March 15, 2012

Ms. Remedios Sunga
California Department of Toxic Substances Control (DTSC)
700 Heinz Avenue
Berkeley, CA 94710-2721

Subject: Draft Feasibility Study/Remedial Action Plan (FS/RAP), Mountain Lake, Presidio of San Francisco, California, dated March 2012

Dear Ms. Sunga:

Enclosed are three hard copies and three electronic copies of the *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California* (FS/RAP) prepared by Kennedy/Jenks for the Presidio Trust (Trust) which is being distributed for public review. The Draft Negative Declaration and Initial Study prepared by DTSC in compliance with the California Environmental Quality Act (CEQA) is included in Appendix I of the document.

Please contact me at (415) 561-4293 if you have any questions.

Sincerely,

Genevieve Coyle
Environmental Remediation Project Manager

Enclosure

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DRAFT
Feasibility Study/ Remedial Action Plan Mountain Lake Presidio of San Francisco California

15 March 2012

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List of Acronyms and Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
BMPs	Best Management Practices
bss	below sediment surface
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (Superfund)
COCs	Chemicals of Concern
cy	cubic yards
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
EKI	Erler and Kalinowski, Inc.
FS	Feasibility Study
GGNPA	Golden Gate National Parks Association
GRA	General Response Action
GREM	Green Remediation Evaluation Matrix
HI	Hazard Index
HQ	Hazard Quotient
HSC	Health and Safety Code
mg/kg	milligrams per kilogram
MNR	monitored natural recovery
NCP	National Contingency Plan
NPS	National Park Service
PCOCs	Potential Chemicals of Concern
PRGs	Preliminary Remediation Goals
RAOs	Remedial Action Objectives
RAP	Remedial Action Plan
RDIP	Remedial Design Implementation Plan
RI	Remedial Investigation
RWQCB	California Regional Water Quality Control Board, San Francisco Bay Region
SVOCs	Semivolatile Organic Compounds
STLC	Soluble Threshold Limit Concentration
SWPPP	Stormwater Pollution Prevention Plan
TBC	To be considered
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
TPHd	Total Petroleum Hydrocarbons as diesel
TPHmo	Total Petroleum Hydrocarbons as motor oil
TMV	Toxicity, Mobility and Volume

Trust	The Presidio Trust of San Francisco
UCL	Upper confidence limit
URS	URS Corporation
USACE	United States Army of Corps of Engineers
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

Executive Summary

This Draft Feasibility Study and Remedial Action Plan (Draft FS/RAP) for Mountain Lake was prepared on behalf of the Presidio Trust (Trust) by Kennedy/Jenks to identify and evaluate remedial alternatives and present the proposed remedial action for Mountain Lake at the Presidio of San Francisco (Presidio). This Draft FS/RAP meets requirements specified by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) in Guidance Document No. EO-95-007-PP, Remedial Action Plan Policy (DTSC 1995). This document is also consistent with the applicable federal requirements for the evaluation and selection of a final remedial action outlined in the U.S. Environmental Protection Agency (USEPA) National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR), Part 300.400 (USEPA 1990) and the California Health and Safety Code (HSC), Chapter 6.8, Section 25356.1.

This Draft FS/RAP is being released for a 45-day public comment period. After the public comment period ends, DTSC, in consultation with the Trust, will respond to comments received, and a Final FS/RAP will be prepared that includes a Responsiveness Summary providing responses to comments received on the Draft FS/RAP. Following DTSC approval of the Final FS/RAP, a Remedial Design will be prepared providing details in implementing the selected remedial alternative in the FS/RAP.

Mountain Lake is a 4-acre, groundwater-fed lake located at the southern edge of the Presidio. The Lake receives runoff from Highway 1 (Park Presidio Boulevard) and the Presidio golf course. Leaded fuels associated with highway use and pesticides from the golf course have historically contributed contaminants to the lake. The golf course is not a significant continuing source of contaminants to the Lake.

The Lake is the main feature of Mountain Lake Park, a recreational area. Picnicking, dog-walking, and hiking are popular activities. The area to the south of the Lake contains a playground, tennis courts, picnic areas, and a small beach. Fishing, swimming and recreational boating are not permitted on Mountain Lake. The Lake area includes open water, wetlands, and riparian woods and vegetation, and supports a variety of exotic and native plant and animal species.

Over 185 samples of sediment have been collected from the Lake during remedial investigations conducted between 1990 and 2011. Four samples have also been collected from sediment in Park Presidio Boulevard storm drains that feed into the Lake. Twelve surface water and seven sediment elutriate (liquid expressed during dewatering) samples have also been collected and analyzed. The analytical results were presented and summarized in the *Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco* (RI Summary; URS 2011) and *Letter Report – Sediment Sampling at Mountain Lake, The Presidio Trust, San Francisco, California* (Kennedy/Jenks 2012). Metals, pesticides, and petroleum hydrocarbons were detected in sediment above screening levels. Contaminants were not detected above water quality criteria in surface water.

Based on the results of remedial investigations, a risk assessment was performed in this Draft FS/RAP to assess potential risks to human health and ecological species from exposure to

contaminants in sediment of Mountain Lake. The risk assessment demonstrated that contaminants in Mountain Lake do not pose a risk to human health because humans are not exposed to sediment with contaminant concentrations exceeding levels that are protective of human health. However, contaminants in sediment of the Lake do pose an unacceptable risk to ecological, aquatic receptors in the lake. Chemicals of concern (COCs) in sediment of Mountain Lake that pose an unacceptable risk to ecological species are lead and total petroleum hydrocarbons as motor oil (TPHmo).

The following remedial alternatives were evaluated in this Draft FS/RAP to address sediment with COCs exceeding ecological cleanup levels:

- Alternative 1 – No Action: Under this alternative, site conditions at Mountain Lake would remain unchanged as no action would be taken to remediate sediment.

