria. Footnote e) lists a PAL for analytes that only have TCLP criteria. Hence, if that PAL is exceeded, then TCLP analysis will be performed to determine if the waste is RCRA hazardous. If the PAL is not exceeded, the rest of the analytical data must be evaluated against the information listed in footnote f) before proceeding to use material as backfill. Footnote d) has been revised as follows to clarify this: *Limit listed is the value at which if exceeded then TCLP analysis must be performed. TCLP results will then be evaluated against CCR Title 22 criteria. If the TCLP results are below the CCR Title 22 criteria, then the material may be suitable for backfill pending evaluation of the rest of the analytical data against criteria in footnote f below. Otherwise, the material will be disposed of off-site.* The PAL values listed in conjunction with footnote f) are the Total Threshold Limit Concentrations (TTLC) that if exceeded the material is automatically considered non-RCRA hazardous but will need to be further evaluated for TCLP analysis. If the TTLC values are not exceeded, then the data will be evaluated for further STLC or TCLP analysis as required. Footnote g) has been revised as follows to clarify this:

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	Limit listed is the Total Threshold Limit Concentration value at which if exceeded the material is automatically considered non-RCRA hazardous and will be evaluated for TCLP analysis. If the value is not exceeded, results will then be evaluated to determine if STLC/TCLP analysis is required in accordance with CCR Title 22. If STLC/TCLP analysis is required, those results will be evaluated against criteria in CCR Title 22. If the STLC/TCLP results are below the CCR Title 22 criteria, then the material may be suitable for backfill pending evaluation of the rest of the analytical data against criteria in footnote e above. Otherwise, the material will be disposed of off-site.
Comment 28. Attachment 4, Worksheet #15.2, Reference Limits and Evaluation Table for Water Samples, Page 92: It is unclear what regulatory limits for hazardous waste criteria will be used to assess results from wastewater samples (i.e., federal, state, etc.). Further, these limits should be listed in the SAP to ensure that the laboratory limits are less than, or equal to, the regulatory limits. Please revise Worksheet #15.2 to provide numerical PALs and indicate the specific source of these values.	**Response 28.** Project action limits and their reference have been added to SAP Worksheet #15.2 for analytes that have STLC or TCLP CCR Title 22 criteria. Chemical analytes that do not have criteria have been deleted from Worksheet #15.2.

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Comment 29. Worksheet #17, Sampling Design and Rationale, Pages 95 and 96: Worksheet #17 should provide the sampling design and rationale for the number of samples and analyses (e.g., why the specified number of samples of each type is sufficient, how sample locations will be chosen, etc.), but this information is not provided. In addition, the text under the subsections titled "Building Up to Subgrade" and "Initial MARSSIM Survey of Subgrade Prior to Installation of Cover," is unnecessary and repeats the text provided in Worksheet #14. Further, Worksheet #17 is missing a table that lists each type of sample, the number of samples that will be collected, and the required analyses. Required QC samples should be included in this table. Please delete the text under the subsections titled "Building Up to Subgrade" and "Initial MARSSIM Survey of Subgrade Prior to Installation of Cover" and revise the Worksheet to provide the sampling design and rationale for the number of samples and analyses. Also, please include a table that lists each type of sample, the number of samples that will be collected, required QC samples, and the required analyses.	**Response 29.** Worksheet #17 of the SAP has been revised to include sampling design and rationale for the number of samples and analyses. Furthermore, text that was repetitive from Worksheet #14 has been removed from Worksheet #17. In regards to a table with the number of samples and required analyses, that information is provided in Worksheet #18. QC samples are discussed in Worksheet #12. No changes were made to the SAP based on this part of the response.

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Comment 30. Worksheet #17, Final MARSSIM Survey of the Cover, Page 96: This section discusses the potential need for remediation (excavation) of portions of the cover in the unlikely event that radiological contamination is found after the cover is constructed, but does not specify surveys or sampling to determine that sufficient soil has been removed. Please revise the text to specify whether a gamma survey of the excavation will be done and the number of samples that must be collected. In addition, please include this information in other worksheets of the SAP as necessary. Further, the text states, "Soil samples will be collected for waste characterization purposes at a frequency defined by the disposal facility," but the disposal facility should be contacted so that the number of required samples and analyses can be specifically included in the SAP. Please revise the SAP to include the number of and analyses for required waste characterization samples.	**Response 30.** Worksheet #17 was completely revised as indicated in Response 29 above. As already indicated in Worksheet #14 regarding the Final MARSSIM Survey of the Cover, "If remediation is warranted, then the area will be excavated as directed by the project team, then filled in to bring the surface back up to grade, and another gamma survey will be conducted." Sampling the area after excavation will not be conducted; however, the material that is excavated will sampled as described in Worksheet #14. Regarding the second statement about the text and frequency of sampling by the disposal facility, that section has been revised as follows: *Any soil that is excavated during this time will be placed in six inch lifts. The soil will be surveyed again and soil samples will be collected at a rate of two samples per 40 cubic yards. All samples will be analyzed for gamma isotopes. Ten percent of the samples will be analyzed for total strontium and/or ^{90}Sr, and alpha isotopes (^{238}U). Additionally, any sample result exceeding the release criterion for ^{137}Cs will also be analyzed for total strontium and/or ^{90}Sr. These results will be used to determine if the material is LLRW or non-LLRW. LLRW material will be transported to the waste broker for subsequent disposal. Non-LLRW will be sampled at a minimum of one sample per 500 cubic yards for chemical analyses as listed in Worksheet #18. These chemical results will determine if the any of the material can be reused as fill material for IR Site 2 or if off-site disposal of the material is required.*

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Comment 31. Attachment 4, Worksheet #18, Sampling Locations and Methods/SOP Requirements Table, Page 99: Footnote "c" and "d" indicate that the number of waste soil and wastewater samples is unknown since the amount of waste is unknown; however, the SAP should indicate the frequency for collecting waste samples (e.g., 1 sample per 40 cubic yards). Please revise Worksheet #18 to indicate the frequency for collecting waste samples.	**Response 31.** Footnote "c" and "d" have been deleted from Worksheet #18 and instead the following has been added to Worksheet #18: Minimum of 1 per 500 cubic yards for the excavated soil waste samples and a minimum of one sample per container for the wastewater samples
Comment 32. Attachment 4, Worksheet #28.1/28.2, Laboratory QC Samples Table - Soil/Water, Pages 144 and 159: The acceptance limits for the post digestion spike (PDS) (75 - 125%) do not meet the acceptance limits in method 6020A (80 - 120%). Please revise SAP to utilize the PDS acceptance limit requirements in Method 6020A.	**Response 32.** Worksheets #28.1 and 28.2 have been revised to list the 80-120% criteria for the post-digestion spike for method 6020A.
Comment 33. Attachment 4, Worksheet #29, Project Documents and Records Table, Page 173: Worksheet #29 states that the Quality Control Program Manager (PQCM) will use an Initial Inspection Checklist during inspections; however, a copy of this inspection checklist has not been provided. Please revise the SAP to provide a copy of this inspection checklist.	**Response 33.** This quality form can be found in Attachment 5 of this Work Plan and is called the Initial Phase Inspection Form. No changes were made to the SAP based on this response.
Comment 34. Attachment 5, Section 7.5, Additional Inspections, Page 7-3: The third bullet states that if activity on a definable feature of work (DFW) is resumed after a substantial period of inactivity, an additional inspection may be conducted; however, a "substantial period of inactivity" is not defined. As such, it is unclear what amount of time this constitutes (e.g., week, month). Please revise Attachment 5 to clearly define the period of inactivity that would result in an additional inspection being conducted.	**Response 34.** The third bullet of Attachment 5, Section 7.5, Page 7-3 has been revised to replace "substantial period" with "2-month period of inactivity."

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Comment 35. Attachment 5, Table 3-1, Definable Features of Work, Page 9 of 15: The Follow-Up column for the Biotic Barrier (Geonet Layer) Placement row states that, "Inspect operation and ensure that material cures properly." However, no concrete is utilized for the installation of the geonet based on Drawing D-5 (Site Details) of Attachment 1 (90% Remedial Design). As such, it is unclear what component of the geonet layer "cures". Further, it is unclear what criteria are utilized to determine curing has occurred properly. Please revise Table 3-1 to clarify the component of the geonet layer which cures. In addition, please clarify what criteria will utilized used to determine curing has occurred properly.	**Response 35.** Comment noted. Table 3-1 of Attachment 5 has been revised to remove this bullet.
Comment 36. Attachment 6, Section 2.1, Agency/Client/Contractor Interface and Contractual Responsibilities, Page 2-1: The EPA is not listed as a regulatory agency overseeing this project. Please revise Section 2.1 to include all key parties overseeing this project.	**Response 36.** Attachment 6, Section 2.1 has been revised to list the regulatory agencies providing oversight through the Base Closure Team (BCT).

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Comment 37. Attachment 6, Sections 6.3.2 and 6.3.6, Pages 6-6 and 6- 8: It is unclear why only plants and birds will be monitored. Based on information presented in Attachment 6, ecological surveys and construction monitoring proposed at IR Site 2 appear to be limited to protecting special status plant and avian species. However, Attachment 7, Wetland Mitigation Plan indicates the presence of pickleweed (Salicornia virginica), which provides a food source and habitat for the endangered salt-marsh harvest mouse (Reithrodontomys raviventris). Further, a remedial action objective specified in Section 2.4, page 2-9, is to protect mammal species, as well as human receptors and avian species. Table 6-1 shows that mammals have been observed at IR Site 2. Please justify why only plants and birds, but not mammals will be monitored in the future. In addition, these sections state that a "qualified biologist" will conduct ecological surveys of the plants and animals at Site 2 to collect information on species present in or near the intended project areas and to monitor construction activities in areas of suitable habitat to avoid the take of individual animals and to minimize habitat disturbance. The current text does not describe the qualifications of the biologist. Please discuss the qualifications of the biologist that will be required for these activities.	**Response 37.** Special status plants and avian species are indicated because they are more likely to be present. Two Salt Marsh Harvest Mouse surveys have been conducted at Alameda Point, including IR Site 2, one in 1995 and one in 2009. Both concluded the Salt Marsh Harvest Mouse was not present. (PRC Environmental Management Inc. 1995), (H.T. Harvey & Associates, Inc. 2009). 2,397 and 1,600 trap nights of effort were performed as a part of the 1995 and 2009 studies, respectively. A "qualified biologist" will have experience monitoring and identifying the special status species mentioned in the report, as well as experience monitoring in tidal wetlands, and be able to set up and execute a monitoring program for these species.

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Comment 38. Attachment 7, Section 5.0, Page 5-2: This section states that habitat for the salt-marsh harvest mouse, consisting of dense pickleweed, is present in seasonal wetlands and tidal wetland. Yet, the text does not discuss any mitigation measures to address this species. The salt-marsh harvest mouse is a Federal endangered species and has fully protected status in California and needs to be addressed in the Wetland Mitigation Plan. Please discuss mitigation measures for the salt-marsh harvest mouse and other small mammals, as appropriate, in the Wetland Mitigation Plan. Additionally, please include mitigation goals, success criteria, implementation activities, and long-term monitoring and maintenance requirements for small mammals as part of the creation of compensatory wetlands. The second paragraph states, "Due to their patchy and isolated nature, the seasonal wetlands at the north end of the site, which are the seasonal wetlands that would be filled, offer minimal habitat value." This concept is reiterated in Section 9.0 on Page 9-1; however, the text does not discuss whether filling these seasonal wetlands may eliminate potential amphibian breeding habitat by replacing freshwater wetlands with tidal wetlands. Please discuss whether the ecological surveys, proposed in Attachment 6, Section 6.3.2, will include the identification of amphibian populations.	**Response 38.** This section indicates that "marginal" habitat for the SMHM is present, and lists reasons why it is not likely to occur there, as stated in the previous response (Response #37). Requiring mitigation measures for the SMHM at this point is unwarranted because it assumes that they are present and would be affected by construction. In response to the second paragraph, we concur that amphibian surveys should be performed to identify whether a listed species is present, in substantive compliance with the California Endangered Species Act, Section 2080, and 2081(b). The surveys would be conducted during the amphibian breeding season, typically December to March. The EPP and Wetlands Mitigation Plan (Attachments 6 and 7) have been revised to reflect this change.

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Comment 39. Attachment 7, Section 10.0, Implementation, Section 10.1, Page 10-2: The Navy has not proposed revegetating the Tidal Wetland Mitigation Area with pickleweed (the desired plant species) and instead, proposes to let the excavated areas revegetate themselves naturally. However, the text does not discuss contingencies in the event that invasive plant species, which seem to be present in the surrounding area, revegetate the newly-created wetlands. It would appear that planting pickleweed as part of the restoration phase will increase the chances that the mitigated wetlands will support the desired plant and animal species. Please propose planting pickleweed or explain the reason(s) for not replanting the area with pickleweed following development of the new marsh.	**Response 39.** Planting pickleweed is not recommended since it will revegetate quickly without replanting. The rationale for this, as explained in Section 10.1, is that at other tidal marsh restoration sites, notably at Piers 94 and 98 in San Francisco, pickleweed revegetated quickly without any plantings. Section 10.1 also indicates that the two main invasive plant species that threaten tidal wetland plant communities (*Spartina alterniflora* and *Lepidium latifolium*) were not observed at the site. The only observed invasive plants that would compete with pickleweed were NZ spinach and Salsola soda, neither of which are particularly aggressive. In addition, the text does discuss contingencies in the event of colonization by invasives, and sets a very low threshold (essentially 0% Spartina or Lepidium) before control measures are implemented (Section 11.1). Section 11.1 also proposes planting pickleweed plugs if the performance goals for Years 2 and beyond are not met.
Comment 40. Attachment 7, Section 11.0, Monitoring and Maintenance, Section 11.2 Success Criteria for Wildlife, Page 11-2: The last sentence of this section defines success criteria for wildlife as increased bird use over a 5-year period as the invertebrate community in the substrate increases yet no plan is discussed in case the success goals are not met. Please provide more details to address actions that the Navy will implement if the 5-year wildlife goals are not met.	**Response 40.** Additional details regarding actions that would be implemented if the 5-year wildlife success goals are not met would be speculative and are beyond the scope of the remedial design.

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Comment 41. Attachment 8, Section 3.2.3, Management of Contaminated Soil, Page 3-2 and Attachment 9, Section 3.3, Dust Control Measures, Page 3-2: The text indicates that stockpiled soil will be treated with a soil tackifier to provide dust control and prevent runoff; however, the specific soil tackifier is not named and the application rate is not specified. Similarly, Section 3.3 (Dust Control Measures) of Attachment 9 (Dust Control and Air Monitoring Plan) indicates that chemical soil stabilizer will be applied in sufficient quantities to disturbed areas; however, the specific chemical soil stabilizer is not named and the application rate is not specified. Further, it is not clear if the soil tackifier and chemical soil stabilizer are the same product, and if not, it is unclear if the chemical soil stabilizer and the application rate are appropriate to provide dust control and prevent runoff. Please revise Attachments 8 and 9 to clarify if the soil tackifier and chemical soil stabilizer are the same product. Further, please include a product specification sheet for all applicable media as well as the associated application rate which will provide dust control and prevent runoff.	**Response 41.** Please see response to EPA Comment #23.

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Comment 42. Attachment 8, Section 3.2.5.1, Diesel Fuel, Page 3-2: The text states that fueling will occur in designated areas; however, the designated areas are not specified. In addition, the text states that, if a spill occurs as equipment is being fueled, the spill will be immediately contained with an earthen berm and an excavation retention trap will be provided; however, the materials to construct an earthen berm are not listed in Section 1.6 (Release Prevention and Minimization Measures) of Appendix A (Emergency Response Plan) of Attachment 11 (Post-Closure Operations, Maintenance and Monitoring Plan) as basic spill response materials on-site. As such, the source of the materials to construct an earthen berm is unspecified. Please revise Attachment 8 to clarify where materials to construct an earthen berm will be obtained and where the berms will be placed relative to the designated areas for fueling.	**Response 42.** Attachment 8, Section 3.2.5.1 has been revised to specify that fueling will occur on the pavement inside the radiological control area (see Figure 5-1 in the work plan) and that import cover material will be used to construct the earthen berm.
Comment 43. Attachment 8, Section 3.3.4, Soil Stockpile Areas, Page 3-4: The text states that large stockpiles will be sloped to reduce the infiltration of rainwater; however, the slope is not specified. As such, it is unclear what approximate angle the large stockpiles will be sloped at to prevent infiltration of rainwater, but not support erosion. Please revise Attachment 8 to specify the angle or a range of appropriate angles at which the large stockpiles will be sloped at to prevent infiltration of rainwater while not inducing erosion.	**Response 43.** Stockpile angles will be at the angle of repose for the material. This is to say, as the material is stockpiled higher, it naturally settles to a slope angle related to the moisture content, grain size, and coefficient of friction between the grains. Stockpiles are covered with a tackifier and bermed so that erosion concerns are mitigated. Specifying a slope angle for the stockpiles is not required.