- Alternative 2 – Capping: Clean sand would be imported and placed over sediment contaminated with COCs. Long-term monitoring and maintenance of the cap would be required.

- Alternative 3 – Dredging and Offsite Disposal with Limited Capping: Sediment contaminated with COCs would be removed by dredging, transported, and disposed at an offsite, permitted facility. As a contingency, a sand cap would be placed in areas where dredging is infeasible.

The proposed remedial action for Mountain Lake is Alternative 3, Dredging with Offsite Disposal and Limited Capping. The primary elements of the proposed remedy are:

- Dredging of 15,600 cubic yards of sediment from the lake to achieve remaining COC concentrations that are protective of ecological resources.

- Placement of a sand cap in areas that cannot be dredged.

- Dewatering of sediment and discharge of water back into the lake.

- Transportation to and offsite disposal of dewatered sediment at an offsite, permitted landfill.

- Restoration of areas impacted by operations.

Under the proposed remedy, the California Department of Transportation (Caltrans) would stabilize Highway 1 to protect the roadway from failure during dredging operations and treat runoff from Highway 1 to prevent future buildup of contaminants in the Lake. The cleanup actions are scheduled to occur in two construction seasons. The Highway 1 stabilization would be conducted in 2012 and the sediment dredging is scheduled for 2013.

Alternative 3 provides a high level of protection to human health and the environment, is implementable, likely results in the greatest benefit for the cost to implement, and complies with applicable and relevant laws and regulations. The present worth of the proposed remedy is $9.2 million.

Section 1: Introduction

1.1 Purpose

On behalf of the Presidio Trust (the Trust), Kennedy/Jenks has prepared this Draft Feasibility Study and Remedial Action Plan (Draft FS/RAP) to address the remediation of contaminated sediment within Mountain Lake in the Presidio of San Francisco, California (Presidio or the Site). The project location is shown on Figure 1-1 and the Site location is shown on Figure 1-2.

The project activities have been, and will continue to be performed by the Trust, under the regulatory oversight of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). As operator of the immediately adjacent highway, Caltrans is also cooperating in developing and implementing the sediment remediation project.

The Draft FS/RAP is prepared to comply with applicable requirements of the U.S. Environmental Protection Agency (USEPA) National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR), Part 300.400 (USEPA 1990) and the California Health and Safety Code (HSC), Chapter 6.8, Section 25356.1. The Draft FS/RAP is also intended to facilitate community review and public participation in selection of a remedial alternative to address chemically-impacted sediment on the floor of Mountain Lake.

1.2 Report Organization

This Draft FS/RAP document is structured to be consistent with relevant USEPA guidance documents (USEPA 1988). The remainder of this report is organized as follows:

- Section 2 provides the background for the project.
- Section 3 summarizes previously acquired information on the setting and environmental conditions at Mountain Lake, presents an evaluation of risk to human health and the environment, selects chemicals of concern (COCs) in lake sediment, and defines the remedial action area.
- Section 4 presents the Remedial Action Objectives (RAOs).
- Section 5 presents the applicable, relevant and appropriate requirements (ARARs).
- Section 6 discusses the screening of technologies and process options and develops the specific remedial alternatives.
- Section 7 presents the detailed analysis of remedial alternatives.
- Section 8 presents the proposed Remedial Action Plan.

At the end of the text, the reference documents used in developing this document are identified.

The following documentation is provided in appendices to this Draft FS/RAP:

- Appendix A includes sediment and surface water analytical data collected during remedial investigations of the Lake.
- Appendix B lists documents in the Administrative Record.
- Appendix C presents Mountain Lake sediment cross sections (URS 2011).
- Appendix D presents the calculation of 95 percent Upper Confidence Limits for potential chemicals of concern under baseline and post-remediation conditions.
- Appendix E presents an analysis of Scatter Plots used to determine background metals concentrations in Lake sediment.
- Appendix F provides Green Remediation Evaluation Matrices used in support of the remedy selection.
- Appendix G presents Cost Estimates for the remedial alternatives included in the Draft FS/RAP.
- Appendix H summarizes Project Controls to minimize Potential Impacts to Human Health and Resources that will be implemented under the proposed remedy.
- Appendix I presents California Environmental Quality Act (CEQA) compliance documents prepared by DTSC for the Mountain Lake remediation project.
- Appendix J presents DTSC's Statement of Reasons and Non-Binding Preliminary Allocation of Responsibility.
- Appendix K of the Final FS/RAP will include a Responsiveness Summary to comments received during the public comment period on the Draft FS/RAP.

Section 2: Background

2.1 Mountain Lake Description and History

2.1.1 Description

As shown on Figure 1-2, Mountain Lake is located at the southern boundary of the Presidio. It is bordered on the west by Park Presidio Boulevard (also known as Highway 1), on the north and east by the Presidio golf course, and to the south by Mountain Lake Park and residences to the north of Lake Street. Mountain Lake is approximately four acres in size and has a maximum depth of approximately 10 feet. Approximately 0.4 acre of the southwestern corner of the lake is owned and operated by the City of San Francisco (Figure 1-2). The watershed for the Lake is approximately 162 acres (Trust 2000, URS 2011).

Park Presidio Boulevard is one of only a few major north-south vehicle thoroughfares in western San Francisco. Use of the adjoining land to the north, east and south is predominantly recreational. Picnicking, dog-walking, and hiking, are popular recreational activities. In addition, Mountain Lake Park, owned and operated by the San Francisco Recreation and Parks Department, includes children's play structures, tennis courts, picnic areas, and a small beach along the south edge of the lake. Fishing, swimming and recreational boating are not permitted on Mountain Lake.

The Lake area includes open water, wetlands, and riparian woods and vegetation. The Lake and surrounding upland areas support a variety of exotic and native plant and animal species. As the Lake has become shallower, emergent vegetation has become more prevalent along the shoreline. Some habitat enhancement and public access improvement work has been completed under a separately-funded Mountain Lake Enhancement Plan (Trust, NPS, and GGNPA 2000), There are no known special status or endangered species that reside in the Lake (Trust 2000, URS 2011).