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Comment 44. Attachment 8, Section 3.5, Non-Stormwater Management, Page 3-6: The text states that inspections to identify any non-stormwater discharges will be performed quarterly; however, it is unclear why inspections will not be performed more frequently than quarterly, especially during active construction when the potential for non-stormwater discharge is greatest. Please revise Attachment 8 to specify more frequent inspections or to clarify why inspections to identify any non-stormwater discharges will not be performed on a more frequency basis than quarterly.	**Response 44.** The frequency for the Non-Stormwater Discharge Inspections is specified in Section I. 10. a. ii. of Attachment D (Risk Level 2 Requirements) of the General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities.
Comment 45. Attachment 8, Section 4.5, Water Quality Sampling and Analysis, Page 4-4: Section 4.5 states that a minimum of three effluent samples will be collected per day during each qualifying rain event; however, it is unclear how a minimum of three samples is appropriate to assess water quality. Further, these samples are not included in the Attachment 4 SAP. The objectives for these samples, sampling procedures, required analytes, etc. must be included in the SAP. Please revise Attachment 8 to clarify how a minimum of three samples is appropriate to assess water quality, and the lines of evidence which support this frequency. Also, please ensure that these samples are included in the Attachment 4 SAP.	**Response 45.** The frequency for water quality sampling is specified in Section I. 4. b. of Attachment D (Risk Level 2 Requirements) of the General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities which is provided in Appendix B. The effluent samples are collected for field measurements only and are not submitted to a laboratory for analysis. Attachment 8 Section 4.5 has been revised to clarify that effluent samples will be measured in the field using hand-held instruments. Field measurement information would be included in a SAP if the measurements pertained directly to decision criteria associated with the CERCLA remedial action for the site. However, for this project, the field measurements pertain to storm water discharge requirements associated with a permit. Furthermore, field measurement information is not applicable to SAP Worksheets #15, 20, and 28 as those worksheets only pertain to samples sent to a laboratory for analysis. In addition, Attachment 8 Section 4.5 already states a) the criteria for the field measurements (which would be applicable to information required for SAP Worksheets #10 and 11); and b) the sampling frequency requirements and which parameters to measure (which would be applicable to information required for SAP Worksheets #14, 17, and 18). In

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	order to address information that would be provided in SAP Worksheets #21 (Sampling SOPs) and 22 (Field Calibration), Attachment 8 Section 4.5 has been revised as follows: *Effluent sampling will be performed during each qualifying rain event (i.e., at least 0.5 inch of rain or more within a 48-hour or greater period). Prior to collecting samples for measurement, the hand-held field meter will be calibrated in accordance with manufacturer's instructions, and the calibration information will be recorded on the effluent sampling field form provided in Appendix D. A sample will then be collected at each location where storm water is discharged off-site. A minimum of three samples will be collected per day during each qualifying rain event. An 8-ounce glass jar or equivalent will be used to collect a sample at each location. The jar will be filled with water at least ¾ full. The samples will then be measured for pH and turbidity using the calibrated hand-held field meter by inserting the meter probe into the water container. The readings will be recorded on the same effluent sampling field form that the calibration information was recorded on. The numeric action level (NAL) for pH is lower than 6.5 pH units or greater than 8.5 pH units, and the NAL for turbidity is greater than 250 nephelometric turbidity units. Section I.15 of Attachment D in Appendix B describes actions to take in the event a measurement exceeds these NALs. Completed effluent sampling field forms will be inserted at the end of Appendix D of the IR Site 2 SWPPP Master Copy to be located in the Field Engineer's office.*

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Comment 46. Attachment 9, Section 2.1, Climate, Page 2-1: The sources for the average daily temperature, mean annual precipitation, and windrose diagram are not provided and/or referenced. As a result, it is unclear if the information is representative of conditions at IR Site 2. Please revise Attachment 9 to provide and/or reference the sources for the average daily temperature, mean annual precipitation, and windrose diagram.	**Response 46.** A reference to the IR Site 2 TCRA (FWENC 2002) has been added to Attachment 9, Section 2.1.
Comment 47. Attachment 9, Section 3.3, Dust Control Measures, Page 3-2: The second bullet indicates that active construction areas outside the dewatering and radiological screening pads will be watered at a minimum of twice daily and more often during windy periods; however, what constitutes a windy period is not defined. Similarly, the third bullet indicates that active excavation areas will be wetted every two hours during periods of dry weather or in windy conditions; however, windy conditions are not defined. As a result, the quantifiable conditions that are associated with windy periods and windy conditions are unclear. Please revise Attachment 9 to quantitatively define windy periods and windy conditions.	**Response 47.** Attachment 9, Section 3.3, second bullet and third bullets have been revised to replace “windy period” with “windy conditions that generate visible dust.”
Comment 48. Attachment 9, Section 8.0, Data Evaluation, Page 8-1: The criterion for elimination of data is not specified. The text states that, “Field records and logbook entries of calibration results will also be reviewed and verified, as appropriate, and final calculated data values will be entered into the data file. Any data known to be erroneous will be edited out of the data file.” It is unclear if this elimination of data is appropriate. Please revise Attachment 9 to specify the criterion that will be used to eliminate data.	**Response 48.** The reference to elimination of data has been removed from Attachment 9, Section 8.0.

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Comment 49. Attachment 11, Section 2.2.2, Proposed Monitoring Network and Sampling Frequency, Page 2-3: a) The text indicates that replacement wells M024R-A, M024R-E, M037R-A, M037R-E, and M039R-A will be sampled semiannually for the first year then annually thereafter; however, it is unclear why the results from the semiannual sampling will not be evaluated after the first year to determine the ongoing frequency of sampling. Further, Section 6.1.1 of Attachment 11 states that only replacement wells M024R-E and M024R-E will be sampled semiannually for the first year. Please revise the Draft RD/RA WP to provide flexibility to adjust the sampling frequency based on the results of the initial sampling. In addition, please ensure that the monitoring wells which will be sampled semiannually for the first year are clearly defined and that the sampling plan reflects all newly installed replacements wells.	**Response 49a.** The RAWP has been revised to include the preservation of the existing groundwater monitoring well network. The Navy has continuous quarterly to annual GW data from the wells in this network from 2002. The DTSC, in a written communication dated March 1, 2013, requested that the Navy submit a separate Groundwater Monitoring Evaluation (GME) as a Remedial Design Addendum document. Groundwater monitoring requirements, including sampling frequency, will be detailed in the evaluation. Section 2.0 of Attachment 11 has been revised to reflect this change.
b) Further, it is unclear why semiannual baseline sampling is warranted given that the wells to be sampled are replacement wells to assess the viability of the landfill remedy. EPA’s Unified Guidance states in Section 5.1, that, “High quality background data is the single most important key to a successful statistical groundwater monitoring program.” Please revise Attachment 11 to include the lines of evidence which support the proposed frequency or revise the frequency to reflect the available lines of evidence.	**Response 49b.** Please see Response 49a above.

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Comment 50. Attachment 11, Section 2.2.3, Data Analysis, Page 2-4: Internal wells are not proposed for use in the trend analysis. The first sentence states that, “Wells at the site perimeter and along the bay will be used for the trend analysis, as required by the ROD [Record of Decision].” It is unclear if this trend analysis will be representative of IR Site 2 conditions. Please revise the text to clarify why interior wells are not proposed for trend analysis to provide a more representative evaluation of IR Site 2 conditions and changes in plume composition and make boundary assessments more meaningful since interior wells could be used to predict boundary changes.	**Response 50.** Specifics regarding groundwater trend analyses will be discussed in the Remedial Design Addendum which will be prepared pursuant to the GME.
Comment 51. Attachment 11, Section 6.1, Scheduled Inspection, Page 6-1: The text states that, “IR Site 2 will be inspected quarterly and after major weather or seismic events for damage, and maintenance will be performed as necessary;” but the text does not define a major weather or seismic event making it unclear when inspections will occur. Similarly, Section 6.1.2 (Cover Settlement) of Attachment 11 states that the landfill cover condition and the slopes of the landfill inspections will occur on a quarterly basis and after significant events; however, significant events are not defined. Please revise Attachment 11 to clearly define a major weather, seismic event and significant event so that inspection triggers are clearly understood and the appropriate inspections can be completed.	**Response 51.** Attachment 11, Section 6.1 has been revised to include specific descriptions of significant weather and seismic events. Significant weather events would include any rain event with 0.5 inch of rain occurring in a 24-hour period. A Modified Mercalli Intensity (MMI) of VII as reported in the USGS intensity maps for recent earthquakes in California is an appropriate threshold to trigger an engineering site inspection, corresponding to the reported intensity of the Loma Prieta earthquake in Alameda when lateral spreads but no slope failures were reported for the site. MMIs are available almost immediately after an earthquake at the following website: http://earthquake.usgs.gov/earthquakes/dyfi/. The benefit of this scale for the purposes of triggering an inspection is that the value is readily available and understandable by site personnel.

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Comment 52. Attachment 11, Section 6.1.4, Site Structures, Page 6-1: The section indicates that settlement monuments will be surveyed annually; however, it is unclear why settlement monuments will not be surveyed on a more frequent basis initially after construction to establish an appropriate baseline data set or following seismic events. Without a more structured monitoring frequency, it is unclear how robust the data set will be upon which landfill settlement assessment will be based if the settlement monuments are only surveyed on an annual basis. Please revise Attachment 11 to clarify how annual surveying of the settlement monuments is appropriate to assess settlement and why a seismic event should not trigger a settlement monument monitoring event.	**Response 52.** It is important to keep the purpose of this landfill cover in context, which does not include limiting infiltration of ponded groundwater that can be increased in areas of the cover that have settled. The ROD is clear that this is a multilayer cover, and not a landfill cap. Therefore, the type of landfill settlement assessment and the associated robust data set appropriate for landfills with infiltration requirements are not applicable for IR Site 2, and the prescribed annual surveys are sufficient. After a seismic event, the entire site would be inspected to ensure integrity of the final cover and that the environmental control systems are functioning. Any damage to the cover, including areas of localized settlement, would be repaired by importing soil and grading. After a seismic event, settlement monuments would be inspected for damage and localized differential settlement.
Comment 53. Attachment 11, Appendix B, Plan Itemized Cost Estimate, Table B.1-1, Detailed Annual Operation and Maintenance Costs: The level of detail provided in Table B.1-1 is not sufficient to support the annual costs. For example, all the costs for work not to be performed by Tetra Tech are provided as lump sums. Detailed cost estimates for the proposed activities have not been presented and, as such, the individual costs and associated assumptions for individual components of the proposed activities are unclear and the costs cannot be evaluated. Please revise Table B.1-1 to include detailed "roll-up" costs used to develop the lump sum costs so that an evaluation of the components of the lump sums may be conducted.	**Response 53.** Level of detail to be provided is the same as in the ROD when presenting remedy costs. The estimate in Appendix B is based on similar O&M costs at Navy CERCLA Sites in the Bay Area. A separate contract will awarded for the O&M at Site 2, and the government will develop a more detailed estimate at that time for bid evaluation purposes.

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Comment 54. Attachment 12, Section 4.0, Area Requiring Institutional Controls, Page 4-1: The text states that the institutional controls (ICs) which will be applied to IR Site 2 are shown on Figure 2-1 (Site Location Map) of Attachment 12; however, no ICs are shown on Figure 2-1 of Attachment 12. As such, it is unclear where the limits of the ICs are, and how the corresponding land use limitations and activity restrictions specified in the ROD will be applied. Please revise Figure 2-1 of Attachment 12 to include all ICs.	**Response 54.** The text of Attachment 12, Section 4.0 has been revised to reference Section 5.0 and the boundary of the area of required institutional controls for IR Site 2 is shown on Figure 2-1.
MINOR COMMENT	**RESPONSE**
Comment 1. Section 5.6.8, Settlement Monuments, Page 5-9: Section 5.6.8 includes details related to the settlement monuments that will be installed on the final grade of the multilayer soil cover system; however, details related to the monitoring of the settlement monuments is not provided and/or referenced. Please revise Section 5.6.8 to reference Section 3.5 (Settlement Monuments) of Attachment 11 (Post-Closure Operations, Maintenance, and Monitoring Plan).	**Response 1.** Section 5.6.8 of the main text has been revised to add reference to Section 3.5 of Attachment 11 for settlement monitoring.
Comment 2. Section 8, References, Page 8-2: Please reference the Final TCRA Post-Construction Report, IR Sites 1, 2, and 32, dated August 2009 instead of the Draft TCRA.	**Response 2.** Section 8 of the main text has been revised to correct the reference from Draft to Final.
Comment 3. Attachment 1 (90% Remedial Design): Attachment 1 does not include any text to introduce or summarize the contents of the attachment. Please revise Attachment 1 to include text to introduce or summarize the content of the attachment.	**Response 3.** A flysheet with a brief description of each component of the RD has been added to Attachment 1.

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Comment 4. Attachment 4, Worksheet #2, SAP Identifying Information, Page 13: Item 4 in Worksheet #2 states that scoping sessions are not applicable. However, Worksheet #9 provides details of a scoping session that was held on September 8, 2011. The date and general description of this scoping session should be provided on Worksheet #2. Please revise Worksheet #2 to provide this information.	**Response 4.** Item 4 in Worksheet #2 has been revised to include the scoping session listed in Worksheet #9.
Comment 5. Attachment 4, Worksheet #15.1, Reference Limits and Evaluation Table for Soil Samples, Page 70: Footnote "a" is referenced in the table for metals; however, this notation applies to radiological analyses, not metals analyses. Please revise the worksheet to apply footnote "a" to the appropriate table(s).	**Response 5.** The footnote a) listed in the metals table in Worksheet #15.1 has been removed.
Comment 6. Attachment 4, Worksheet #18, Sampling Locations and Methods/SOP Requirements Table, Page 99: Footnote "a" states that the sequential numbering system used to determine sample identification in the field is explained in Worksheet #29. However, this process is not explained in Worksheet #29. Instead, Worksheet #27 provides a brief explanation of this process. Please revise Worksheet #18 to resolve this discrepancy.	**Response 6.** Footnote a) in Worksheet #18 has been revised to reference Worksheet #27 instead of #29.
Comment 7. Attachment 4, Worksheet #37, Usability Assessment, Page 201: Worksheet #37 states that the data quality assessment report (DQA) will include review of "field QC samples to verify that these were collected in accordance with Worksheet #12." However, Worksheet #12 was not included in the SAP because they are not required for the project. Please remove the reference to field QC samples in Worksheet #12 for consistency.	**Response 7.** Worksheet #37 bullet #1 has been revised to remove the reference to review of field QC samples.

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Comment 8. Attachment 10, Waste Management Plan, Section 1.2.3 (Soil and Waste Stockpiles and Staging Piles), Page 1-6: The last sentence of Section 1.2.3 states that, "A site-specific Stormwater Pollution Prevention Plan (SWPPP) will also be prepared for the project in accordance with [Applicable or Relevant and Appropriate Requirements] ARARs;" however, it is unclear why Attachment 8 (Stormwater Pollution Prevention Plan) is not directly referenced. Please revise Section 1.2.3 of Attachment 10 to directly reference Attachment 8.	**Response 8.** Attachment 10, Section 1.2.3 has been revised to reference Attachment 8.
Comment 9. Please correct the mail code for Xuan-Mai Tran as SFD-8-3 for all Points of Contact pages where mail code is listed.	**Response 9.** The mail code has been corrected where present.

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Comments from John R. West
Remedial Project Manager
Groundwater Protection Division
California Regional Water Quality Control Board, San Francisco Bay Region

Comments Dated: June 13, 2012

COMMENT	RESPONSE
Comment 1. Wetlands. Wetland delineations of the seasonal, intermittent, and tidal wetland areas at the site are currently pending verification by the Army Corps of Engineers. Because the verification of the delineation of jurisdictional wetlands is a critical component in decision making related to wetland destruction and creation design, we cannot approve or support the design and mitigation proposals until the Army Corps has verified the wetland delineation. In Attachment 7, page 5-2 the report states: *"although extensive pickleweed habitat was found at the site and was not identified as wetland, the areas identified as tidal wetlands in the wetland delineation report appear to be those areas that receive frequent tidal inundation. All other pickleweed habitat does not meet hydrology criteria needed for a wetland designation to be applied. The tidal wetland portion of the proposed project area, which comprises part of the area that would be filled, is of relatively low value to the waterfowl and shorebird species that use the general area, but it may offer good foraging habitat for raptors."*	**Response 1.** Navy has prepared wetlands delineation reports for IR Site 2 in accordance with the ROD agreement. CERCLA response actions are exempt from federal and state permits (Section 121[e] of CERCLA). However, substantive provisions of the ACOE's Section 404 regulations have been accepted and identified as federal ARARs in the ROD. Refer to Attachment 7, Appendix A, Section 2.0 of the IR Site 2 RD/RAWP for compliance. The comment does not cite to any law or regulation that requires ACOE verification of wetlands delineations. However, if there were such statute provision in a law or regulation, it would not qualify as an ARAR because administrative /procedural provisions do not qualify as CERCLA ARARs.

John R. West, Remedial Project Manager
Groundwater Protection Division, California Regional Water Quality Control Board, San Francisco Bay Region

We disagree with two components in these statements and have discussed our concerns below: a-1) We find inadequate information supporting the premise that wetland indicators have not been met at portions of the site. What evidence has been collected indicating that other wetland indicators, (e.g., having adequate hydrology, vegetation, etc.) have not been met? a-2) What is the basis for calling the tidal wetland portion of the project to be of relatively low value? Ecologically speaking as a whole, we consider tidal wetlands to be quite valuable and pickleweed as a species is generally considered to be a valued habitat throughout the Bay. b) We are very concerned about the age and integrity of the culvert that is the sole source of Bay water to the tidal wetlands. It is our understanding that the aged culvert is in very poor shape and may collapse any time. The value of this culvert became painfully apparent a year ago when some driftwood or other material clogged it up and impeded all tidal flow of brackish water to the wetland. In a matter of days the tidal wetland started drying up. Should that culvert collapse, the delays in rebuilding, from getting contracts to actual physical work, could be devastating and even fatal to the wetland flora and fauna.	**Response to comment a-1:** Pickleweed is the key issue here and its presence is usually considered evidence of wetland conditions, given that it's an obligate wetland species (occurs in wetlands >99% of the time). However, the delineators did explain why they called some areas with pickleweed "upland," and had a discussion of problematic vegetation in Section 3.5.3 of the delineation report (See Appendix A, Attachment 7). In this section, they indicated that pickleweed can spread rhizomatously from wetland areas into upland areas, where it was found comingling with upland species such as coyote brush, ice plant, and ripgut brome. The pickleweed was present at densities less than 5% in locations that the delineators referred to as upland, and was generally a small component of an otherwise upland plant community. This is particularly likely to occur in areas filled with dredge spoils that may still have a high salt content, which would favor pickleweed and salt grass over the upland species. **Response to comment a-2:** The passage says the tidal wetland portion of the project area (meaning the pickleweed area that was identified as jurisdictional wetland, not the open water/mudflat area) is of relatively low value *to the waterfowl and shorebirds that use the general area.* The pickleweed marsh at the site is not sufficient to support waterfowl and shorebirds breeding requirements, nor is pickleweed their primary choice for foraging habitat. However, we do recognize that pickleweed marsh contributes detritus to the mudflat area and helps to sustain the benthic community that in turn sustains the shorebirds. Attachment 7 will be revised to clarify this distinction. **Response to comment b:** See Response to EPA Comment #2.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
John R. West, Remedial Project Manager Groundwater Protection Division, California Regional Water Quality Control Board, San Francisco Bay Region	
Comment 2. Proposed Groundwater Monitoring Program and Well Network. It is unclear from Attachment 11, Section 2.2.2 of the report if the proposed monitoring well network will be adequate to demonstrate protection of surface waters in the two onsite wetlands and areas adjacent S.F. Bay. Will there be an adequate number of wells effectively placed to monitor landfill leachate concentrations that might adversely affect the adjacent wetland species? Groundwater monitoring information will be especially important after the proposed site activities are completed (e.g., re-grading, capping) to assess hydrological changes and any associated increases in contaminant concentrations that may have occurred due to the site work. Therefore, please provide a comprehensive Groundwater Monitoring Program including a monitoring well network evaluation for the entire site so that we can better assess if the proposed monitoring well network will be sufficient.	**Response 2.** The DTSC, in a written communication dated March 1, 2013, requested that the Navy submit a separate Groundwater Monitoring Evaluation (GME) as a Remedial Design Addendum document. Groundwater monitoring requirements will be detailed in the evaluation.
Comment 3. Exclusionary Fencing and Gas Vent Pipes. There has been considerable public concern regarding the proposed 6' high chain link barbed wire fence to circumscribe the landfill and the thirty, 10-feet high, methane gas vents at the Site. The main public concern is that this location is extremely unique and arguably offers one of the best Bay views in Alameda. The Public has also expressed the desire to avoid the stigma of leaving the landfill as a toxic waste dump. Also, it is unclear why the methane vents need to be so high. Although protection of human health and the environment is our primary goal, we request that alternatives be evaluated for the fence line and methane gas venting so that public concerns and environmental health might more naturally coexist with the other beneficial uses that are planned for the area.	**Response 3.** Please see Response to DTSC General Comment #2 regarding the site fence and Response to EPA General Comment #36 regarding the vents.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
John R. West, Remedial Project Manager Groundwater Protection Division, California Regional Water Quality Control Board, San Francisco Bay Region	
MINOR COMMENT	
Comment 1. Section 1.3 Points of Contacts. Please list as a contacts: a) John West, Water Board PM, (510) 622-2438, jwest@waterboards.ca.gov. b) Peter Russell, City of Alameda, (415) 902-3123, peter@russellresources.com.	**Response 1.** Section 1.3 has been revised to add the contact information for John West and Peter Russell.

Comments from Peter Russell, PhD, PE
Russell Resources, Inc.

Comments Dated: May 31, 2012

COMMENT	RESPONSE
Comment 1. Perimeter Fence: The August 2010 ROD for IR Site 2 specifies Institutional Controls (ICs, Table 2-13), which include Land Use Restrictions and Activity Restrictions. Briefly, the Land Use Restrictions restrict IR Site 2 to open space and recreational uses, and prohibit residential and other specified sensitive land uses. The Activity Restrictions restrict land disturbing activities, extraction of groundwater, disturbing infrastructure, etc. Note that the ROD's ICs explicitly do not prohibit recreational uses. The RD/RA Work Plan contemplates recreational use once remedial action is complete: "The proposed future use at IR Site 2 includes low-impact recreational uses such as a recreational trail around the site." (Section 2.3) "The proposed future use at IR Site 2 is 'undeveloped' with potential for recreational uses such as a perimeter hiking trail. ... Access to the shoreline trail south and west of the landfill will remain open." (Attachment 11, Section 1.3) However, Design Drawing C-9 of Attachment 1 of the RD/RA Work Plan indicates that the new 6' high chain link fence is to join the existing fence and that a chain link gate is to be constructed near the northwest corner of IR Site 2. The other end of the chain link fence (at the southeast corner of IR Site 2) is not shown on any drawings: it is outside the limits all of the RD's drawings.	**Response 1.** Please see response to DTSC General Comment #2.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Peter Russell, PhD, PE Russell Resources, Inc.	
To ensure that access to the shoreline trail south of the landfill will remain open, please add a note to Design Drawing C-12 that specifies a gate in the perimeter fence at the southeast corner of IR Site 2. Further, please add "Access to the shoreline trail south and west of the landfill will remain open" to Section 2.3 of the RD/RA Work Plan. This is the same sentence appearing in Attachment 11, Section 1.3, a less prominent location.	
Comment 2. Design Drawing C-17 of Attachment 1 of the RD/RA Work Plan specifies that the newly installed 4-inch PVC vertical landfill-gas vent pipes are to extend a minimum of 10 feet above the ground surface. The vent pipes are a replacement and expansion of the landfill gas control system installed following the 1983 Water Board Order No. 83-35. However, tall vertical vent pipes may not be needed for landfill gas control at the IR Site 2 landfill. Typically, vent pipes are engineered with two objectives: (1) to prevent the buildup or migration of landfill gas and (2) to protect the health of recreational users. The vertical vent height may be important for the second objective, because it promotes atmospheric mixing of the emitted gases before they might reach the breathing zone of recreational users. The tall vent pipes would be visually conspicuous and may detract from the esthetic experience of future recreational users of the shoreline perimeter trail and other recreational users. Thus, alternatives to the tall vent pipes may be preferable. For example, the vent pipes could be shortened to a few feet above ground surface, where they would be concealed in vegetation and less conspicuous. With this option, a posted and fenced exclusion area could be installed around each vent to prevent users from approaching the vents. Please modify the design of the vent pipes. If modifications to the	**Response 2.** Please see response to EPA General Comment #36.

Peter Russell, PhD, PE
Russell Resources, Inc.

vertical vent pipes' design is not adopted in the RD/RA Work Plan, please explicitly recognize in the RD/RA Work Plan that, in the future, the vents' design may be altered, with Water Board approval.	
Comment 3. The August 2010 ROD for IR Site 2 specifies non-radiological Soil Remediation Goals (RGs) in Tables 2-4 and 2-5. However, the RD/RA Work Plan's Reference Limits and Evaluation Table for Soil Samples (Attachment 4, SAP Worksheet #15.1) contains multiple instances where the Project Action Limit (PAL) exceeds the RG by at least one order of magnitude. For example, the ROD's RG for cadmium is 6.5 mg/kg, but the PAL is 100 mg/kg. For chromium, the values are 48.5 mg/kg and 2500 mg/kg, respectively; for molybdenum, 1.9 mg/kg and 3500 mg/kg; and for zinc, 263 mg/kg and 5000 mg/kg. For benzo(a)pyrene, the ROD's RG is 0.24 mg/kg, but the PAL is "Not established". Finally, for total DDx and total PCBs, the ROD specifies numerical RGs, but SAP Worksheet #15.1 provides no PAL. The PALs specified for the individual chemicals that comprise total DDx and total PCBs exceed the RGs for the respective sums of their concentrations. This appears to allow use of cover soil at IR Site 2 that exceeds RGs selected to be protective of recreational users and ecological receptors. Please clarify this apparent discrepancy.	**Response 3.** For those compounds with RGs, the PALs should be the same as the RG, and SAP Worksheet #15.1 will be revised accordingly.

RAB COMMENTS

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from Carol Gottstein, MD, George Humphreys, James D. Leach, Kurt Peterson, Dale Smith, Michael John Torrey Naval Air Station Alameda Restoration Advisory Board Comments Dated: July 2, 2012	
COMMENT	**RESPONSE**
Comment 1. It seems cynical to claim that a thinner cap supports a sustainability goal, when the document states that in the event of a maximum credible earthquake (MCE), the site is projected to turn into "soup" and that permanent displacement has been calculated to range from 0.2 to 11 inches and transverse cracks up to 4.5 feet deep are expected. The document also states that a full seismic stability analysis has never been completed, either by TetraTech or CH2M Hill, whose contract was cancelled. The Navy representative, Mr. Jacques Lords, announced at a planning meeting that "there is already enough information about seismic hazards and it's time to design something rather than study it further". He also stated that with this cap design, the site doesn't have to withstand a MCE and repairs can be performed when cracks appear and the cap slides towards the bay. These all lead to a lack of confidence that this remedy will endure. This is the first time limits of liability have been included by a consultant, indicating a lack of certainty as to the efficacy of the solution and an attempt to limit liability.	**Response 1.** A thinner soil cover means less mass, and that reduced soil mass is placed at lower slope angles, all of which reduces the potential energy for mass displacement during an earthquake. Three rounds of Seismic Stability analysis were performed over the course of Site 2 assessment, and the Navy has reviewed and reassessed the response to comments regarding seismic stability presented in the RD/RAWP RTCs. Prior recommendations for ground improvements were based on default assumptions in the modeling. The Navy has performed a new analysis of existing data using site-specific model parameters to predict a tighter range of deformation of the soil cover and the berm. See Response to EPA General Comment #10.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Carol Gottstein, MD, George Humphreys, James D. Leach, Kurt Peterson, Dale Smith, Michael John Torrey Naval Air Station Alameda Restoration Advisory Board	
Comment 2. Because hazardous materials, including munitions and explosives of concern and radioactive material, are interred on site and are not very deeply buried, it can be assumed they will move towards the surface during a seismic event, even one less than an MCE, such as the Lorna Prieta earthquake. The Bay Area is constantly subjected to small "shudders", causing buried hazards to migrate to the surface. This will be an ongoing problem and will require constant monitoring and remediation. We would prefer a more permanent solution that did not present the possibility of unnecessary exposure.	**Response 2.** The assumption that waste will migrate to the surface during an event that is marginally less than the MCE was not observed during the Loma Prieta event. The soil cover has been selected as the remedy precisely because it will function as a barrier between waste and receptors, and it is required by the ROD to accommodate a maximum credible earthquake while maintaining cover integrity. The vegetative cover and HDPE biobarrier also provide stability through the establishment of a root system and uniform horizontal geonet in the cover, providing barriers to waste possibly migrating to the surface. The reviewer is correct that the site represents an obligation on the part of the property owner of monitoring. The RAWP Attachment 11, Post-Construction Maintenance and Monitoring Plan, details the Navy's obligations once the cover is installed.
Comment 3. The document states that the vertical pipes along the inside eastern and northern perimeter fencing are for the purpose of venting gas generated in the landfill. Based on the site tour they appear to be offsite migration monitoring devices, rather than part of a gas collection system. This infrastructure was installed to meet a 1982 Bay Area Water Quality Control Board requirement to detect offsite migration of soil gas. Why are new pipes being installed when there is a functioning set of pipes already in existence?	**Response 3.** Please see Response to EPA General Comment #36.
Comment 4. As is the case with almost every project on Alameda NAS, the number of monitoring wells is less than adequate and does not cover the entire site sufficiently to ensure contaminant migration is not occurring, especially since the design anticipates soil movement.	**Response 4.** The DTSC, in a written communication dated March 1, 2013, requested that the Navy submit a separate Groundwater Monitoring Evaluation (GME) as a Remedial Design Addendum document. Groundwater monitoring requirements will be detailed in the evaluation.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Carol Gottstein, MD, George Humphreys, James D. Leach, Kurt Peterson, Dale Smith, Michael John Torrey Naval Air Station Alameda Restoration Advisory Board	
Comment 5. If Site 2 is to be fenced, how will mosquito abatement and other safety personnel gain access to the site in a timely manner? The document describes razor or barbed wire in association with the fence, but this not shown as part of the design drawings.	**Response 5.** Please see Response to DTSC General Comment #2.
Comment 6. The choice of Decker Island sand is a fine choice for habitat remediation. However, we would prefer to see the replacement ratio for lost habitat be greater than one to one. Site 34 and 32 also lost wetlands habitat and that does not appear to have been replaced. Thus, overall the Navy is not leaving as much wetland area as existed before, in spite of its poor quality. There is an endemic *lupinus* in the northeast side of the site that should be protected during construction, either by removal and tending or shielding from damage. There is also *distichlis* present that should be protected and used for propagation purposes. The restoration with native grasses is much appreciated.	**Response 6.** Wetlands mitigation strategy was agreed to in the ROD. The endemic *lupines* will be protected during construction to the extent practicable. Navy is working with the construction Contractor to hydroseed the soil cover with a native grassland plant community that is as closely associated with Alameda and the East Bay habitat as practicable. This specific seed mix was proposed by the RAB, at the request of the Navy.

RESPONSE TO COMMENTS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

Comments from Richard Bangert
Restoration Advisory Board member

Comments Dated: June 11, 2012

COMMENT	RESPONSE
Comment 1. The security fence should not be used as an institutional control. By incorporating design changes for the soil gas vents, the security fence will not be necessary. The risks to soil gas probes, groundwater monitoring wells, and the soil cap itself are close to nonexistent. The only institutional control should be a digging restriction. An example of a park on top a landfill that illustrates the lack of need for a fence is Byxbee Park in Palo Alto, California. The park is open from 8 am until sunset. There is no fence to keep anyone off of the landfill. And on a recent visit, I saw no evidence of any supervision or any damage to equipment located in the ground. Soil gas monitoring equipment is located inside of concrete casements with cast-iron covers with no padlock. They are easily visible and accessible and show no signs of damage. I did not see any visible groundwater monitoring wells, but I did see a different type of equipment that the public had unsupervised access to: high voltage underground transmission lines. The park trails had active use on a Sunday, and there were no signs of damage to the grasslands caused by humans. The only ground disturbances were from ground squirrels. The only fence is around the soil gas flare equipment.	**Response 1.** Please see Response to DTSC General Comment #2.
Comment 2. New 10-foot-tall soil gas vent pipes on top of the soil cap will be a blight on views of the Bay and San Francisco.	**Response 2.** See Response EPA Comment #36.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from Richard Bangert Restoration Advisory Board member	
Comment 3. Landfill methane gas is typically captured and burned off in compliance with Bay Area Air Quality Management District regulations. Explain why methane gas is being vented into the atmosphere. If this were not a CERCLA site, would a permit for flaring off methane gas be required?	**Response 3.** Per the ROD (DON 2010), "The operator shall ensure that landfill gases generated at a disposal site are controlled. Methane must not exceed 1.25 percent by volume in air within on-site structures, concentrations of methane gas migrating from the landfill must not exceed 5 percent by volume in air at the property boundary, and trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds." Annual monitoring has demonstrated compliance with the ROD requirement, as documented in the Basewide Groundwater Monitoring Reports.
Comment 4. Groundwater monitoring wells should remain permanently in place and operable. Regardless of how clean the groundwater ever becomes, or whether monitoring is discontinued, the inevitable earthquake on the Hayward Fault will require investigation to determine if the geotechnical assumptions about the site remain valid. Exercising the work plan's option of destroying the groundwater monitoring wells in five years would be shortsighted. This option should be removed from post-closure options in the plan.	**Response 4.** Geotechnical data does not come from groundwater sampling. Groundwater monitoring wells are an asset so long as the information collected is useful. But they are also a liability as a potential pathway for an accidental spill to get to the aquifer. Potential spills include liquids associated with the vehicles that perform the monitoring. Text will remain but wells are not removed without a review and concurrence from the BCT
Comment 5. The North Pond culvert connecting to San Francisco Bay is the lifeline for this high value tidal wetland. The steel culvert is old and will someday need replacement. If it rusts out and succumbs to the weight of overlying soil and collapses, the cutoff of water interchange would have a devastating effect on the North Pond. The culvert is also subject to clogging by driftwood. The Remedial Action Work Plan should include a pre-approved design and authorization for replacement/upgrade to this culvert so that work by the new owner can be executed in a timely fashion without cumbersome CERCLA post-closure administrative procedures. Optionally, the Navy should consider replacing the culvert during the current remedial work project through a	**Response 5.** Please see Response to EPA General Comment #2.

collaborative funding effort with other agencies. Preservation, as well as expansion, of wetlands around San Francisco Bay is a key part of Bay ecosystem health.	
Comment 6. Soil cap testing – The following statement in the Remedial Action Work Plan does not provide adequate assurance that the soil for the soil cap will be free of mercury or other harmful chemicals: "This import material (Decker Island Aggregates) has been chemically and radiologically tested for use on other Navy projects including Hunters Point Naval Shipyard, and testing results will be provided prior to use." *5.6.4 Barge Delivery and Stockpile of Soils.* Since the soil for Site 2 (at least 400,000 cubic yards) has not yet been excavated, describe the tests that were conducted on the area from which this soil will be excavated. The soil cap will shed water onto the wetlands, including the North Pond that is connected to San Francisco Bay, and must not pose a risk to the marine environment or waterfowl. Are screening requirements higher for soil that drains to a wetland, as opposed to use at Hunters Point Naval Shipyard as cited in *5.6.4 Barge Delivery and Stockpile of Soils*?	**Response 6.** The excavated soil from Decker Island is *in situ* delta sediment and is known to be free of mercury or other harmful chemicals at concentrations above screening levels. The Soil from Site 17 currently stockpiled at IR Site 2 is also profiled and acceptable for use as subgrade material, but not for the 2-foot-thick cover layer.