2.1.2 History

Mountain Lake is historically significant and is a contributing feature to the Presidio of San Francisco National Historic Landmark District (NPS 1993). It has intrinsic and historic value as one of the few remaining natural lakes in San Francisco, and the only lake in the Presidio (Trust 2000).

Mountain Lake originally extended farther westward and northward. Significant filling of the Lake occurred in 1939 during construction of the adjacent Park Presidio Boulevard and the nearby MacArthur Tunnel, reducing the surface area of the Lake by approximately 40 percent. Over the past sixty years, runoff from Park Presidio Boulevard, the golf course and other nearby areas has contributed to sediment buildup in the Lake. The filling of the lake in 1939 and continuing sedimentation has decreased the depth of the Lake from approximately 30 feet to 10 feet (Trust 2000, URS 2011). Near-shore deciduous vegetation has contributed organic matter to the sediment layer.

2.2 Summary of Previous Investigations

Over 185 samples of sediment have been collected from the Lake during remedial investigations conducted between 1990 and 2011. Four samples have also been collected from sediment in Park Presidio Boulevard storm drains that feed into the Lake. Twelve surface water and seven sediment elutriate (liquid expressed during dewatering) samples have also been collected and analyzed. The analytical results were presented and summarized in the *Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco* (RI Summary; URS 2011) and *Letter Report – Sediment Sampling at Mountain Lake, The Presidio Trust, San Francisco, California* (Kennedy/Jenks 2012). Table 2-1 summarizes the sediment sampling and analysis activities. Table 2-2 summarizes the surface water and sediment elutriate sample collection activities. The sample collection locations are shown on Figure 2-1. Sediment and surface water analytical data tables are included as Appendix A.

2.3 Public Participation Activities

To facilitate information exchange between the Trust and the public, the Trust prepared a Community Relations Plan (CRP) for the Presidio environmental remediation program (Trust 2001). The CRP provides information on public participation in the environmental cleanup decisions at the Presidio and opportunities for public input.

In accordance with the CRP, DTSC and the Trust have implemented a public participation program for the Mountain Lake remediation project. The program has included community meetings, notices, and opportunities for early public input on the planned remediation of Mountain Lake. Prior to release of this Draft FS/RAP for public comment, DTSC and the Trust held information sessions with community members on 26 September 2011, 16 November 2011, and 25 January 2012.

Pursuant to DTSC RAP Guidance (DTSC 1995), this Draft FS/RAP is subject to public review and comment as follows:

- Preparation and distribution of a fact sheet (called a Proposed Plan) on the Draft FS/RAP to a Mountain Lake Community mailing list, Presidio Environmental Remediation mailing list, DTSC RAP Mailing List, and residents near the project site. The Proposed Plan for this Draft FS/RAP was distributed prior to the start of the public comment period.

- Announcement of the release of the Draft FS/RAP for public review in a Presidio E-Newsletter (transmitted to Presidio tenants), advertised in the San Francisco Chronicle, and posted on the Trust's public website and DTSC's EnviroStor website.

- A 45-day public comment period on the Draft FS/RAP that was announced by a public notice. The public comment period was specified in the Proposed Plan and public notice.

- A public meeting to present the contents of the Draft FS/RAP and receive comments.

- Preparation of a Responsiveness Summary that will respond to oral and written comments on the Draft FS/RAP received during the public comment period. The Responsiveness Summary will be included as Appendix K in the Final FS/RAP.

- Availability of the Administrative Record. Documents related to the Draft FS/RAP are available for public review as part of the Administrative Record, maintained at the Presidio Library at 34 Graham Street, San Francisco. The Administrative Record List is included as Appendix B.

- Preparation of and availability of CEQA documents. CEQA requires state and local agencies to consider the environmental consequences of projects that they undertake, fund, or permit. The CEQA Initial Study and Draft Negative Declaration for the implementation of the proposed remedial alternative have been prepared by DTSC in compliance with CEQA. The CEQA documentation is subject to public review concurrently with the Draft FS/RAP for the 45-day public comment period.

Section 3: Summary of Site Conditions

3.1 Geology and Hydrogeology

Mountain Lake overlies the Colma formation (Trust, NPS, and GGNPA 2000). However, data and boring logs from samples of accumulated sediment in the Lake indicate contributions from serpentinite and other Presidio native formations, such as greenstone. Greenstone is a native, secondary geologic unit that occurs at the Presidio (Schlocker 1974; EKI 2002). Also, the Lake was filled in 1939 with cuttings and materials during construction of Park Presidio Boulevard and the associated MacArthur Tunnel. Therefore, sediment in the Lake appears to contain a mixture of native materials and imported materials from nearby areas in the Presidio that may not be representative of the underlying Colma formation. The beach area along the south edge of the Lake, within the City of San Francisco property, also contains imported sand.

Evaluation of sediment cores previously collected from the Lake floor indicate that near-shore sediment is organically enriched, and contains a surface layer of vegetative materials reflective of the vegetation surrounding the Lake. Sediment cores collected away from the shoreline appeared generally uniform and contained mixtures and varying layers of peat, sand, silt, silty sand, and clay. Five cross-sections of the Lake-bottom sediments were constructed using the sediment core logs. These cross-sections are presented in the RI Summary (URS 2011), included in Appendix C, and summarized as follows:

- In the first cross-section, the shorelines consist primarily of sand with or without silt and organic material. The inner portion of the Lake consists of relatively homogenous organic matter.

- In the second cross-section, the western shoreline consists of a mixture of sand, silt, clay, and peat. The inner portion of the Lake consists of organic matter and fine-grained sediment. The eastern shoreline consists primarily of sand, with some clay and peat.

- In the third cross-section, the northern shoreline consists of sand and organic matter. Fine-grained sediments extend towards the middle and southern portions of the Lake.