OTHER COMMENTS

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from Jaime Michaels, Coastal Analyst and Andrew Winetroub, Legal Intern San Francisco Bay Conservation and Development Commission Comments Dated: July 9, 2012	
COMMENT	**RESPONSE**
Comment 1. Commission's Authority Under the Coastal Zone Management Act and ARARs. Section 3.2 of the RAWP correctly states that the IR-2 remediation activity is not subject to the Commission's permitting authority, yet also asserts: "wherever relevant, substantive provisions of permits that would be required for a non-CERCLA action will be adhered to." Additionally, the RAWP cites the permit exemption in CERCLA Section 121(e) as being applicable, while failing to address the consistency review process authorized under the federal Coastal Zone Management Act (CZMA) (RAWP Attachment 6, § 5.3.3) (stating that the Navy will submit project information to the Commission to support "an informal federal consistency determination").[1] [Footnote 1: The CZMA imposes on federal agencies both the substantive requirement to be consistent to the maximum extent practicable with the enforceable policies of the Commission's federally-approved Coastal Management Program as well as the procedural requirement to undergo a consistency review process (CZMA § 307(c)(l)(C)). The Commission previously outlined in a letter to the Environmental Protection Agency dated May 3, 2010, the legal basis for its view that in conducting onsite remediation activities under the CERCLA the DON is subject to both the substantive and the procedural requirements of the CZMA. Furthermore, while the Commission agrees that its permit requirements do not generally apply to the activities of federal agencies (see 15 CFR § 930.39(e)), it is not correct to state,	**Response 1.** Comment acknowledged. In order to clarify the language of the RAWP, the last sentence of the third paragraph of Section 3.2 shall be revised to say "However, substantive provisions of federal and state applicable or relevant and appropriate requirements (ARARs) will be adhered to as required by CERCLA and the NCP. Section 121(e) of CERCLA provides that no Federal, State or local permit shall be required for on-site remedial actions." In addition, the fourth paragraph of Section 3.2 will be deleted. As explained in the June 10, 2010, letter from Mr. Keith Forman of the Navy to Mr. Jaime Michaels of BCDC regarding the Hunter's Point Naval Shipyard, the Navy's CERCLA remedial actions are not subject to permit requirements based on the CERCLA permit exemption at Section 121(e) of CERCLA and are not subject to federal and state administrative/procedural requirements (see National Oil and Hazardous Substances Pollution Contingency Plan [NCP] preamble at 55 Federal Register 8756, March 8, 1990). The Navy has prepared a "CERCLA Substantive BCDC Bay Plan Consistency Evaluation for IR Site 2, Former Landfill, Alameda Point California," which is included in the RAWP in Attachment 6, Table 5-2. This document is the substantive CERCLA equivalent to a CZMA "consistency determination" for IR Site 2 on-site activities and evaluates and demonstrates

Jaime Michaels, Coastal Analyst, and Andrew Winetroub, Legal Intern
San Francisco Bay Conservation and Development Commission

as section 5.3.3 does, that projects "that require federal approval," or "that are supported by federal funds" are for these reasons alone also exempt from the Commission's permit requirements.]	the Navy's compliance with the substantive provisions of the San Francisco Bay Plan.
Further, the ROD states that the Navy intends to carry out the remediation activities in a manner that meets the Commission's applicable or relevant and appropriate regulations (ARARs) (ROD Appendix A, pp. A-18 & A-32). Importantly, for the Commission's jurisdiction, the North Pond is connected to the bay by-a culvert installed in the seawall, which connects the Bay to waters within IR-2 (RA WP § 2.1). Specifically, the *Comments* section regarding the CZMA in the ROD states, "To the extent that during the remedial design phase it is determined that some minor filling of the North Pond is *required* to place the multilayer soil cover, the Navy will ensure [ARARs] are followed to protect the beneficial uses of San Francisco Bay in compliance with the CZMA" (ROD Appendix A, p. A-18). Lastly, Attachment 12 of the RA WP indicates that future transfer of property would involve the preparation of a Memorandum of Understanding or other agreement between the Navy and transferee to ensure that it would comply with all federal and state environmental, public health, and cultural and natural resource protection laws (RAWP Attachment 12, § 3.1).	Comment noted.
While the RA WP' s inclusion of "Chemical-Specific" ARARs (RAWP Attachment 6, Table 5-1) and exclusion of "Location-Specific" ARARs *(see* ROD Appendix A, p. A-18 & A-32) is not adequately explained, we interpret the applicable or relevant regulations to include the federal Coastal Zone Management Act (16 U.S.C. § 1451 *et seq.),* the McAteer-Petris Act (Cal. Gov. Code§ 66600 *et* seq.),the *San Francisco Bay Plan* (Bay Plan), and the Commission's federally-approved Coastal Management Program for San Francisco Bay.	The IR Site 2 ROD identifies specified substantive provisions of the CZMA and McAteer–Petris Act as relevant and appropriate ARARs. See Attachment 6, Table 5-2 for an evaluation of the DON's compliance with the substantive provisions of the Bay Plan. Table 5-1 of Attachment 6 will be revised to include all ARARs identified in the ROD.

RESPONSE TO COMMENTS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

Jaime Michaels, Coastal Analyst, and Andrew Winetroub, Legal Intern
San Francisco Bay Conservation and Development Commission

Therefore, we recommend that future revisions to the RAWP, including Attachment 6, Table 5-1, refer to the above-referenced Commission requirements and any specific policies identified in sections below. While the Commission's laws and regulations are recognized in the ROD, their identification is incomplete due to the lack of details regarding relevant policies. The Commission's ARARs, as they appear in the ROD, should be supplemented with references to how specific provisions relate to the proposed project and, further, should appear in the next document drafted for remedial design/remedial action at IR-2. The revised RAWP should also note that the Commission's substantive requirements likely relate to other remediation activities described in the RAWP, including (1) the implementation of a mitigation plan at the northern pond's southern boundary; (2) the temporary establishment of any off-loading facilities for barges either in the water or at the shoreline; (3) the removal of weir structures, venting systems, and fencing, and the abandonment of monitoring facilities; and (4) the installation of monitoring and security facilities, including a six-foot-high permanent fence at the eastern and northern site boundaries, monitoring wells, and venting systems (RAWP §§ 5.1-5.12).	Please see responses to the specific comments that follow and Table 5-2 of Attachment 6. The evaluation addresses how the remedial design and remedial action will comply with the substantive provisions of the coastal zone ARARs identified by the Navy in the CERCLA IR Site 2 Record of Decision (ROD) and BCDC in these comments. The DON has reviewed the Bay Plan policies to determine how they relate to (1) implementation of a mitigation plan at the northern pond's southern boundary; (2) temporary establishment of any off-loading facilities for barges either in the water or at the shoreline; (3) removal of weir structures, venting systems, and fencing, and abandonment of monitoring facilities; and (4) installation of monitoring and security facilities, including a 6-foot-high permanent fence at the eastern and northern site boundaries, monitoring wells, and venting systems. The relevant Bay Plan policies relate only to implementation of the mitigation plan. The DON does not plan to establish off-loading facilities for barges in the water or at the shoreline. Removal of weir structures, venting systems, and fencing and abandonment of monitoring facilities are not expected to affect the bay and, therefore, these policies do not apply. The remedial design has been revised and currently there is no plan for the 6 foot fence referred to in the comment; therefore, the Bay Plan policies similarly do not apply.
Comment 2. San Francisco Bay Plan and McAteer Petris Act – Tidal Wetlands, Bay Fill, and Mitigation. According to the RAWP, the proposed placement of cover material at the IR-2 site would result in a loss of 0.89 acres of tidal wetlands at the North Pond (RAWP Attachment 7, § 3.0). Attachments 6 (Draft Environmental Protection Plan) and 7 (Wetland Mitigation Plan) of the RAWP provide information about existing habitat, potential impacts of remediation, and a mitigation plan, which states that on-site tidal	**Response 2.**

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Jaime Michaels, Coastal Analyst, and Andrew Winetroub, Legal Intern San Francisco Bay Conservation and Development Commission	
wetlands provide resting and foraging areas for migrating waterfowl and habitat for other resident bird species. The plans further state that special-listed species, including California least tern, California clapper rail, and western snowy plover, could potentially locate at the site, but that the remediation project is *not* anticipated to adversely affect such species (RAWP Attachment 7, §§ 6.1-6.1.3). Proposed mitigation measures include staff training and education programs, wildlife surveys and appropriate construction schedules, the creation of a pickleweed marsh—using a replacement ratio of 1:1— at the North Pond's southern boundary, and the implementation of a monitoring and corrective action plan for the mitigation site (RAWP Attachment 7). In general, the mitigation and monitoring plan outline an approach that is typical of successful restoration programs. However, we have a number of questions about the details of the program. To fully evaluate the program, it is essential to know the following:	
1) the range of elevations that support pickleweed in the immediate vicinity (i.e. within the north pond). Page 11-1 states that above -0.2 feet NGVD 29, the restored areas will support primarily pickleweed. However, this elevation is much lower than normally supports picklweed elsewhere in San Francisco Bay. Please explain this discrepancy;	**Response to comment 1):** Elevations were reported in NGVD29, rather than NAVD88. Converting the elevations to NAVD88 indicates that pickleweed first appears at elevation 2.34 feet, which is just below the MHHW. The main pickleweed community appears starting at MHHW. The RAWP will be revised to show elevations in NAVD88.
2) the range of tides experienced at the site and the elevation of Mean Sea Level (MSL), Mean High Water (MHW), Mean Higher High Water (MHHW), and the highest expected tide within the north pond;	**Response to comment 2):** Navy can estimate MSL, MHW and MHHW based on the closest USCG tidal gauge. The Navy will also use published data including the 2004 tidal study at Site 2 to estimate the highest expected tide, although none of the goals or design elements are tied to that elevation, so it is not clear why that data are needed.
3) the target habitat types and their respective square foot coverage within the restored wetlands;	**Response to comment 3):** The Navy will insert this data into the revised report.

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4) the composition of the uncovered substrate after excavation (e.g. is it bay mud?);	**Response to comment 4):** A test pit that was excavated in the marsh as part of a previous investigation is still usable and reveals a homogeneous composition of mud from the surface to at least 4 feet in depth (well below the level of excavation proposed for this project). No additional soil sampling is proposed.
5) rates of sedimentation within the pond, if any;	**Response to comment 5):** It is not anticipated that sedimentation would occur as a result of tidal processes, but erosion of the upland areas may contribute sediment to the ponded areas. Preparation of a sediment budget is beyond the scope of this study and is not required to implement a CERCLA remedy**.**
6) a grading plan showing the range of elevations proposed at the restored area, slopes and any channels. If the uncovered substrate is not bay mud, and little sedimentation is expected, overexcavating the restored area and backfilling with a thin (six inch) layer of Bay mud has been proven the improve plant colonization of the restored site.	**Response to comment 6):** The final grading plans are included as Sheets C9-C13 of the Design Drawings included in Attachment 1.
The approach outlined in the event that success criteria are not met is also typical of successful restoration programs. While we appreciate that no invasive cordgrass or pepperweed are currently found at the mitigation site, the Commission generally requires that all nonnative, invasive species be controlled to five percent or less of the vegetative cover to assure that the target species have the best chance of establishment. Also, restoration in areas that experience muted tidal action (which may be the case for the north pond) have sometimes irrigated restored areas until the plants become established. It is not clear if monitoring would continue until the success criteria are met, for the specified give year period only, or extended for an additional five years if the restoration goals for Year 2 are not met.	**Response to comments regarding success criteria:** The Navy concurs that invasive species should comprise no more than 5 percent of vegetation; Section 11.1 already incorporates a threshold lower than this percentage for the main species. Plan documents will be revised to reflect this comment. Tidal action may be somewhat muted compared with areas with no levee, but full tidal exchange appears to occur on a diurnal basis in the north pond. The newly excavated marsh area will be inundated under most tidal conditions; therefore, no irrigation is needed. The Navy is obligated to monitor annually and report observations and recommendations at a minimum of every 5 years as long as necessary to provide adequate protection of human health and the environment.

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Comment	Response
As stated above, the ROD recognized that placing cover material at the North Pond may be necessary, in which case "the Navy will ensure applicable substantive requirements are followed to protect the beneficial uses of San Francisco Bay in compliance with the CZMA" (ROD Appendix A, p. A-18). The Commission's applicable or relevant requirements include the Bay Plan policies on: (1) Fish, Other Aquatic Organisms and Wildlife, particularly Policy No.1, which states, in part: "... the Bay's tidal marshes, tidal flats, and subtidal habitat should be conserved, restored, and increased;" (2) Tidal Marshes and Tidal Flats, particularly Policy No.1, which states: "Tidal marshes and tidal flats should be conserved to the fullest possible extent. Filling, diking, and dredging projects that would substantially harm tidal marshes or tidal flats should be allowed only for purposes that provide substantial public benefits and only if there is no feasible alternative;" and (3) Mitigation, particularly Policy No.1, which states, in part: "Projects should be designed to avoid adverse environmental impacts to Bay natural resources such as ... tidal marshes or tidal flats. Whenever adverse impacts cannot be avoided, they should be minimized to the greatest extent practicable .... Mitigation is not a substitute for meeting the other requirements of the McAteer-Petris Act," as well as Mitigation Policies 2 through 8. Additionally, Section 66605 of the McAteer-Petris Act sets forth criteria for Commission authorization of fill in the Bay (including wetland areas). Specifically, to satisfy statutory requirements, the water area to be filled must be the "minimum necessary" (McAteer-Petris Act § 66605(c)). As such, the Navy should explain why the 0.89 acres of fill are necessary to achieve the purpose of the fill. Other standards that must be satisfied include, but are not limited to, the fill being for a water-oriented use,	**Response to specific comments regarding Bay Plan policies.** The discussion below summarizes how the Navy has complied with each of the Bay Plan policies specified in this comment. Refer to Table 5-2 of Attachment 6 for a complete evaluation of how the existing RAWP documents demonstrate compliance with the substantive requirements of the CZMA and San Francisco Bay Plan ARARs as identified in the ROD. **(1) Fish, Other Aquatic Organisms and Wildlife Policy** Policy No. 1 states: To assure the benefits of fish, other aquatic organisms, and wildlife for future generations, to the greatest extent feasible, the Bay's tidal marshes, tidal flats, and subtidal habitat should be conserved, restored, and increased. Implementation of the remedy will comply with the substantive provisions of this policy. The remedy is designed to minimize damage to the tidal marshes, tidal flats, and subtidal habitat and to protect fish, other aquatic organisms, and wildlife. The wetland areas at Site 2 do not support a high diversity or density of invertebrates or mammals, and although the wetland ponds may be used by a variety of avian species, they do not support aquatic vegetation or significant invertebrate and fish populations. However, the DON will implement reasonable measures to ensure adequate protection of ecological receptors during excavation and cover placement, and the remedy will ultimately result in improved habitat. The DON will also comply with the additional Fish, Other Aquatic Organisms and Wildlife policies. Policy No. 2 states that specific habitats that are needed to conserve, increase, or prevent the extinction of any native species, species threatened or endangered, species that the California

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the fill benefits exceeding the public detriment from the loss of water, and the fill being such that is minimizes harmful effects to the Bay (McAteer-Petris Act § 66605(a), (d)). In making this request, we also recognize that "public health, safety or welfare" is a statutorily established justification for fill placement (McActeer-Petris Act § 66632(f)(1)). In light of impacts to 0.89 acres of tidal wetlands, the Commission staff recommends that the Navy consider how the above-cited Commission ARARs would be followed in capping the former landfill as described in the RAWP. We also recommend that, if feasible, consideration be given to an alternative cover approach that minimizes impacts to existing tidal wetlands.	Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected. The DON has identified the California Endangered Species Act as an ARARs and will comply with the substantive provisions of the requirements identified. The habitats of listed species will be protected during remediation and after it is completed through the mitigation measures identified in Attachment 7. The DON will coordinate with the USFWS and California Department of Fish and Game during remedial design and construction to ensure compliance with the substantive provisions of these ARARs. As described in Attachment 6, the DON will implement measures to avoid, minimize, and mitigate for potential impacts from remedial activities. **(2) Tidal Marshes and Tidal Flats Policy** Policy No. 1 states: > Tidal marshes and tidal flats should be conserved to the fullest possible extent. Filling, diking, and dredging projects that would substantially harm tidal marshes or tidal flats should be allowed only for purposes that provide substantial public benefits and only if there is no feasible alternative. As described immediately above, tidal marshes and tidal flats will be conserved to the fullest extent possible and the remedy complies with the Tidal Marshes and Tidal Flats policies. Tidal marshes and tidal flats will be conserved to the fullest possible extent and the filling of 0.89 acres of tidal wetland will provide substantial public benefits as explained below. The evaluation presented in Section 5.6.6.1, and Attachment 1, and Section 3, Attachment 7, of the Remedial Design/Remedial Action Work Plan (RD/RAWP) establishes that there is

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	no feasible alternative to installing a soil cover that will anchor into the margin of the intertidal zones and wetlands at IR Site 2. Bulldozing the landfill back from the wetland margin in an effort to consolidate the footprint eliminates destruction of the wetland margin, in theory, but the re-grading and placement of contaminated material creates unnecessary risk for releases. The larger mass being moved during consolidation has a similar potential to disturb the surrounding wetlands, there is unnecessary potential for worker exposures, and the consolidation approach had significant cost and schedule increases. The approved remedy incorporates appropriate actions to minimize adverse impacts to San Francisco Bay such as erosion controls (Attachment 8), and on-site mitigation of lost wetlands with equal or better value. The total affected wetland area is 0.89 acre of tidal wetland. The success criteria are outlined in Section 11 of Attachment 7. The remedy also complies with the other Tidal Marshes and Tidal Flats policies, which include: • Thoroughly evaluating any proposed filling, diking, or dredging project to determine the effect of the project on tidal marshes and tidal flats, and designing projects to minimize, and if feasible, avoid any harmful effects • Designing projects to avoid or minimize adverse impacts on any transition zone present between tidal and upland habitats • Including clear long- and short-term biological and physical goals, success criteria and monitoring of ecosystem restoration projects

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	Through the CERCLA process, and particularly through the feasibility study, the DON thoroughly evaluated the remedy and considered the impact on tidal areas. The DON, with the approval of the regulatory agencies, selected this remedy, which has been designed to minimize any harmful effects. In addition, the DON will monitor the success of the mitigation as outlined in Attachment 7, Section 11. **(1) Mitigation Policy** Policy No.1 states: Projects should be designed to avoid adverse environmental impacts to bay natural resources such as to water surface area, volume, or circulation, and to plants, fish other aquatic organisms and wildlife habitat, subtidal areas, or tidal marshes or tidal flats. Whenever adverse impacts cannot be avoided, they should be minimized to the greatest extent practicable. Finally, measures to compensate for unavoidable adverse impacts to the natural resources of the bay should be required. Mitigation is not a substitute for meeting the other requirements of the McAteer-Petris Act. The evaluation presented in ROD verifies that there is no feasible alternative to addressing site contaminants within the intertidal zones and wetlands at IR Site 2 in a manner that completely avoids disturbance. The Navy proposed on-site mitigation for the tidal marshes in the IR Site 2 ROD. Damage to other natural resources of the bay, including on-site tidal flats, would be avoided because excavation would not extend into shoreline areas located below mean sea level. The Navy will perform mitigation in accordance with the substantive provisions of Part IV of the San Francisco Bay Plan.