- In the fourth cross-section, cores closest to the western shoreline consist primarily of sand and sandy silt or clay.

- In the fifth cross-section, a layer of peat is present from the western side of the Lake to approximately 120 feet from the eastern side of the Lake. The eastern side of the Lake consists of interbedded lenses of clay, silt, and sand.

Deeper sediment cores were collected from five locations within the Lake in 1998. The lithology of the sediment is described in the *Report of Sediment Sampling at Mountain Lake* (EKI 1998). The total depths of the cores ranged from 10.6 to 20 feet. In general the material encountered in the five cores was characterized as predominantly black and fine-grained (silt and clay). In three cores, the sand increased at approximately 11 to 15 feet. In one core, interbeds of dark gray and olive colored clayey silt were observed from approximately 14.8 to 17 feet.

Deeper sediment cores were also collected from the middle of the Lake in 1999 and 2000 by a UC Berkeley professor and graduate students. The stratigraphy of a composite core was summarized in a Masters thesis (Reidy 2001). As described in Reidy 2001, sediment within the top six feet is fairly homogenous. The sediment is silty clay from 0 to 5.2 feet with a laminated layer at approximately 2.4 feet in depth. From 5.2 feet to 6.2 feet, there is an increase in clay. Between 6.2 feet and 14.8 feet, there is organic clay with some peat. From 14.8 feet to 15.7 feet, the sediment changes to clay silt. The core is coarsely laminated between 15.7 feet and 18.9 feet and contains peat and plant macrofossils. Between 18.9 feet and 19.5 feet, the sediment is organic rich clay.

3.2 Hydrology

The San Francisco climate is characterized by cool, foggy summers, without significant precipitation. Precipitation typically occurs as rainfall between October and April, with an average annual rainfall of approximately 20 inches.

Mountain Lake is largely fed by groundwater. In addition, runoff from Park Presidio Boulevard, the Presidio golf course, and riparian areas around the Lake typically flows into the Lake during winter storm events. Runoff from Park Presidio Boulevard flows through three drainage culverts into the western portion of the Lake. However, groundwater from the MacArthur Tunnel dewatering system flows into the Lake on a continual basis. The water level in the Lake is controlled by an outlet structure, which discharges to a pipeline that flows westward beneath Park Presidio Boulevard and then discharges to the City's Richmond Transport pipeline near the headwaters of Lobos Creek.

3.3 Conceptual Site Model

Groundwater from the ongoing dewatering of the MacArthur Tunnel for Park Presidio Boulevard is discharged to the Lake. In addition, stormwater runoff from Park Presidio Boulevard enters Mountain Lake through one of three drainage structures located in the western bank of the Lake. Elevated concentrations of lead and petroleum hydrocarbons in the Lake sediment have been attributed to the highway drainage.

The Presidio golf course discharges runoff to the Lake through culverts at the eastern and northern edges of the Lake. Runoff from the golf course was a historical source of pesticide contamination to the Lake. However, the golf course now operates under an Integrated Pest Management Program which controls pesticide and fertilizer use at the golf course in a manner that minimizes risks to human health, ecological species, and the environment (Arnold Palmer Golf Management and Trust 2005). Pesticides are only used in very limited quantities when non-chemical methods have been ineffective at keeping pest levels below action thresholds. The golf course has annually monitored metals, pesticides, and/or general chemistry parameters in stormwater since 1996 (Blankinship 2010). The data indicate that contaminants are not present at levels of concern in stormwater from the golf course. Thus, the golf course is not a significant continuing source of contaminants to Mountain Lake.

Water from Mountain Lake is not used for drinking water supply. However, the Lake is in the Lobos Creek groundwater basin. Lobos Creek is used as the Presidio's drinking water supply.

Fishing, recreational boating, and swimming are not permitted in the Lake. Wading at the southern beach area may occur occasionally, providing a limited mechanism for human contact with surface water and submerged Lake sediments. Overall, the potential for human contact with the Lake floor sediment is considered to be very low (URS 2011).

The existing and planned future indirect use of Mountain Lake is to provide wildlife habitat and an aesthetic feature for land-based recreational activities such as bird-watching and walking. The *Vegetation Management Plan* for the Presidio identifies Mountain Lake as a native plant communities zone (Trust and NPS 2001).

Based upon current and anticipated future uses of Mountain Lake, a conceptual site model has been developed and is presented on Figure 3-1. This figure illustrates potential pathways for contaminants to enter the Lake and for potential exposure.

3.4 Identification of Potential Chemicals of Concern (PCOCs)

In the RI Summary (URS 2011), potential chemicals of concern (PCOCs) were selected by comparing contaminant concentrations with screening levels. The screening levels used in the RI Summary were cleanup levels identified in the *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water* (EKI 2002). Cleanup levels applied for Mountain Lake sediment were ecological freshwater sediment criteria. Background metals concentrations characterized for the Colma formation were also used to select metal PCOCs if the background concentrations were higher than the freshwater criteria. Cleanup levels for surface water were water quality criteria for freshwater organisms. Surface water data were also compared with drinking water standards (e.g., maximum contaminant levels). In general, PCOCs were identified as those chemicals with at least one concentration exceeding its respective cleanup level. The PCOCs are summarized in Table 3-1.

3.4.1 PCOCs in Sediment

The following are PCOCs in Lake sediment (URS 2011):

- Metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc.[1]
- Pesticides: 4,4-dichlorodiphenyldichloroethane (DDD), alpha-BHC, beta-BHC, gamma-BHC (lindane), delta-BHC, alpha chlordane, and gamma chlordane.[2]
- Total petroleum hydrocarbons as diesel (TPHd) and as motor oil (TPHmo).

[1] Antimony was not selected as a PCOC in the RI Summary (URS 2011) because only one sample had an antimony concentration exceeding its cleanup level. Although antimony is not a PCOC, due to uncertainties with high reporting limits for non-detect values, DTSC requested that post-remediation sediment confirmation samples for antimony be collected.