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	Included in the RAWP as Attachment 7 is a detailed wetlands mitigation program intended to address any adverse impacts. Approximately 2.27 acres of seasonal wetland and 0.89 acre of tidal wetland will be filled during construction and will be replaced with an equivalent area of similar or higher quality wetlands outside of the landfill cover but within the Site 2 boundary. The wetlands have been avoided to the extent possible, but given the capacity and design requirements of the landfill, the remaining wetland impacts are considered unavoidable. In addition, Attachment 6, Section 6.3 sets forth additional project mitigation measures, which include: • Training all personnel who will work at the site during construction • Ecological surveys that will be conducted by a qualified biologists • Documentation and reporting including a preconstruction survey report Policy No. 2: Individual compensatory mitigation projects should be sited and designed within a bay-wide ecological context, as close to the impact site as practicable to: (1) compensate for the adverse impacts; (2) ensure a high likelihood of long-term ecological success; and (3) support the improved health of the bay ecological system. Determination of the suitability of proposed mitigation locations should be guided in part by the information provided in the Baylands Ecosystem Habitat Goals report.

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	The compensatory mitigation is sited within Site 2 in an area as close as practicable to the impact area. The mitigation will compensate for adverse impacts, and monitoring will be implemented to ensure a high likelihood of long-term ecological success (See Attachment 7, Section 11). Policy No. 3: When determining the appropriate location and design of compensatory mitigation, the Commission should also consider potential effects on benefits provided to humans from bay natural resources, including economic (e.g., flood protection, erosion control) and social e.g. aesthetic benefits, recreational opportunities. The remedy has been designed to address erosion control (see Attachment 8) and to accommodate potential recreational uses of the site as a trail. Policy No. 4: The amount and type of compensatory mitigation should be determined for each mitigation project based on a clearly identified rationale that includes an analysis of the probability of success of the mitigation project; the expected time delay between the impact and the functioning of the mitigation site; and the type and quality of the ecological functions of the proposed mitigation site as compared to the impacted site. Section 11 of Attachment 7 addresses this policy.

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	Policy No. 5: To increase the potential for the ecological success and long-term sustainability of compensatory mitigation projects, resource restoration should be selected over creation where practicable, and transition zones and buffers should be included in mitigation projects where feasible and appropriate. In addition, mitigation site selection should consider site-specific factors that will increase the likelihood of long-term ecological success, such as existing hydrological conditions, soil type, adjacent land uses, and connections to other habitats. Section 11 of Attachment 7 addresses this policy. Policy No. 6: Mitigation should, to the extent practicable, be provided prior to, or concurrently with those parts of the project causing adverse impacts. Mitigation will be conducted as part of the remediation process and is expected to be conducted concurrently. Policy No. 7: When compensatory mitigation is necessary, a mitigation program should be reviewed and approved by or on behalf of the Commission as part of the project. Where appropriate, the mitigation program should describe the proposed design, construction and management of mitigation areas and include: (a) Clear mitigation project goals (b) Clear and measurable performance standards for evaluating the success of the mitigation project, based on measures of both composition and function, and including the use of reference sites

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(c) A monitoring plan designed to identify potential problems early and determine appropriate remedial actions. Monitoring and reporting should be of adequate frequency and duration to measure specific performance standards and to assure long-term success of the stated goals of the mitigation project

(d) A contingency plan to ensure the success of the mitigation project, or provide measure to ensure alternative appropriate measures are implemented if the identified mitigation cannot be modified to achieve success. The Commission may require financial assurances, such as performance bonds or letters of credit, to cover the cost of mitigation actions based on the nature, extent and duration of the impact and/or the risk of the mitigation plan not achieving the mitigation goals

(e) Provisions for the long-term maintenance, management and protection of the mitigation site, such as a conservation easement, cash endowment, and transfer of title.

Attachment 7 complies with the substantive provisions of this policy. Because the DON is not required to comply with the procedural requirements under CERCLA, the DON is not required to obtain formal approval of the mitigation plan.

Policy No. 8:

> Mitigation programs should be coordinated with all affected local, state and federal agencies having jurisdiction or mitigation expertise to ensure, to the maximum practicable extent, a single mitigation program that satisfies the policies of all the affected agencies.

The mitigation program has been coordinated with all appropriate local, state, and federal agencies through the CERLCA process.

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<tr><th colspan="2">RESPONSE TO COMMENTS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA</th></tr>
<tr><td colspan="2">Jaime Michaels, Coastal Analyst, and Andrew Winetroub, Legal Intern
San Francisco Bay Conservation and Development Commission</td></tr>
<tr><td></td><td> California Government Code Section 66605 (McAteer-Petris Act):
The Legislature further finds and declares:
(a) That further filling of San Francisco Bay and certain waterways specified in subdivision (e) of Section 66610 should be authorized only when public benefits from fill clearly exceed public detriment from the loss of the water areas and should be limited to water-oriented uses (such as ports, water-related industry, airports, bridges, wildlife refuges, water-oriented recreation, and public assembly, water intake and discharge lines for desalinization plants and power generating plants requiring large amounts of water for cooling purposes) or minor fill for improving shoreline appearance or public access to the bay;
(c) That the water area authorized to be filled should be the minimum necessary to achieve the purpose of the fill;
(d) That the nature, location, and extent of any fill should be such that it will minimize harmful effects to the bay area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes or fish or wildlife resources, or other conditions impacting the environment, as defined in Section 21060.5 of the Public Resources Code;
Attachment 7 explains in detail the wetlands mitigation program. It explains that the wetlands that will be filled during the project total 0.89 acre and will be replaced with an equivalent area of similar or higher-quality wetlands. The justification for filling the wetlands has been documented throughout the CERCLA process and has been approved by the regulatory agencies.
The filling of the 0.89 acre satisfies the substantive requirements of Section 66605(a) and (d) and is necessary to implement the remedy. Ultimately, the fill will result in increased protection of human health and the environment because the site will be remediated and the wetlands will be of higher quality. </td></tr>
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	The fill is necessary to implement the remedy. Remediating the contamination at the site is a public benefit that exceeds the public detriment from the loss of water. The DON has considered the McAteer-Petris Act as an ARAR throughout the CERCLA process, and the remedy was designed to comply with the substantive requirements. The selected remedy was developed and selected with the approval of the regulatory agencies and, at this time, the DON does not plan to develop an alternative cover approach. **California Government Code Section 66632(f)(1):** (f) The commission shall take action upon an application for a permit, either denying or granting the permit, within 90 days after it files the application. The permit shall be automatically granted if the commission shall fail to take specific action either denying or granting the permit within the time period specified in this section. A permit shall be granted for a project if the commission finds and declares that the project is either (1) necessary to the health, safety or welfare of the public in the entire bay area, or (2) of such a nature that it will be consistent with the provisions of this title and with the provisions of the San Francisco Bay Plan then in effect. Because permits are not required for CERCLA actions, the DON is not required to comply with the permit requirement of this section. The DON recognizes that the public health, safety, or welfare is one of the statutory justifications for fill placement. The DON believes that it has established through the CERCLA process the justification for the remedy.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
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Comment 3. San Francisco Bay Plan and McAteer Petris Act – Aquatic Resources, Dredging, and Water Quality. According to the RAWP, landfill cover material would be transported to IR-2 site via barges (RAWP § 5.6.4). The RAWP illustrates the general locations for temporary barge and material off-loading, but does not provide details about the establishment of any related facilities (RAWP Figure 5-1). If dredging, pile-driving, or in-water excavation of material are needed to facilitate such operations, we recommend that the Navy consider how the Commission's requirements would be followed with particular focus on the following Bay Plan policies: (1) Fish, Other Aquatic Organisms and Wildlife Policy No. 1 (cited above) and No. 4, which states, in part, that the Commissions should consider project-related recommendations of the state and federal agencies for protecting resources; (2) Water Quality Policies Nos. 1 and 2, which, respectively, provide, in part: "Bay water pollution should be prevented to the greatest extent possible" and "The policies, recommendations, decisions, advice and authority of the State Water Resources Control Board and the Regional Board should be the basis for carrying out the Commission's water quality responsibilities;" and (3) Dredging Policy No. 1, which states, in part: "Dredging and dredged material disposal should be conducted in an environmentally and economically sound manner," and, if applicable, Dredging Policy Nos. 2 through 4.	**Response 3.** Barges and soil transportation and off-loading operations associated with IR Site 2 will not involve dredging, pile driving, or excavating. The barges will drop two anchors (e.g., concrete blocks on ropes) to temporarily stabilize the craft during off-loading, a safety necessity. Therefore, the Fish, Other Aquatic Organisms and Wildlife Policy No. 1 and No. 4, Water Quality Policies Nos. 1 and 2; and Dredging Polices 1- 4 are not relevant and appropriate.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
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Comment 4. San Francisco Bay Plan and McAteer Petris Act – Public Access and Views. The RAWP states that the proposed remediation plan would involve the removal and/ or abandonment of existing facilities, including a weir, fencing, venting and monitoring structures, and the installation of new monitoring wells, probes and venting facilities, and a six-foot-high fence at the former landfill (RAWP §§ 5.5-5.8.4). The document also states that, in planning for site remediation, a future shoreline public path for low-impact recreation activities is envisioned *(see* RAWP §§ 2.3, 5.8.1). When planning for this recreational path, please be aware that Section 66602 of the McAteer-Petris Act establishes "maximum feasible public access" as the applicable standard for projects along the shoreline. Ensuring public access to the Bay is a cornerstone of the Commission's law, so we look forward to the development of further plans that satisfy this standard. Additionally, the Bay Plan Appearance, Design, and Scenic Views Policy No. 2 states, in part: "All bayfront development should be designed to enhance the pleasure of the user or viewer of the Bay." Also relevant is the Bay Plan Public Access Policy No. 4, which requires, in part: "Public access should be sited, designed and managed to prevent significant adverse effects on wildlife." Lastly, the Bay Plan Public Access Policy No. 5 states, in part: "Public access should be sited, designed, managed and maintained to avoid significant adverse impacts from sea level rise and shoreline flooding." We understand that the future shoreline trail at the IR-2 site is in the early stages of development and that the RAWP is not intended to provide detailed information about trail design. However, The Commission staff recommends that, if feasible, the Navy consider locating the remediation facilities proposed for abandonment or installation outside of the area	**Response 4.** Please see response to DTSC General Comment #2 in reference to the fencing design, the response to EPA General Comment #36 in reference to the vent design, and the response to DTSC General Comment #1 in reference to sea level rise. Please also see response to BCDC Comment #1 referencing the weir and monitoring structures and wells. Also see Table 5-2 of Attachment 6. The Navy, in this remedial design, has removed fencing, other than symbolic, and has been responsive to community concerns regarding access. The Navy has complied with the cited substantive provisions of the Bay Plan in addressing the fence issue.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
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envisioned for the shoreline path. In addition, if feasible, we recommend that any planned adjacent remediation facilities, including fencing or monitoring structures, be located so as to minimize their impact—visually and physically—on the experience of those using the trail. Additionally, we recommend that, as illustrated in Figures C-9 to C-13 of the RAWP, proposed fencing at the former landfill area be installed with openings at the northwest and southeast corners of the IR-2 site for appropriate connections with future neighboring open space areas and with areas managed to sustain habitat or sensitive wildlife, including the special-listed California least tern. Lastly, we recommend that the area and dimensions envisioned for a shoreline trail be adequate to adapt to anticipated sea level rise. Therefore, we recommend that future revisions to the RAWP (or related documents) provide greater specificity about the future shoreline trail boundaries, remediation structures (including height, dimensions, and construction materials) proposed for placement within or adjacent to those boundaries, and strategies for minimizing physical or visual impacts of permanent remediation facilities on those using the future shoreline trail.	

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from Leora Feeney, Co-chair of Friends of the Alameda Wildlife Refuge and Mike Lynes, Conservation Director, Golden Gate Audubon Society Comments Dated: July 9, 2012	
COMMENT	**RESPONSE**
Draft Remedial Action Work Plan – May 2012	
Comment 1. 5.8.3 Installation of Landfill Gas Passive Vent System /referenced Sheets C-16 and C-17. It is strongly hoped that there are other ways to vent methane at Site 2 rather than using 30 PVC pipes "a minimum of ten feet above the ground surface" along the north and east sides of the property. The pipes will serve as roosts for raptors which already use similar structures at the site. Are there other solutions that would not provide high perches? In addition, the pipes provide a significant blemish on a natural setting, impairing unique and beautiful views with a reminder of its Superfund status.	**Response 1.** Please see Response to EPA General Comment #36. Anti-perching devices have been added to the vent specification, as required.
Comment 2. 5.8.4 Installation of Permanent Fencing and Institutional Controls/referenced Sheet D-6 It is not clear how the refuge properties where Least Terns nest and adjacent lands and ponds, including Site 2, will be finally defined. Fencing will be needed to provide a barrier to public access along the northern border of Least Tern habitat running east and west, in addition to the fence currently on the east side running north and south. These barriers should provide the "institutional controls" needed for Site 2. A fence within a fence shouldn't be necessary. Once again, Site 2 design is hoped to reduce raptor perches and minimize visual interruption to Alameda's most spectacular views.	**Response 2.** Please see Response to DTSC General Comment #2.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Leora Feeney, Co-chair of Friends of the Alameda Wildlife Refuge and Mike Lynes, Conservation Director, Golden Gate Audubon Society	
Attachment 6, Environmental Protection Plan	
Comment 3. 6.1.1 Upland. Plants mentioned in this habitat description are minimal. A table of plants would have enhanced the ability to identify habitat values for the site. The multi-species acacia stand (northwest corner) and willows (east of tidal pond) adds another dimension to the uplands habitats of Site 2 that are not described here. Delineations are not described.	**Response 3.** The RAB has worked with the Navy to re-define the hydroseed mix to be applied to the soil cover. Rather than a generic California native plant list, the RAB has participated in selecting native grassland species endemic to the East Bay and Alameda for the cover. In addition, a *lupinus* species currently living outside the fence on the east side of the site (2 specimens) will be identified, flagged, and protected to encourage its propagation, to the extent practicable. The area of the Site that will be covered with the soil cover will be cleared (vegetation will be removed by cutting them at the ground surface, and mulching the detritus) so all plants currently on site that will be under the soil cover will be removed.
Comment 4. 6.1.2 Wetlands and Ponds. A description of wetlands, as in the prior section regarding uplands, does not occur which left this reader confused. It is important to identify at least the types of wetlands found in each of the ponded areas, salinities, and associated vegetation. Delineations are important, but should not be the entire focus.	**Response 4.** The wetlands delineation report was in Attachment 7 in CD form. It describes the wetlands. Navy complied with the substantive requirements of the ACE wetlands identification procedures.
Comment 5. 6.1.3 Vegetation. Limited discussion mentions no wetland species. An organized pattern of reporting would be helpful in a document of this dimension and importance.	**Response 5.** See the Wetlands Delineation Report, Attachment 7 of the RAWP, CD.

Leora Feeney, Co-chair of Friends of the Alameda Wildlife Refuge
and Mike Lynes, Conservation Director, Golden Gate Audubon Society

Comment 6. 6.2 Fish and Wildlife/Threatened, Endangered, and Sensitive Species.	**Response 6.**
The statement that "[n]o avian foraging at ponds was observed during the DON's RI sampling activities of 2004/2005 (Battelle and BBL 2006)," is very misleading. The document does not provide date(s) or methods for observation, length of time or specific purpose of visit. Foraging is almost always observed on waters or along waters of both ponds, which serve as a valued wildlife resource. Site 2 currently hosts a complex food chain, which includes foraging and nesting of significant number of species along the wetland and in upland areas.	The reference to the RI report, Battelle and BBL, 2006, directs the reader to the backup details requested by the commenter. Foraging almost certainly takes place at the Site, but it was not observed at the time of the study.
A short list in the text of four very common avian species is not helpful and misleading. Site 2 is important habitat for numerous species and breeding habitat for Red-winged Blackbirds, Black-necked Stilts, ducks, Savannah Sparrows, American Goldfinch (using trees), and more. Both Sora and Virginia Rail have been detected from the high berm along wetlands without using tapes. We suspect many birds are undetected even by twice monthly surveys since April 2004 made from inside a vehicle on the berm. DON receives annual data. FAWR surveys offer a much more comprehensive view of Site 2 avian activity and the data are available upon request.	The full list of birds observed on site is given in Table 6-2 of the EPP, Attachment 6. Text has been revised to include a reference to Table 6-2.
The document states that "[t]he habitat also is suitable for the red fox, but this species has not been specifically observed at this site," a year or two ago, a refuge biologist did observe a red fox run under the fence from the eastern perimeter road into Site 2.	During the referenced studies, no foxes were observed. Navy is aware of the anecdotal observations (including Least Tern Colony predation) and will be sensitive to the potential presence of Red Fox.
Without extensive trapping it should not be assumed that Salt Marsh Harvest Mouse (SMHM) is absent from Site 2. Small mammals can survive being water-borne for some time; rafting (riding floating debris) is possible; and it is likely that marshes in West Alameda historically	Surveys for the Harvest Mouse including trapping have been conducted at IR Site 2 in 1995 (PRC Environmental Management, Inc.) and 2009 (H. T. Harvey and Associates). In both cases none were identified. See EPA response 37.

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hosted SMHM, being pushed ever westward as fill was added. We understand that small mammal trapping was done at Site 2. If this is the case, please confirm whether trapping is occurring and the methods used. If trapping is occurring, why weren't results included in the document? The document states that "[s]cheduled remedial activities planned for the site are not anticipated to have an adverse effect on the listed species." Species mentioned here are California Least Tern, California Clapper Rail, Western Snowy Plover. The Salt Marsh Harvest Mouse is not mentioned. We strongly challenge the statement regarding all but the Western Snowy Plover.	
1. **California Least Tern**: Avian and mammalian Least Tern predators that rely on Site 2 will be displaced by the important and necessary work. The consequences to Least Terns will require additional management. Site 2 currently offers foraging to Northern Harrier, Red-tailed Hawk, White-tailed kite, American Kestrel, Peregrine Falcon, Sharp-shinned and Cooper's Hawks. With the removal of vegetation and expected prey, these predators will be forced to put heavier foraging on outlying areas, including the Least Tern colony. Red fox has been seen at Site 2 once. Gray fox has been observed nearby at least twice. Mitigation could be additional Wildlife Service funding. The impact should be a topic of discussion. Fox presence is documented in Least Tern annual reports.	Please refer to page 6-4 of Attachment 6 to understand the Navy's current agreement with USFWS to provide Least Tern Colony Management and protection, including from predation.
2. **Salt Marsh Harvest Mouse**: The document does not show that the Salt Marsh Harvest Mouse does not exist at Site 2 which offers excellent and adequate habitat. If it does occur on the site,	See previous response regarding Harvest Mouse.

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impacts will occur and mitigation could be required. 3. **California Clapper Rail** This rail has not been heard or seen during twice monthly surveys, and may not be impacted because of its absence and that habitat is not perfect. That most of local invasive cordgrass has been removed and that most local Clapper Rail habitat lost, this species should be given some consideration. A small effort to detect it specifically would be appropriate. Dawn listening or tapes played are methods available. It is an omission to exclude any discussion of aquatic vertebrates and invertebrates. Fish are mentioned only in the headline, but not in the text. Invertebrates and reptiles of the uplands are an omission also.	Prior surveys have yet to report a Clapper Rail on site, though they have been reported within 3 to 4 miles away. The Navy is aware of the shy nature of Rails and that they are rarely seen, so the pre-construction survey activities will be sensitive to this protected bird An amphibian survey has been included as part of the pre-construction activities. Attachment 6 text is revised to refer to prior aquatic studies done at Site 2.
Comment 7. 6.3.2 Ecological Surveys Reference to a "qualified biologist" does not say what the qualifications are. We hope that it means that the biologist(s) will have training in multiple areas of Bay Area biology and ecology, and years of local field investigation experience for all habitats found at Site 2. The biologist(s) should also have training on appropriate methods for collecting and reporting data to bring the best possible results and understanding of habitat use and ecological function of the valuable site. It is sometimes the case that the DON brings scientists from other areas and even out of state. In the case of ecological surveys, this does not offer the best results. We suspect it is more costly, as well.	**Response 7.** Comment noted. A "qualified biologist" will have experience monitoring and identifying the special status species mentioned in the report, as well as experience monitoring in tidal wetlands, and be able to set up a monitoring program for these species.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
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Comment 8. 6.3.6 Construction Monitoring. It is hoped that the biologist(s) will have qualification stated in 6.3.2. Having a "clearance survey" done 1 day "prior to the onset of each phase of construction activities" is short sighted. One to 7 days is stated. As a courtesy to workers and hiring equipment, 3 or 4 to 7 days prior to activities seems more reasonable in case cancellation is needed. It would also likely take more than one day to conduct and report all suggested surveys.	**Response 8.** The requirement is one week prior to the start of the first phase, and one day before each subsequent phase. Because the first phase involves vegetation clearing most if not all of the upland habitat, the schedule is not unreasonable.
Comment 9. Table 6-1 Mammalian Species Observed at IR Site 2. That the list of mammals does not include California vole, house mouse, opossum, Salt Marsh Harvest Mouse given perfect habitat for this endangered species, gray fox, red fox, mule deer, and dog is a considerable omission. Site 2 could potentially host all of these mammals. A deer has lived on Alameda Point for over a year, but not seen recently. The table should be accompanied with methods for detection and dates of field work.	**Response 9.** Assessment for the Harvest Mouse has been conducted and reports published that conclude the SMHM is not present. Please see Response to EPA Comment #37.

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Comment 10. Table 6-2 Avian Species Observed at IR Site 2. Neither the table nor text (6.2) has information about "sampling" methods. Text (6.2) refers to avian sampling during "the DON 's IR sampling activities of 2004/2005 (Battelle and BBL 2006)", but numbers of Caspian Terns (1086 birds in 6 visits) on the Table is not in line with FAWR twice monthly surveys. These high numbers averaging 181 Caspian Terns per visit (with none in 4 visits?) would not likely happen unless there is a breeding colony. If surveys were done when Caspian Terns nested at Site 2 these numbers would make more sense. Succession caused habitat changes that forced them elsewhere. It appears that there are 10 "sampling" dates, but that isn't stated clearly. Numbers and species in the table raise a few questions. For example seeing 20 Brandt's Cormorants in 2 visits is unlikely. They are not often seen. We are happy to see one in a year or two. California Gulls are showing very high numbers on this table. Even when this gull had a sizeable colony at the south end of the north/south runway near the pier, Site 2 would not attract 2741 birds in 8 visits. It did not provide appropriate habitat or foraging resources. Unfortunately, these numbers without an explanation raise questions about the data that causes concern for the whole body of work. The table should be accompanied with methods and dates of field work.	**Response 10.** The information regarding sampling methods and dates of field work that the reviewer requests to be included in Table 6-2 are cited by referral to the Battelle and BBL, 2006 IR document.

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Attachment 7, Draft Wetland Mitigation Plan

Comment 11. 5.0 Habitat Types and Values, Open Water/Mudflat. It is appreciated that the non-tidal South Pond is seen as a "high tide refugia for wading shorebirds and low tide refugia for ducks and geese." And that the pond "is available as foraging habitat year-round." And "…in late October (2011?), an estimated 500 birds representing eight species were observed foraging in this pond and mudflat." This corrects the impression of no foraging created in Attachment 6.	**Response 11.** Comment noted.
Comment 12. 5.0 Habitat Types and Values, Seasonal Wetlands. There are assumptions made about the patchy and isolated seasonal wetlands on the north and northeast corner of the site, suggesting "access to them by small mammals is very restricted; therefore their value as habitat is similarly restricted. It is important to consider them as accessible and valuable seasonal wetlands for avian fauna. No matter how access is limited by development and fencing, ducks and shorebirds do use these waters in winter. Patches of inland water appear without rainfall, during some high tides along the Perimeter Road adjacent to Site 2, just west of the curve heading north and then west. The small ponds are used by breeding Killdeer and American Avocets which nest on the shores. The hydrology of this water raises curiosity. Is there an explanation?	**Response 12.** Comment noted. Wetlands have been delineated using U.S. Army Corps of Engineers protocols.

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Comment 13. 5.0 Habitat Types and Values, Tidal Wetland. We do not understand the sentence, "All other pickleweed habitat does not meet hydrology criteria needed for a wetland designation to be applied." Isn't *Salicornia* spp. a "wetland indicator". The Long-billed Dowitcher mentioned is unusual to rare at Site 2. Identification of dowitchers is very difficult and is traditionally made by vocalization in the field. Table 6.2 Avian Species Observed at IR Site 2 lists Short-billed Dowitcher, which is expected in Central SF Bay, but it is safest to call it dowitcher spp. unless clearly heard.	**Response 13.** Please see response to Water Board comment a-1, page 66, for clarification regarding the pickleweed. Comment noted regarding Dowitcher spp.
Comment 14. 6.1.1 California Clapper Rail. Again, the presence or absence of Clapper Rails at Site 2 should not be assumed. Loss of habitat locally due to invasive cordgrass removal has forced rails to seek other sites for survival. The Elsie Roemer Bird Sanctuary in recent years hosted breeding Clapper Rails and no longer serves them well. The size of the sanctuary is not any bigger than Site 2, and Site 2 would be nearest habitat. Young Clapper Rails seeking new territories can be found in lesser habitats, including rip-rap. **6.1.2 Western Snowy Plover** Not expected at Site 2. **6.1.3. California Least Tern** Not expected to use Site 2 under current conditions except in transit.	**Response 14.** Comment noted.

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Comment 15. 6.1.4 Salt Marsh Harvest Mouse. For reasons stated above (Attachment 6, section 6.2), there should be an effort to confirm the absence of the Salt Marsh Harvest Mouse before making assumptions. Once again, habitat is suitable; these mice can raft and swim, and could have existed historically and moved just ahead of westward filling activity.	**Response 15.** Please see Response to EPA Specific Comment #37.
Comment 16. 10.1 Seasonal Wetland Mitigation and Figure 2. It is suggested that the South Pond or Seasonal Wetland is comprised of fresh water both in text and Figure 2. It is more to be salt water or at least brackish water as the primary associated vegetation is pickleweed, a salt water indicator. No fresh water wetland flora indicators have been named. Have salinity tests been made? If not, the salinity of this pond is essential before habitat type can be identified. There may be a hydrological explanation for brackish conditions in this pond that appears to have no tidal influence.	**Response 16.** Comment noted. No further testing is required**.**
Comment 17. The Project Schedule in the first part of the document appears to be aimed at finishing in April 2013 before the Least Tern season begins, but healing of Site 2 and maturation of habitat to serve predators will take longer, if not years. We want to express concern for migrating raptors as well as other species, White-tailed Kites, Say's Phoebe, Western Meadowlark, and more which rely on Site 2 for the winter. We have no suggestion for mitigation, but wish that biologists would have offered some discussion of the loss to these species and resident animals during the work. Without reintroduction, it isn't clear how small mammals, for instance, will reestablish themselves. It would be helpful for science and future projects of this kind to conduct pre project small mammal-sampling testing and annual post small mammal sampling until it matches the pre-sampling rates.	**Response 17.** The Salt Marsh Harvest Mouse Survey in 2009 (H. T. Harvey and Associates, 2009) trapped over 130 house mice in a 10-day period in wetland areas outside of the IR Site 2 construction area. This is a good indication the areas around IR Site 2 have mammal populations to supplant what is lost during construction and to migrate to IR Site 2 once construction is complete.

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Comment 18. There is a rare opportunity to see how long it takes for a mature and complex habitat to return to this disturbed area. Can biological recovery be a component, measured and reported in the final documents by the DON? Can this be done with DON funding, grant funds? Or volunteers?	**Response 18.** The definition of success is discussed in the Wetlands Mitigation Plan, Attachment 7, Section 11.
Comment 19. The spring of 2013 may find ground nesting colonial species of birds such as Caspian Tern, California Gull, Snowy Plover or even Least Tern attracted to breed at Site 2. Has any thought been given to this possibility; how this might impact the project; and what steps would be made?	**Response 19.** EPP and WP require a biologist to monitor conditions. The appropriate response will be taken once the situation is observed. State and regulators will be notified when appropriate.
Comment 20. The culvert that now serves the tidal pond (North Pond) at Site 2 has suffered a log/debris jam, which took considerable effort to correct using heavy equipment forcibly pulling large and rigid items through the culvert. WE wonder about its current condition and strength. Does this culvert have a functioning tide gate? Is one needed? Will the culvert's condition maintain long term tidal action to the North Pond sustaining tidal wetlands? Will the culvert, over time, support the berm that runs over it. If necessary wouldn't it be best to repair or replace the culvert during the extensive efforts of the Remedial Action Work?	**Response 20.** Please see Response to EPA General Comment #2.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
Comments from Paul Stanton Kibel Center on Urban Environmental Law (CUEL) Co-Director Golden Gate University School of Law Comments Dated: July 7, 2012	
COMMENT	**RESPONSE**
Comment 1. Chain Link/Barbed Wire Fencing for Site 2 and Above-Ground Gas Vents Network. In CUEL's previous submissions to the City of Alameda, including our September 2011 booklet referenced above, CUEL emphasized that the planning for the federal portions of Alameda Point and the City portions of Alameda Point are necessarily inter-related. That is, if the federal portions of Alameda Point are planned as beautiful and scenic landscapes, with grant vistas, waterfowl habitat and recreational opportunities, this will contribute greatly to the prospects for a successful redevelopment of the City Portions of Alameda Point. People will want to live and work in and visit Alameda Point to take advantage of these magnificent open space amenities. Conversely, however, if the federal portions of Alameda Point are perceived as polluted, as dangerous, as ugly, as an eyesore -- the federal portions will remain a stigma for Alameda Point. The federal portions will embody and perpetuate perceptions that Alameda Point is a toxic wasteland and a blight. At the late May 2012 Alameda Point RAB meeting, the Navy unveiled a series of proposed permanent cleanup remedies that would unfortunately create the eyesores and stigma that threaten the City's redevelopment plans. More specifically, in the most scenic area of the federal portions, along the edge of San Francisco Bay and immediately adjacent to wetlands in the area known as Site 2, the Navy proposed to install a 6-foot high chain link exclusionary fence with barbed wire on top around 110 acres. In addition, the Navy has proposed installing a network of 30	**Response 1.** See Response to DTSC Comment #2 regarding the fencing. Please see Response to EPA General Comment #36 regarding the venting.

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10-foot high methane gas vents. This fence and these gas vents would obstruct and degrade the viewsheds and landscapes on the federal portions of Alameda Point. To provide the Navy, BCT staff and the public with a sense of the adverse scenic/viewshed impacts that would result from these proposed structures, CUEL's colleagues at the UCLA Landscape Architecture Department have prepared full color landscape depictions of views across Site 2 with and without the proposed fencing and vents. These landscape depictions are attached as **Exhibit C** to this letter. CUEL's analysis suggests an absence of technical support for the Navy's claim that the current proposed fencing and gas vents network are needed because these 110 acres were previously a landfill. Throughout the San Francisco Bay Area there are many examples of former landfills that have been re-purposed for open space and habitat that do not include exclusionary fencing and that do not include 10-foot high gas vents (such as Shoreline Park in Mountain View, Oyster Point Park in San Leandro and Cesar Chavez Park in Berkeley). Further, and specifically in regard to the proposed network of gas vents, there is the alternative of installing a below grade/subsurface piping network to collect and transport methane gas to a single (or limited number) of venting locations (instead of littering the landscape with 30 towering above-ground gas vents). To explore these alternatives, CUEL retained its own environmental consultants, Pangea Environmental Services Inc. (Pangea), to evaluate the Navy's proposed fencing and vents and compare this approach with other landfill-to-open space sites in the region Pangea's report, a copy of which is attached as **Exhibit D** to this letter, identifies several alternatives to what the Navy has proposed that are protective of public health and the environmental..	

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Golden Gate University School of Law

In regard to Shoreline Park in Mountain View, Oyster Point Park in San Leandro and Cesar Chavez Park in Berkeley, Pangea noted: "The interviewees all reported that they could not recall encountering any vandalism or other damage associated with public use to either monitoring wells/vapor probes, landfill cover materials or landfill gas venting systems during the periods (generally exceeding a decade) for which they had roles in managing the landfills."	
In regard to the configuration of the gas vents, Pangea found: "Although [the Navy's initial proposal] is likely the cheapest solution to venting Site 2, it would have a significant negative visual impacts that conflicts with the proposed future land use of open space and recreational uses at a location where scenic vistas are a substantial aspect of that land use ... The current passive vent configuration design should be reviewed and revised based on proposed landfill geometry and current gas generation estimates to ensure that the venting is optimized to employ the minimum number of vents necessary ... For example, could the system be re-engineered to run slanted subsurface vent pipes upslope to common outlets, using the topography of the landfill berm slope to disguise part of the vents and adjusting spacing and vent diameters to compensate for such design and still allow for adequate venting. Passive venting could be enhanced with a wind-activated roof turbine fan or similar (or a solar-powered fan) to place a small vacuum on the piping network. Such a vacuum may allow further consolidation or modification of the venting network." In regard to the height of the vents, Pangea observed: "If methane and other constituents have concentrations that are sufficiently low to not constitute fire or breathing hazards, then pipe heights should be reduced as much as permitted by applicable regulations."	Please see Response to EPA General Comment #36.