[2] The RI Summary (URS 2011) indicated that 4,4-dichlorodiphenyldichloroethylene (DDE) was detected above its cleanup level. However, 4,4-DDE was not detected above the cleanup level in Mountain Lake sediment (Table 4 of the RI Summary). Therefore, 4,4-DDE is not retained as a PCOC in this Draft FS/RAP.

Lead is the primary PCOC in Lake sediment due to the high number and widespread distribution of sediment samples containing lead at concentrations exceeding its cleanup level. The presumed source of lead and other metals is stormwater runoff and drainage from the adjoining Park Presidio Boulevard (URS 2011).

Elevated concentrations of TPHd and TPHmo tend to be co-located with elevated concentrations of lead and zinc, suggesting a common source. The highest concentrations of TPHd and TPHmo were detected in sediment samples collected near the storm drain outlets along Park Presidio Boulevard at the western portion of the Lake (URS 2011).

3.4.2 PCOCs in Surface Water

The levels of chemicals detected in surface water samples from the Lake are less than water quality criteria and drinking water standards. Thus, there are no PCOCs in surface water at the Lake (URS 2011).

3.5 Risk Evaluation

The current and planned future use of Mountain Lake is wildlife habitat. Fishing and swimming are not permitted in the Lake. Visitors to Mountain Lake typically engage in activities where there is no exposure to sediment. Wading may occur occasionally at the southern beach area; however, human exposure to sediments during wading is expected to be infrequent and of limited duration. Furthermore, concentrations of lead and other PCOCs in sediment samples collected from the southern beach area are below levels that are protective of human health (Kennedy/Jenks 2012). Also, the ecological-based cleanup level for lead, which is the primary PCOC, is lower than the levels that are protective of human health, so remediation of sediment to address risk to ecological receptors would be protective of potential human exposures (URS 2011). Therefore, contaminants in the Lake sediment do not pose a risk to human health.

Previous evaluations of water concentrations in Mountain Lake concluded that surface water data meet water quality criteria for aquatic life and drinking water standards (e.g., maximum contaminant levels). Therefore, ecological risk from surface water exposure and domestic use of surface water in Mountain Lake are not exposure pathways of concern and were not evaluated further in the risk evaluation (URS 2011).

Ecological receptors could be exposed to PCOCs in sediment at Mountain Lake. Common species of fish, amphibians, waterfowl, and mammals that occupy the Lake and surrounding area may be exposed to sediment at Mountain Lake. Complete exposure pathways for aquatic species living in the water column or sediment are direct contact with or uptake of PCOCs in sediment and dietary exposure to PCOCs. For aquatic-dependent wildlife, the primary exposure pathway of concern is dietary exposure to PCOCs (URS 2011). There are no sensitive species (i.e., species on federal or state lists of threatened and endangered species) that reside in the Lake but these species could occupy the area after the cleanup and future Lake enhancement activities (Trust, NPS, and GGNPA 2000).

Risks to ecological receptors were evaluated in this FS/RAP for baseline conditions at Mountain Lake, which assumed no remediation of sediments. To evaluate risk, the 95 percent upper confidence limit on the arithmetic mean (95 percent UCL) concentrations in sediment were estimated for each of the PCOCs (see Appendix D). The 95 percent UCLs were calculated using data from the upper 3 feet of sediment because this is the exposure interval for ecological

receptors and where biological activity in the lacustrine environment is expected to occur (URS 2011).

The 95 percent UCL sediment concentrations were compared with the freshwater sediment cleanup levels for Mountain Lake, which are based on ecological freshwater sediment criteria (EKI 2002). For metals, background concentrations for the Colma formation were used for screening if they were higher than the freshwater sediment criteria (EKI 2002). The calculations of the 95 percent UCL concentrations and comparisons with freshwater sediment cleanup levels are included in Appendix D. As shown in Appendix D, Table D-2, the 95 percent UCL concentrations for lead, nickel, and TPHmo in sediment exceed their respective freshwater sediment cleanup levels. Thus, it is concluded that baseline conditions in sediment present an unacceptable risk to the ecosystem in and around Mountain Lake.

3.6 Nature and Extent of Chemicals of Concern in Sediment

The nature and extent of contamination in Mountain Lake sediment was evaluated based on the results of the risk evaluation. The sediment remediation should address the chemicals of concern (COCs), which are those chemicals with 95 percent UCL concentrations greater than the respective cleanup level and not representative of background. This section describes the evaluation of background metals, identifies the COCs in lake sediment, and develops the remedial action area.

3.6.1 Evaluation of Background Metals

For screening purposes in the risk evaluation, metal sediment concentrations were compared with background concentrations for the Colma formation. However, boring logs from Mountain Lake cores show the presence of olive/gray fines, which indicates the possible presence of greenstone materials (URS 2011). Greenstone is a secondary geological unit that occurs at the Presidio (EKI 2002). Greenstone has been identified in fill at Graded Area 9, which is in the vicinity of Mountain Lake at the Presidio, and at the Transfer Station, which is located above the MacArthur Tunnel (EKI 2002). Cuttings from the construction of MacArthur Tunnel were used to fill the western portion of the original Mountain Lake during construction of Park Presidio Boulevard.

Appendix E provides an evaluation of background metals in Mountain Lake sediment. Bivariate scatter plots for metals data from the Presidio were prepared for sediment samples collected from Mountain Lake. The data for Mountain Lake are compared with data representing background for serpentinite, the Colma formation, and greenstone (Schlocker 1974; EKI 2002). The evaluation in Appendix E demonstrates that Mountain Lake sediment is likely a mix of Colma formation and greenstone and that chromium, nickel, and vanadium concentrations in Mountain Lake sediment are consistent with background concentrations for that mix of material.