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Pangea's analysis evidences that there is not substantial evidence from a public health/safety perspective to support the need for the proposed exclusionary fencing, and that feasible alternatives approaches are available to significantly reduce both the number of gas vents and as well as the height of such gas vents.	
Comment 2. Federal Consistency under the CZMA and California State Coastal Policy of Maximum Shoreline Public Access to San Francisco Bay. As reflected in state legislation establishing the San Francisco Bay Conservation and Development Commission (BCDC), it is a longstanding California state policy to provide maximum public access to areas along our shorelines (including those along San Francisco Bay) and avoid the siting of structures in shoreline areas that would degraded the views and experience of persons using such shoreline areas. Moreover, pursuant to such laws as the federal Coastal Zone Management Act (CZMA), it is the general policy of federal agencies such as the Navy to avoid federal actions that are inconsistent with State coastal policies and to consult closely with state coastal agencies (such as BCDC) regarding such federal consistency. In the case of the Navy's proposed fencing and gas vents network in the shoreline area of Site 2 at Alameda Point, BCDC staff have provided comments to the Navy outlining concerns about the consistency between California state coastal policies (regarding public shoreline access) and the exclusionary fencing and gas vents network currently proposed. These federal consistency considerations again suggest that alternatives to what the Navy has proposed should be more fully explored.	**Response 2.** See response to DTSC General Comment #2.

RESPONSE TO COMMENTS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

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Golden Gate University School of Law

Comment	Response
Comment 3. Maintaining Site 2 Culvert to Preserve Tidal Flow Between Wetlands and San Francisco Bay. In the vicinity of Site 2 there are extensive wetland resources (and waterfowl dependent on such wetland resources). These wetlands maintain their tidal connection to San Francisco Bay via a culvert that runs beneath Site 2. The maintenance and functioning of this culvert is essential to the wetlands as without this tidal influence such wetlands will be destroyed. According to members of the Friends of the Alameda Wildlife Refuge, there have been previous incidents in which this culvert has collapsed and/or become clogged, with serious resulting adverse impacts on the wetlands. These wetlands are subject to protection pursuant to Section 404 of the Clean Water Act (Section 404). These culvert-related concerns were highlighted in the San Francisco Bay Regional Water Quality Control Board's June 13, 2012 letter to the Navy commenting on the Draft Site 2 RAW. The Regional Water Board stated: "We are very concerned about the age and integrity of the culvert that is the sole sources of Bay water to the tidal wetlands. It is our understanding that the aged culvert is in very poor shape and may collapse at any time. The value of this culvert became painfully apparent a year ago when some driftwood or other materials clogged it up and impeded all tidal flow of brackish water to the wetland.. In a matter of days, the tidal wetlands started drying up. Should that culvert collapse, the delays in rebuilding, from getting contracts to actual physical work, could be devastating and even fatal to the wetland flora and fauna." For the reasons noted above in the letter from the Regional Water Board, it is critical that the Navy properly delineate the Section 404 wetlands (both at Site 2 and elsewhere at Alameda Point) and that the Navy thoroughly evaluate the condition of the Site culvert to determine	**Response 3.** The Navy agrees with the comment that the culvert is critical to the health of the tidal wetlands at IR Site 2. The culvert is currently functioning adequately, and based on work done to unclog debris from the culvert in 2008, it is not in need of repair. The Post-Closure Operations, Maintenance, and Monitoring Plan has been modified to include Culvert Inspection as part of regular visual inspections defined in Attachment 11, Appendix C, SOP 001 Multilayer Soil Cover Inspections.

RESPONSE TO COMMENTS DRAFT REMEDIAL ACTION WORK PLAN INSTALLATION RESTORATION SITE 2, ALAMEDA POINT ALAMEDA, CALIFORNIA	
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whether replacement and/or reinforcement is needed to maintain this critical tidal flow between the wetlands and the Bay. If such replacement and/or reinforcement work is deemed necessary, the provision for such work should be included in the RAW so that the federal government's obligations (of the Navy or of the Veterans Administration if ownership of Site 2 is transferred) going forward are clear to the regulators and the public.	

ATTACHMENT 14

ADDITIONAL RESPONSE TO COMMENTS DATED DECEMBER 2012

- James M. Polisini, PhD, Senior Toxicologist
  Office of Human and Ecological Risk
  December 17, 2012
- Xuan-Mai Tran, Remedial Project Manager
  U.S. Environmental Protection Agency, Region IX
  January 17, 2013
- Peter Gathungu, GE, Hazardous Substances Engineer
  California Department of Toxic Substances Control
  January 25, 2013

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RESPONSE TO COMMENTS TO
RESPONSE TO COMMENTS, DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

Comments from James M. Polisini, PhD
Senior Toxicologist
Office of Human and Ecological Risk (HERO)
Ecological Risk Assessment Section (ERAS)

Comments Dated: December 17, 2012

SPECIFIC COMMENT	RESPONSE
Comment 1. Response to Specific Comment number 6: HERO commented that the Department of Fish and Game (DFG) should be consulted to determine whether the 220-mil un-seamed layer of HDPE geonet with half-inch openings proposed as animal penetration control (Section 5.6.6.2, page 5-7 of Draft RI Work Plan) would be sufficient rather than a rock cover. The response indicates that DFG received the Draft RI Work Plan, had no comments, and included a statement on the uniformity of HDPE geonet over crushed concrete rubble as the basis for selection of geonet. Second, HERO never mentioned 'crushed concrete rubble' and is more familiar with compacted crushed rock of varying size as cover to prevent animal penetration. For a detailed explanation of the DFG objection to use of geotextile alone as a biological barrier to prevent penetration by burrowing animals please see the attached pages of the October 31, 2012 DFG memorandum to Ryan Miya, DTSC Remedial Project Manager, regarding the Draft Final Record of Decision for Parcel E-2, Hunters Point Shipyard, San Francisco, California. Specifically the section titled *DFG-OSPR's Response to the Navy's Second Response to DFG-OSPR's General Comments on the PP* (page 4 of 24 through page 18 of 24), outlines the DFG position on use of geomembranes alone as a control on burrowing animals. This DFG memorandum is referenced as it contains DFG responses to the Navy's original responses to a November, 18, 2011 DFG memorandum outlining their objections to geomembrane alone as a biological barrier at Parcel E-2. While this DFG memorandum is lengthy, a summary of DFG concerns regarding the susceptibility of	**Response 1.** The comment referenced a 2011 DFG response memo to the Hunter's Point Parcel E-2 landfill which states that "designing a landfill cap to only meet the minimum regulatory requirements for a landfill cover does not guarantee it will be effective against damage from burrowing animals in perpetuity…The Navy had not presented sufficient technical information to support its assertions that a geomembrane would deter or control animals from burrowing under the cover…" Section 5.6.6.2 of the RAWP has been revised to list the reasons that HDPE geonet was selected as follows: *The HDPE geonet was selected as an alternative to a rock layer for the following reasons:* • *High strength and durability* • *An approximately half-inch opening size, which is too small for burrowing animals* • *Consistent barrier quality—no variety in rock or crushed concrete size or thickness as with a rock layer, uniformity in installation and at seams and penetrations* • *Reduced mass for increased seismic stability of cover* • *Lower profile* • *Sustainability (lower fuel use, less to transport, no compaction necessary)* • *USEPA's Technical Guidance Document: Final Covers on*

geomembranes alone, based on installed landfill covers is on page 14 of 24 (underlining is presented as in the original text):
 	
"Designing a landfill cap to only meet the <u>minimum</u> regulatory requirements for a landfill cover does not guarantee it will be effective against damage from burrowing animals in perpetuity. The Navy has installed landfill covers without biotic barriers at other locations in California (i.e., Port Hueneme Site 14 and Moffett Field Site 1). As a result of inadequate cover design at these locations, the Navy has resorted to poisoning gophers in perpetuity to prevent these animals from damaging the landfill cap. DFG-OSPR does not believe that a remedy that proposes to clean up one type of chemical of ecological concern (COEC) (i.e., lead and mercury) only to substitute them with another type of COEC (i.e., pesticides), complies with CERCLA and the requirement that the remedy be protective of the environment."
 	
Just from the description, geonet, with half-inch openings, would appear more susceptible to penetration by burrowing mammals than unbroken geomembrane. Agreement should be reached on the type of biological barrier to be implemented prior to finalization of the IR Site 2 Work Plan.
	Hazardous Waste Landfills and Surface Impoundments, July 1989 indicated "There also is little evidence that insects or burrowing animals destroy polymer liners or cover materials. In tests done with rats placed in lined boxes, none of the animals were able to chew their way through the FMLs [flexible membrane liners]. Thus, degradation from a wide spectrum of biological sources seems highly unlikely."
	• *Specification sheets from a geonet manufacturer (Tenax) circulated in January 2009 indicated that the example geonet materials had a hardness of about 68 on "Shore D" scale. This hardness is in the same class as some soft, non-ferrous metals, or the covering on a golf ball, or a typical hard hat (approximately 75).*
	• *Precedents and technical basis exist for the use of geonets and other polymeric materials to impede animals in cover systems for solid waste containment:*
	  ◦ *HDPE geonet was the USEPA-recommended design for Casmalia Resources Disposal Site , and was agency-approved for use at the Concord Stie 1 landfill*
	  ◦ *HDPE geonet was approved for a burrowing animal barrier in 2010 by DTSC in a landfill cover at Naval Air Weapons Station China Lake (TtEC 2010)*
	  ◦ *HDPE geonet used for a CERCLA action at the Site 300 landfill located at the U.S. Department of Energy facility, Lawrence Livermore National Laboratory (U.S. Department of Energy 1997)*

RESPONSE TO COMMENTS
ATTACHMENT 1, FINAL REPORT, GEOTECHNICAL RECOMMENDATIONS
DRAFT REMEDIAL ACTION WORK PLAN
INSTALLATION RESTORATION SITE 2, ALAMEDA POINT
ALAMEDA, CALIFORNIA

Comments from Xuan-Mai Tran
Remedial Project Manager
Federal Facilities and Site Cleanup Branch
U.S. Environmental Protection Agency, Region IX

Comments Dated: January 17, 2013

GENERAL COMMENT	RESPONSE
Comment 1. Section 2, Basis of Design, of Attachment 1, Final Report, Geotechnical Recommendations, Installation Restoration Site 2, Alameda Point, Alameda, California, October 29, 2012 (the Geotechnical Report) indicates that the integrity of the Site 2 cover is considered to be maintained if there is no release of solid refuse to the San Francisco Bay beyond the perimeter seawall, the site will remain isolated from and will not be flooded by the San Francisco Bay water, and the function of the cover to act as a pathway interruption between landfill content and human and environmental receptors will not be rendered ineffective; however, Section 9.1, Slope Stability and Newmark-Type Displacement Interpretation and Conclusions, indicates that some incidental refuse beneath the perimeter berm may be exposed at the western coastal margin and Section 12, Summary of Analyses, indicates that substantial remedial grading will be required to repair damage following a maximum credible earthquake (MCE). As such, the integrity of the Site 2 cover appears to be rendered ineffective following a MCE because the potential exposure pathway between landfill content and human and environmental receptors will be complete. Please revise the Geotechnical Report to clarify how the function of the cover to act as a pathway interruption between landfill content and human and environmental receptors is expected to remain effective when the potential exposure pathway between landfill content and human and environmental receptors following a MCE will be complete.	**Response 1.** The proposed design concept assumes that relatively large displacements may take place during an MCE event. Although refuse is not predicted to be released into the Bay (lateral direction), substantial disturbance (cracking, separations, offsets) of the cover is anticipated that might expose the refuse to the human and environmental receptors (vertical direction). This exposure is expected to be localized due to 1) localized distribution of the refuse beneath the berm 2) localized nature of cover disturbance. The overall cover disturbance will require substantial remedial grading (Section 12, p.33). This remedial grading will re-establish the barrier between the human and environmental receptors. It is understood that this comment is concerned with the exposure of refuse under the berm along the western coastal margin. The cover along the western coastal margin will be subject to deformations from perimeter slope movements and/or possibly also from lateral spreading. It is expected that the larger of the two effects will govern, i.e., the effects are not additive. The Final report includes rationale/basis for determination that the refuse along the western coastal margin is localized and therefore its exposure to the open environment following an MCE event is also expected to be localized. The performance concept for the site anticipates that significant repair will need to be implemented following a design seismic event.

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Comment 2. Given the size of the coastal margin along the western portion of Section D-D' compared to Section A-A' and Section B-B', it is unclear why a slope stability and Newmark-type seismic deformation evaluation was not conducted on Section D-D'. Please revise the Geotechnical Report to clarify why an evaluation of slope stability and Newmark-type seismic deformation was not conducted at Section D-D'.	**Response 2.** Section D-D' is presented in the Report to illustrate the interpreted subsurface conditions. . Section D-D' is neither suitable nor intended for engineering analyses due to its oblique angle to the governing engineering mechanisms. It is presented mainly to illustrate the variability of the thickness of the fine-grained Young Bay Mud under the project site. The vertical dimensions of the cross-section are exaggerated to capture this variability. Instead, Sections A-A', B-B', and C-C' were developed as representative of the critical subsurface conditions along the southern coastal margin, western coastal margin, and interior wetland margin, respectively, and perpendicular to the margin to be suitable for engineering analyses. Sections A-A', B-B', C-C' were developed for the specific purposes of engineering analyses as they are all deemed representative and critical. Another cross-section not directly inferred from cross-section D-D' would need to be prepared for any additional analyses. However, it is our professional opinion that the provided cross-sections A-A', B-B', C-C' adequately and sufficiently characterize the site and provide basis for engineering analyses.
Comment 3. The Geotechnical Report does not discuss the impact of the existing slurry wall, shown on Plate 4, Geologic Section B-B', on the geotechnical analysis for cross section B-B'. For example, it is unclear if it was assumed that no slurry wall existed or if it was factored into the slope stability and Newmark-type seismic deformation evaluation. Please revise the Geotechnical Report to discuss the existing slurry wall. If the existing slurry wall was factored into the slope stability and Newmark-type seismic deformation evaluation, please clarify how the integrity of the existing slurry wall was incorporated into the evaluation.	**Response 3.** The existing slurry wall is considered to be a typical bentonite-soil cut-off wall to impede groundwater connection between the landfill and the Bay. Due to its size (2 feet wide) the slurry wall does not have any engineering impact on the deformation and stability analyses of Section B-B' and was not rigorously considered in the analyses. Given the predicted seismic deformations along the western coastal margin of 10 feet, the integrity of the slurry wall is expected to be commensurately disturbed.

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Comment 4. The Geotechnical Report does not discuss how Sections A-A', B-B', C-C', and D-D' are representative of site conditions along the coastal margin areas and areas between the landfill and wetlands. As such, the validity of the geotechnical evaluation is uncertain. Please revise the Geotechnical Report to discuss how Sections A-A', B-B', C-C', and D-D' are representative of site conditions along the coastal margin areas and areas between the landfill and wetlands.	**Response 4.** The cross-sections were developed based on geologic interpretation of the data collected during subsurface investigations described and presented in the report. All four sections were developed to illustrate the subsurface conditions interpreted from the previous field investigations discussed in Sections 4 and 5 of the Report and logs and lab testing results included in Appendices A and B. Sections A-A', B-B', and C-C' were considered critical and utilized for the engineering analyses. Section D-D' was deemed necessary to present the thinning of the fine Young Bay Mud prone to seismic softening and appearance of the liquefiable coarse Young Bay Mud between the western and southern coastal margins.
Comment 5. Section 7.1, Slope Stability and Newmark-Type Deformation Evaluation Methodology, indicates that a simplified method, based on a database of similar simulations, rather than the SHAKE2000 software, was used to predict permanent seismic deformations at Section C-C' because the interior slope between the landfill and wetlands is not critical due to the width of the buffer zone between the landfill boundary and the seawall. While the width of the buffer zone between the landfill boundary and the seawall is larger than along the coastal margin areas, seismic deformations at Section C-C' are still critical as waste could enter the ponds or wetlands. It should be noted that the North Pond is connected to San Francisco Bay through the existing culvert pipe so the potential for refuse to reach San Francisco Bay exists. Please revise the Geotechnical Report to utilize SHAKE2000 software to assess Section C-C'.	**Response 5.** Simplified seismic deformation method by Bray & Travasarou (2007) was utilized for Section C-C' in accordance with the Standard of Practice and as recommended by Special Publication 117A (California Geological Survey, 2008, Guidelines for evaluating and mitigating seismic hazards in California). This method is considered to yield adequate results compared to more rigorous methods, i.e., SHAKE2000. On this basis, the seismic deformation predictions presented in the Report for Section C-C' are considered appropriate and adequate. The simplified method also allows to quantify the probability of exceedance of a given resulting seismic deformation, whereas SHAKE2000 yields a deterministic value calculated based on a given time history or average for a design time history set. The simplified method result presented in the Report for Section C-C' was a mean value, i.e., probability of exceedance of 50%. Results for other risk levels (probability of exceedance of 84% and 16%) were provided in Appendix E.

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Comment 6. Section 8.2, Approximate Energy Method, indicates that a flow model for simplified geometries was utilized for the southern coastal margin; however, the text does not discuss the simplified geometries at the southern coastal margin or discuss why the geometries at the western coastal margin and interior slope between the landfill and wetlands were not appropriate for use in a flow model for simplified geometries. Please revise the text to discuss the geometries for the coastal margins and interior slope between the landfill and wetlands to substantiate the use of a flow model for simplified geometries for the southern coastal margin.	**Response 6.** The Approximate Energy Method is applicable to all geometries subject to plastic flow. As such this model is applicable to both the western and southern coastal margins. The text of the Report is not clear by implying that the method is *applicable* only to the southern coastal margin, whereas the intent was to state that the method was *used* only for the southern coastal margin. This is because the southern coastal margin was still unstable at the end of the design MCE event and therefore subject to further deformations evaluated using the Approximate Energy Method. For the western coastal margin the configuration was determined to be stable at the end the design MCE event and therefore the Approximate Energy Method did not need to be utilized.