3.6.2 Chemicals of Concern (COCs) in Sediment

The COCs in Mountain Lake sediment are a subset of the PCOCs. The COCs are defined as PCOCs in Lake sediment with 95 percent UCL concentrations that exceed the freshwater sediment cleanup levels from the *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water* (EKI 2002) under baseline (current) conditions and are not associated with background. The 95 percent UCL calculations for baseline conditions

are included in Appendix D. Based on the calculation of 95 percent UCLs and metal background concentrations at the Presidio, the COCs in Mountain Lake sediment are:

- **Lead:** Lead has a 95 percent UCL concentration of 432 milligrams per kilogram (mg/kg), which is above the freshwater sediment cleanup level of 82 mg/kg, and is not assumed to be associated with native material. Lead is considered the primary COC in Lake sediment due to the high number and widespread distribution of sediment samples containing lead at concentrations exceeding its cleanup level.

- **TPHmo:** TPHmo has a 95 percent UCL concentration of 286 mg/kg, which is above the freshwater sediment cleanup level of 144 mg/kg.

The 95 percent UCL concentration for nickel under baseline conditions is above the freshwater sediment cleanup level. However, as discussed in Section 3.6.1 and Appendix E, nickel in Lake sediment is representative of background concentrations in native and fill material. Therefore, nickel is not a COC in Lake sediment. All other PCOCs have 95 percent UCL concentrations in sediment below freshwater sediment cleanup levels (Appendix D).

As discussed in Appendix D, there is uncertainty in the data set for cadmium due to potential analytical interference. The 95 percent UCL concentration for cadmium based on the 2005 data set is below the cleanup level, so cadmium is not a COC in Lake sediment. The 2001 cadmium data set was not included in the 95 percent UCL calculation because of the potential interference. To confirm the 2001 detections and ensure that no elevated concentrations will remain after the cleanup, cadmium will be included in the confirmation sampling following sediment removal.

3.6.3 Remedial Action Area

Based on the risk evaluation, the remedial action area at Mountain Lake was delineated as the area containing concentrations of COCs in sediment that pose an unacceptable risk to the Mountain Lake ecosystem. The remedial action area was drawn to include all sample points with lead and TPHmo exceeding cleanup levels. Additionally, the area was expanded vertically to a depth of 5.5 feet below sediment surface (bss) at location MLSE 21 in the eastern arm of the Lake to cover the maximum detected concentration of selenium at 12 mg/kg, which is almost an order of magnitude higher than its cleanup level of 1.6 mg/kg.

The remedial action area at Mountain Lake covers nearly the entire footprint of the Lake to a depth of 2.5 feet bss, and some areas to 4.5 to 6.5 feet bss. The remedial action area is shown on Figure 6-4. The anticipated volume of sediment in the remedial action area is 15,600 cubic yards. This volume takes into account the removal of the COCs and actual implementation of a sediment removal process.

The Mountain Lake remedial action area is primarily within the limits of the Presidio property. Based upon analytical results of samples collected from the beach area of Mountain Lake Park in December 2011, concentrations of PCOCs in sediment in the City-owned portion of the Lake are below sediment cleanup levels (Kennedy/Jenks 2012). As shown on Figure 6-4, the remedial action area dips into the City limits only to cover one sample location (MLSE 28) adjacent to the City boundary.

Following remediation of sediment in the remedial action area, COC concentrations in sediment are not expected to pose an unacceptable risk to ecological receptors. In Appendix D, post-remediation 95 percent UCL concentrations for the PCOCs were calculated using the existing data set and assuming removal of sediment from the remedial action area. As shown in Appendix D, the post-remediation 95 percent UCL concentration of the primary COC (lead) in the remaining top 3.5 feet of sediment would be reduced to 26 mg/kg, which is well below the freshwater sediment cleanup level of 82 mg/kg. The post-remediation 95 percent UCL concentrations for the other PCOCs calculated are also below the freshwater sediment cleanup levels and the metal background concentrations. Post-remediation confirmation sampling following sediment removal in the remedial action area would confirm that COC concentrations have been reduced to acceptable risk levels.

Section 4: Remedial Action Objectives and Cleanup Levels

The NCP and CERCLA require that remedial measures be protective of human health and the environment. Remedial Action Objectives (RAOs) are developed to address COCs (primarily lead for this Site) and a specified medium (Lake sediment). CERCLA guidance also states that RAOs should include criteria for COC concentrations and potential exposure routes. RAOs have been developed for Mountain Lake based on current and planned land use.

4.1 Planned Land Use

Current and planned land use of the Lake and in the immediate vicinity is for recreation and wildlife habitat. Fishing, swimming, and recreational boating are not allowed at the Lake. Therefore, the potential for future human contact with the Lake sediment is very limited. Recreational activities such as walking, dog walking, and bird watching are expected to occur around the shores of the Lake. A separately-funded effort is underway to enhance the Lake, including restoration of native plants and other Lake enhancements to improve ecological functions (Trust, NPS, and GGNPA 2000).

4.2 Mountain Lake Sediment Cleanup Levels

In the *Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water* (Cleanup Level Document; EKI 2002), the Trust developed cleanup levels for various media and receptors in the Presidio. The Cleanup Level Document outlines procedures to identify specific cleanup levels that are applicable to a given contaminant release site. The procedures include selecting cleanup levels based on site-specific considerations including current and future site land use.

Based on current and future land use at Mountain Lake, freshwater sediment cleanup levels will be applied to Mountain Lake. Table 3-1 includes the sediment cleanup levels for PCOCs at Mountain Lake.

4.3 Remedial Action Objectives

The RAOs used to evaluate remedial alternatives and develop the remedial action plan include specific technical objectives and general strategic objectives that pertain largely to the beneficial use of the Lake. RAOs are developed specifically for the COCs, exposure route, and media of interest, as discussed in Section 3. Considering the current and planned future land use and the cleanup objectives described above, the RAOs for Mountain Lake are as follows:

- **General RAOs:** The general RAOs for the Mountain Lake sediment remediation project are provided below.
    - Protection of human health and the environment.
    - Protection of water quality and ecological resources.
    - Remediation of contaminant mass (primarily lead) in the Lake sediment, and elimination or reduction in further accumulation of contaminant mass.