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Comment 7. The conclusions presented in Sections 9.2, Flow Model Interpretation and Conclusions, and 12, Summary of Analyses, require additional discussion. For example, the conclusions imply that the perimeter berm remains intact following a MCE and only appears to settle four feet; however, the text does not explain why the perimeter berm does not flow. Similarly, the perimeter berm is not predicted to be overtopped by rising water yet there is no discussion of tides/rising water in the Geotechnical Report. Please revise the Geotechnical Report to provide additional discussion of each conclusion, including associated assumptions.	**Response 7.** The perimeter berm is not subject to liquefaction because it is above groundwater, nor is the compacted fill of the berm considered sensitive and prone to significant seismic weakening. As a result, the berm is considered to translate as a rigid body as the underlying liquefied hydraulic fill flows plastically. Based on borings KCHSB-1, -2, and -3 advanced on top of the perimeter berm, the berm is primarily composed of LEAN CLAY (CL) with plasticity index and liquid limit of 28 and 46, respectively. As such this material is not liquefiable because the prerequisite condition for liquefaction is 1) saturated and 2) contractive (loose, metastable) granular soils or silts. Although under some extreme conditions and certain tides the toe of the berm could get saturated, the material that comprises the berm is primarily cohesive clay, which is not usually considered liquefiable. Recent advances in soils mechanics indicated that under certain conditions fine-grained soils may be subject to either to liquefaction-like behavior (built-up of pore pressures and reduction of effective stress) or a significant loss of strength due to thixotropic response of the soils grains during earthquake shaking, i.e., sensitivity. This propensity was evaluated based on the following criteria: 1. Fine-grained soils with Plasticity Index < 12 and moisture content greater than 85 percent of the liquid limit are classified as fine-grained soils susceptible to liquefaction (typically silts); 2. Fine-grained soils with Plasticity Index > 18 are classified as soils potentially susceptible to significant loss of strength during seismic shaking and require additional evaluation. The sensitivity of the on-site fine-grained soils is then evaluated based on the water content, Atterberg limits, and

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	effective vertical stresses using the procedures suggested by Holtz and Kovacs (1981) and Mitchell and Soga (2005). 3. Fine-grained soils falling outside the two categories above are considered to behave like clays and are not considered susceptible to liquefaction. As indicated above, the materials that compose the berm are typically lean clays with plasticity index and liquid limit of 28 and 46, respectively, and fall into the 2nd category defined above. Considering the assumed saturated moisture content of about 35 percent, the Liquidity Index is about 0.6 and the associated sensitivity is about 3 (Mitchell and Soga, 2005). Soils with sensitivity less than 4 are considered low sensitive (Holtz and Kovacs, 1981) and therefore the potential for significant loss of strength of fine-grained materials and ensuing failure during seismic shaking is not considered likely. However, the seawall and perimeter berm will be inspected immediately after the MCE event, and repaired or raised as necessary to maintain acceptable freeboard above the King tide as part of post-MCE remedial grading already deemed necessary to repair cover damage from lateral spreading. Rising sea level on the order of 0.1 feet over a period of time measured in decades is considered relevant to long term maintenance. If sea level rise is appreciable in the coming decades, the seawall and berm should be raised to keep pace with rising mean sea level as part of long term maintenance.

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SPECIFIC COMMENT	RESPONSE
Comment 1. Section 2, Basis of Design, Page 2: The second paragraph references the Applicable or Relevant and Appropriate Requirements (ARARs) presented in the Final Record of Decision (ROD) for IR Site 2; however, a specific reference to the ROD is not included in Section 2 or Section 15, Selected References. Please ensure that the ROD is referenced.	**Response 1.** Agreed. The ROD reference will be included as follows: Final Record Of Decision IR Site 2; Former Naval Air Station Alameda, California, BATL-6009-0007-0010, August 2010.
Comment 2. Section 7.1, Slope Stability and Newmark-Type Deformation Evaluation Methodology, Page 18: The text indicates that the mean predicted seismic deformation was taken as representative of anticipated permanent deformation during the MCE for Section C-C'; however, information to substantiate the use of the mean predicted seismic deformation is not provided. It is unclear if the mean predicted seismic deformation represents a conservative assessment of seismic deformation. Please revise the Geotechnical Report to clarify how the use of the mean predicted seismic deformation is a conservative assessment of seismic deformation.	**Response 2.** The mean predicted seismic deformation of 1.0 foot is intended to be the likely deformation, with a 50% probability of being less and a 50% probability of being greater. That is, it is not intended to be a conservative assessment. A conservative estimate may be taken from the result presented in Appendix E as 1.9 feet, with only a 16% probability of being exceeded. For the purpose of evaluating the permanent seismic deformation of the interior slope adjacent to the wetland, either 1.0 foot or 1.9 feet are effectively comparable indexes of permanent deformation with respect to impact to the cover and in relation to other deformation magnitudes including liquefaction induced lateral spreading. Nonetheless, the Report will be revised to use a conservative value of 1.9 feet.
Comment 3. Section 7.1, Slope Stability and Newmark-Type Deformation Evaluation Methodology, Pages 18-19: The text indicates post-earthquake movement was anticipated for Section A-A' and no post-earthquake displacement was anticipated for Section B-B'; however, the text does not discuss Section C-C'. Please revise Section 7.1 to discuss the post-earthquake movement at all cross sections.	**Response 3.** Post-earthquake displacement is not predicted for Section C-C' because the post-earthquake Factor of Safety is 1.36. Section C-C' has been included in the discussion presented in Section 7.1 of the Report.

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Comment 4. Section 8, Flow Run-Out Analyses, Page 23: The text states that, "Although most slides behave largely like rigid bodies as the involved materials soften, the deformation character transitions more towards the flow-type movement. This flow-type movement is considered applicable to the type of slide movements anticipated along the southern coastal margin, where potential for liquefaction of the coarse-grained Young Bay Mud sands is determined;" however, information to substantiate this statement is not provided. Please revise the Geotechnical Report to provide information to substantiate why this flow-type movement is only applicable for the southern coastal margin.	**Response 4.** This flow-type movement is applicable to all geometries subject to plastic flow. As such this model is applicable to both the western and southern coastal margins for seismic wakening and liquefaction type failures, respectively. The text of the Report is not clear by implying that the method is *applicable* only to the southern coastal margin, whereas the intent was to state that the method was *used* only for the southern coastal margin. This is because the southern coastal margin was still unstable at the end of the design MCE event and therefore subject to further deformations evaluated using the Approximate Energy Method. For the western coastal margin the configuration was determined to be stable at the end the design MCE event and therefore the Approximate Energy Method did not need to be utilized.
Comment 5. Section 8.1, Flow Constitutive Model, Page 23: Based on Section 8.1, flow resistance is utilized rather than viscous resistance for plastic flow; however, no information is provided to substantiate that viscous resistance is not occurring. Please revise the Geotechnical Report to clarify why viscous resistance is not utilized in the plastic flow constitutive model.	**Response 5.** Viscous flow where resistance is a function of flow velocity will likely occur. However, plastic flow model where resistance to flow is provided by a constant residual shear strength was selected for the analyses to utilize a closed-form solution based on the conservation of energy to determine the resultant run-out distance. The choice of a plastic flow rheological constitutive model was a matter of convenience, but deemed appropriate for an order of magnitude estimate of the run-out distance. The selection of the plastic flow model is also consistent with conventional modeling of liquefied materials using a single shear strength parameter (undrained shear strength). Given the positive confining contribution of the rock seawall is ignored, the plastic flow model to estimate of the run-out distance is deemed to be conservative.

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Comment 6. Section 9, Results of the Slope Stability and Permanent Seismic Deformation Analyses, Pages 26 to 30: The text does not discuss the results of the slope stability and permanent seismic deformation analysis conducted on Section C-C'. Please ensure that the results of the slope stability and permanent seismic deformation analysis conducted on Section C-C' are discussed in the Geotechnical Report.	**Response 6.** Agreed. The results of the slope stability and permanent seismic deformation analysis conducted on Section C-C' are described in Reponses 3 and 2 above, respectively.
Comment 7. Table 7, Summary of Slope Stability and Permanent Seismic Deformation Analysis, Page 28: The vertical translation of the crest, as shown in Figure D-8, Post-Seismic Stability Analysis (Section B-B'), is not discussed. Please ensure that the vertical translation of the crest is discussed in Table 7 and the text of the Geotechnical Report.	**Response 7.** Agreed. The vertical translations shown on the figures in Appendix D were considered supplementary to the lateral deformations, which were the focus of the analyses. For completeness, the vertical translations has been added on Table 7 and discussed in the text.
Comment 8. Section 12, Summary of Analyses, Page 33: The text indicates that lateral spreads of the cover throughout the interior of the landfill are on the order of a few feet; however, information to support this statement is not provided. Please revise the Geotechnical Report to provide information to substantiate that lateral spreads of the cover throughout the interior of the landfill are on the order of a few feet.	**Response 8.** The basis for this conclusion is provided in Section 10.2 while Section 12 is intended to provide only a summary of the conclusions. The rationale includes discussion that liquefaction induced lateral spreads are intrinsically difficult to predict, and in particular for a case of edge constraint provided by a large seawall. As a result, the historic lateral spreads observed at the site during the 1989 Loma Prieta Earthquake are considered to provide the best estimate and are believed to be on the order of a few feet (California Geological Survey, 2003, Seismic Hazard Report for the Oakland West 7.5-Minute Quadrangle, Alameda County, California).The requested reference and discussion is included in the Draft Final report

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Comments from Peter Gathungu, GE
Hazardous Substances Engineer
Engineering and Special Projects Office
California Department of Toxic Substances Control

Comments Dated: January 25, 2013

COMMENT	RESPONSE
Comment 1. Section 1.0, Introduction. The text in the first paragraph indicates that a multilayer cover system consisting of a biotic geonet barrier and a minimum two-foot thick layer of soil, including a minimum six-inch vegetative layer, will be installed over the landfill. The report does not indicate the properties/type of soil, such as low permeability clay, to be used in the landfill cover. The described system does not include a mechanism to keep water out of the waste other than the two foot soil layer. Although the Report appears to be focused on preventing release of solid waste into or flooding of the site by waters of San Francisco Bay during a seismic event, preventing infiltration of water into the waste which is in contact with groundwater that is subject to tidal influences should be considered.	**Response 1.** The proposed cover is intended to provide a physical barrier between the refuse and the surrounding environment. The parameters of the geotechnical design do not include qualification, quantification, or control of precipitation water infiltration into the refuse or groundwater movement and interaction. The selected remedy for groundwater is monitoring and natural attenuation as described in the ROD. . The landfill content is already sitting in the groundwater, so the cover does not need to be designed to prevent infiltration. According to the ROD, engineering controls for groundwater remedy are not an issue because active remediation of groundwater will not be conducted.
Comment 2. Section 6.1 Causative Faults. The text in the first sentence states that Caltrans' ARS Online v.1.0.4, a web based tool was used to select the causative faults for the deterministic Maximum Credible Earthquake (MCE). We note that a newer version of the web based tool is currently available. Please determine if using the latest version of the web-based tool changes the current results and make adjustments as necessary.	**Response 2.** ARS Online (version 2.0.4) was implemented on November 14, 2012 and has since been updated to the current version 2.1.05. The ARS tool was utilized to develop the deterministic response spectra for the governing faults (Hayward Fault and San Andreas Fault). The comparison of the deterministic response spectra generated by the ARS Online Tool v.1.0.4 and v.2.1.05 for the governing faults indicates no difference. As such the results of the ARS Online Tool v.1.0.4 presented in the Report remain fully applicable.

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Peter Gathungu, GE, Hazardous Substances Engineer Engineering and Special Projects Office, California Department of Toxic Substance Control	
Comment 3. Section 6.5 Design Peak Ground Acceleration. The text in the second paragraph states that the design peak ground acceleration (PGA) is taken as the average result for the seven input acceleration time histories, but no rationale is provided for using the average values. Please expand the text in this paragraph and include a rationale for using the average PGA values.	**Response 3.** The reference to the PGA in the Report is provided only for reference purposes and for comparison with the PGA values presented in the previous reports (if desired). This value is not used for any subsequent deformation analyses, except to verify that liquefaction is triggered and the liquefaction induced settlements presented in previous reports remain applicable. Furthermore, the use of average values is conventionally utilized when several input time histories are utilized, e.g., PEER Center target spectrum matching procedure or AASHTO Guide Specification for Seismic Isolation Design, 3rd Edition, prescribes using the maximum response when 3 time-histories are used and the average when 7 or more time-histories are used. 7 time-histories are used in our analysis.
Comment 4. Section 7.1 Slope Stability and Newmark-Type Deformation Evaluation Methodology. The text in the third sentence states that two typical sections representing the western and southern coastal margins were selected for analyses. The text in the second paragraph indicates that a third section was also considered. However, it would appear that because the North Pond communicates with San Francisco Bay via a 36-inch diameter pipe, a section through the pond including the landfill and seawall likely would present greater vulnerability than Section C-C'. Please include analyses for an additional section through the north pond.	**Response 4.** The third section, Section C-C’, was developed to evaluate the stability of the landfill perimeter in the wetland area. Because of the large setback of the landfill from the Bay (well in excess of 400 feet) by inspection this section is not expected to be critical and did not need to be extended to the Bay and analyzed. The presence of the pond at the toe does not affect the stability and deformation calculations and the calculated deformations indicate only minor potential seismically induced deformations, which are not expected to impact the refuse confinement. From that perspective analyses on an additional section are not considered necessary.
Comment 5. Section 7.1 Slope Stability and Newmark-Type Deformation Evaluation Methodology. The text in the last sentence of the third paragraph states that post-earthquake flow failure is considered imminent for factors of safety less than 1. However, it would appear that in common usage a factor of safety less than 1 indicates failure/instability and not imminent failure. Please clarify and revise the text accordingly.	**Response 5.** The text of the report refers to the imminent post-earthquake flow failure. This is an important distinction since even with the Factor of Safety of less than 1, further analysis is needed to evaluate if a flow failure associated with large displacement or “conventional” failure with much more limited displacements would take place.

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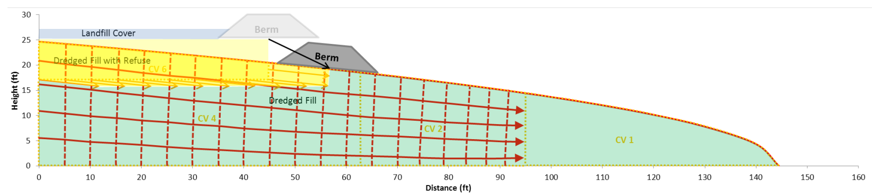
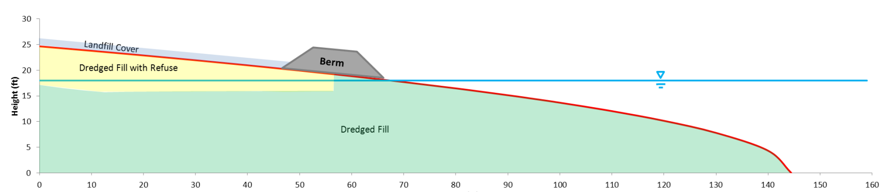
Comment 6. Section 8.2 Approximate Energy Method. The text in the third sentence states that the final geometry is taken as a parabolic profile, and the initial and final geometries are shown in Figure 9. However, it is not clear whether the berm and sea wall will remain intact, and their location and configuration, after movement. In addition, the sea wall along the southern coastal margin appears to be based on liquefiable hydraulic fill. Please clarify the final post-earthquake configuration of the sea wall, berm, and landfill cover, and indicate whether the waste would still be isolated from bay waters taking into account the presence of the North pond (see Comment 4), and anticipated future sea level rise.

Response 6. The berm is expected to remain as a block because it is composed of compacted fill not susceptible to liquefaction or seismic weakening. Consequently the berm is expected to deform as a rigid block on a foundation susceptible to plastic flow, illustrated below:



In the model, the seawall is conservatively assumed to be non-existent, instantaneously whisked away and replaced with a 25-foot vertical face of liquefiable sand subject to plastic flow without being constrained by a rigid shell (sea wall). Actual seawall will limit deformation to less than shown above.

The final post run-out configuration shown below predicts the berm will not be overtopped by the waters of San Francisco Bay and freeboard of about 5 feet above mean sea level will remain and so the refuse will remain isolated:



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Comment 7. Section 9.1 Slope Stability and Newmark-Type Displacement Interpretation and Conclusions. The text in the first bullet states that the perimeter slope at the southern margin is prone to liquefaction and may flow as evidenced by the calculated post-earthquake factor of safety. The conclusions in this section should be expanded to discuss liquefaction and flow effects on the berm, perimeter wall and whether post-earthquake overtopping of the deformed berm and/or sea wall is likely to occur.	**Response 7.** Liquefaction and flow effects on the berm and perimeter seawall are described in Response 6 above.
Comment 8. Section 9.2 Flow Model Interpretation and Conclusions. The text in the last bullet states that the cover is predicted to settle a maximum of four feet adjacent to the perimeter berm. This bullet appears to be incomplete as it does not draw any conclusions on the effect of the predicted settlement on the adjacent berm and whether if similar settlement of the berm occurs it could lead to flooding of the landfill from the bay. Please expand the text to include any conclusions regarding berm performance in light of the predicted settlement of the adjacent cover.	**Response 8.** Agreed. Translation and settlement of the berm and the potential flooding of the landfill as shown in Response 6 have been discussed in Section 9.2 of the Report.
Comment 9. Section 10.2 Liquefaction Lateral Spreading. The text in the first paragraph states that previous studies have predicted liquefaction induced lateral spreads ranging from a few inches to flows of many tens of feet and goes on to state that lateral spreads are poorly constrained and uncertain. However, the text in the second paragraph states that lateral spreads in some areas may be on the order of several feet. The statements appear to be overly vague and we would suggest refining the predicted lateral spreading values to provide a better sense of the anticipated lateral spread and related effects.	**Response 9.** The anticipated and most likely estimate of lateral spreading deformations is the reference to the experience from the 1989 Loma Prieta earthquake, i.e., "order of several feet". Given the nature of the empirical relationship by Youd (2002), in particular the impediment to lateral spreading provided by the seawall, refinement of the analytical predictions is not considered practical or reliable.