- Preference for permanent remedies, whenever practicable, cost effective, and consistent with planned use of the Lake.

- **Site-Specific RAOs:** The specific RAOs for the Mountain Lake sediment remediation project are provided below.

  - Remediation of sediment in a manner that would not further impair Lake health or habitat quality.

  - Planning, design, and performance of the sediment remediation activities in a manner that maintains structural stability of the western shore and adjoining Park Presidio Boulevard. Undermining or destabilization of Park Presidio Boulevard is an unacceptable consequence of the sediment remediation activities.

  - Control of future chemical release to the Lake associated with stormwater discharges from Park Presidio Boulevard.

Section 5: Applicable or Relevant and Appropriate Requirements

This Draft FS/RAP has been developed to be consistent with the NCP and CERCLA. In accordance with Section 121(d)(1) of CERCLA (42 USC Section 9621[d]), remedial actions performed under CERCLA must achieve a level of cleanup and control of hazardous substances, pollutants, or contaminants that assures protection of human health and the environment. Additionally, remedial actions that propose to leave hazardous substances onsite must meet the substantive requirements of federal environmental laws or more stringent state environmental and facility siting laws, referred to as applicable or relevant and appropriate requirements (ARARs). In evaluating remedial alternatives, the NCP also requires consideration of ARARs, which it defines as follows (40 CFR 300.5):

- Applicable requirements are "...those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site."

- Relevant and appropriate requirements are "...those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site."

ARARs are categorized as chemical-, action- or location-specific, as follows:

- Chemical-specific requirements are typically health or risk-based concentrations for specific substances in the various environmental media and represent the acceptable concentration of a specific chemical that may be found in, or discharged to, the environment based on protecting potential receptors from adverse health effects associated with the specific chemical. Chemical-specific ARARs are the primary criteria used to establish cleanup levels.

- Action-specific requirements generally set performance, design, or other similar activity- or technology-based controls related to the management of hazardous substances by restricting or directing specific types of remedial or waste management activities. Action-specific ARARs are used to identify and evaluate remedial action alternatives.

- Location-specific ARARs address restrictions on activities or permissible chemical concentrations in a particular location. For example, projects located in sensitive areas such as wetlands or a flood plain would include ARARs specific to these attributes of the project site in the evaluation of alternatives. Location-specific ARARs are used to identify and evaluate remedial action alternatives.

ARARs at the Presidio can be either federal or state requirements, with state requirements governing only when applicable to federal land and more stringent than federal requirements. In

addition to ARARs, which are regulatory requirements, to-be-considered material (TBC) should also be identified. TBCs are nonbinding criteria, advisories, guidance, and proposed standards that might provide useful information or recommended procedures for developing standards that protect human health and the environment. There may also be local permitting requirements and ordinances relevant when performing remedial actions.

ARARs and TBCs have been developed in Table 5-1 for the Mountain Lake remediation project using federal, state, and local statutes, regulations, and guidance. Compliance with the ARARs and TBCs criteria identified in Table 5-1 are considered during the preliminary screening of technologies. Compliance with ARARs is used as a threshold criterion during detailed analysis of the alternatives.

Section 6: Identification and Screening of Remedial Technologies

This section discusses the identification, development, and screening of alternatives for removal of contaminated sediment from Mountain Lake. The goal of the CERCLA remedy selection process is to develop and select remedial alternatives that meet the following broad objectives (USEPA 40 CFR 300.430(a)(1)(I)):

- Protect human health and the environment.
- Maintain protection over time.
- Minimize untreated waste.

To develop remedial alternatives that satisfy these goals, potential suitable technologies must be identified and screened. Technologies passing this screening process can then be retained to develop specific remedial alternatives.

The first step in the development of remedial alternatives is the identification of general response actions (GRAs) considered capable of achieving the RAOs and applicable technologies within these GRAs. The specific options within each GRA are then screened based on their effectiveness, implementability, and cost. The screening process is intended to identify promising technologies and process options (specific forms or variations on technologies) potentially applicable to Site conditions.

Following this initial screening process, a range of comprehensive alternatives is then developed using the focused list of the more promising technologies. The alternatives are developed to be responsive to and satisfy the RAOs, which are developed to address specific contaminants impacting a specified medium. ARARs and TBCs that potentially apply to remedial activities are identified and used to supplement the preliminary evaluation of technologies.

The identification and screening process performed in this section is based on USEPA's general remedial investigation and feasibility study guidance (USEPA 1988) and specific contaminated sediment remediation guidance (USEPA 2005).

6.1 Identification of Technologies

As described in USEPA guidance (USEPA 1988), remedial alternatives are identified based on the following three components:

- **GRAs:** There are a few broad categories of remedial methods generally used to address the contaminated media (e.g., source control/natural recovery, institutional controls, containment, removal, or treatment).

- **Remedial Technologies:** Within each GRA there may be various types of technologies that represent the same general remedial method (e.g., different containment options include thin-layer capping, engineered caps, or active caps).

- **Process Options:** For each technology option there may be specific variations in the way the technology is implemented (e.g., variations in wet removal include mechanical or hydraulic dredging).

Following USEPA guidance (USEPA 1988, 2005), a wide range of contaminated sediment GRAs are identified for possible application to the Site. The GRAs are identified considering the addressable environmental media (sediment), as well as the site characteristics and the current understanding of the COCs. The GRAs responsive to the RAOs and that potentially contribute to satisfying the RAOs are as follows:

- **No Action:** This response is necessary to establish a baseline for comparison with the other potential remedial actions and is always evaluated in accordance with USEPA guidance (USEPA 1988). The No Action response assumes that no remedial action would be performed to reduce toxicity, mobility, or volume of the COCs in the impacted media.

- **Institutional Controls:** This non-engineering response includes legal, administrative, and procedural measures intended to mitigate the risks of exposure to contaminated sediment in Mountain Lake by restricting access to the Lake.

- **Monitored Natural Recovery (MNR):** This response relies upon ongoing, naturally occurring environmental processes such as chemical transformation, reduction in contaminant mobility/bioavailability, physical isolation, and dispersion that contain, destroy, or reduce the bioavailability or toxicity of contaminants in sediment and thereby reduce ecological and human health risks to acceptable levels (Magar 2009). A key component of this response is long-term monitoring to verify effectiveness.

- **Enhanced Monitored Natural Recovery (EMNR):** This response augments the natural recovery of contaminated sediments by accelerating the clean sedimentation rate and encouraging benthic re-colonization and the accompanying bioturbation to mix underlying contaminated sediment with the cleaner surface deposits. EMNR involves placing clean sediment or sand in a thin layer (e.g., six inches) above contaminated sediment. EMNR is fundamentally different from capping (see below) in that mixing of the surface deposits with underlying contaminated sediment is intended, whereas with capping the surface deposits are intended to restrict the mobility of underlying material.

- **In Situ Treatment:** This response applies traditional treatment methods previously implemented as full-scale ex situ technologies (e.g., stabilization or immobilization) to submerged sediments. Sediment geochemistry is altered by the introduction of sorbent amendments (e.g., activated carbon) into contaminated sediment to reduce exposure risks by increasing contaminant binding and therefore bioavailability and subsequent uptake by benthic organisms. In situ treatment in sediments is an innovative remediation method that is not yet widely employed, but is gaining greater support (USEPA 2005, ASTSWMO 2007).

- **Capping:** This response generally involves placing clean cover material over contaminated sediments to reduce unacceptable risk through three mechanisms (USEPA 2005):

- Physical isolation to reduce direct contact exposure and reduce contaminant mobilization by burrowing organisms.
- Stabilization and erosion protection to reduce contaminant re-suspension and transport.
- Chemical isolation to reduce direct contact exposure to dissolved contaminants.

Caps generally consist of one or more layers of granular material (e.g., clean sediment, sand, or gravel) that serve these primary functions.

- **Removal:** This response involves removal of contaminated sediments from the Site. Sediment removal can be performed either in the wet or in the dry. Wet removal or dredging involves removal of submerged sediment by mechanical or hydraulic means. Dry removal or excavation involves draining or diverting water from the excavation limits prior to sediment removal by conventional excavation means. For dredging operations, equipment must be selected, controls installed, and operational procedures followed to minimize the re-suspension and release of contaminants during the removal activities and minimize contaminant residuals that may remain following the removal operations (USEPA 2005, 2008). Both dredging and excavation would require transport of sediment to processing and/or disposal facilities.

- **Ex Situ Treatment:** This response is a component of a sediment remediation system that follows removal activities and precedes disposal or reuse of the treated materials. Dewatering is the most common form of treatment and generally precedes loading for off-haul to permitted disposal facilities. Other treatment processes are intended to destroy or reduce the toxicity, mobility, or volume of contamination in sediment prior to disposal or reuse.

- **Disposal Technologies:** This response is a component of a sediment remediation system that follows removal and possibly treatment activities. Sediment is generally disposed in an engineered in-water disposal facility or within an operating commercial upland landfill. These disposal facilities are specifically designed to control and limit environmental impacts associated with the contaminated sediments.

Table 6-1 lists these GRAs and corresponding remedial technologies with brief descriptions of specific process options considered in the screening analysis.

6.2 Technology Screening and Evaluation

A range of potential technologies and process options are identified for implementation of each GRA. Table 6-1 is used as the basis for the technology and process option screening process. Technologies and processes considered effective in the remediation of sediments contaminated by the COCs are considered. Following USEPA guidance (USEPA 1988), screening of the potential technologies and process options is based on simplified assessments of effectiveness, administrative and technical implementability, and the relative implementation cost, as described below:

- **Effectiveness:** This screening level criterion addresses the ability of the technology to meet the RAOs, mitigate potential impacts to human health and the environment during

construction and implementation, perform reliably with respect to the site-specific conditions and COCs, minimize unacceptable residual risk, and comply with ARARs. Technologies were also rated in terms of their relative effectiveness compared to other technology and process options within the same GRA.

- **Implementability:** This screening level criterion evaluates the site-specific technical and administrative feasibility factors involved in applying the technology or process option. Factors affecting implementability include available resources such as equipment and workers, site hydrogeology and soil types, physical obstructions such as buildings, permitting requirements, and availability and proximity of treatment and disposal facilities. As an example, options requiring equipment, specialists, or facilities that are unavailable may not be implementable and would be eliminated from further consideration.

- **Cost:** Relative costs were evaluated based on the components of both capital costs and long-term operation and maintenance (O&M) costs rather than detailed estimates. Costs are qualitatively based on engineering judgment, with each option evaluated as high, medium, or low relative to other options in the same category. Cost has a limited role in this phase of evaluation. Assumptions for unknown conditions are applied consistently to all options. Cost effectiveness is considered in terms of qualitative level of effectiveness and implementability for the cost expended. Alternatives providing comparable or reduced effectiveness and implementability for a greater cost expenditure than another alternative providing equal or greater effectiveness or ease of implementation may be eliminated from further consideration.

Screening of technologies and process options is based on the current conditions and uses of the Site and/or reasonable likely future conditions and uses related to ecological restoration and stormwater management at Mountain Lake, as currently understood for the Site. Consequently, for the screening and evaluation of remedial technologies and process options, existing Site conditions and uses are generally assumed, and information on likely potential future uses is used where available.

A summary of the screening evaluation of technologies and process options based on effectiveness, implementability, and cost is shown in Table 6-2. The technologies and process options that were retained for further consideration are also indicated in Table 6-2. The following technologies and process options have been retained as applicable strategies for remediation of sediment at Mountain Lake:

- No Action.
- Conventional Sand Cap.
- Armored Cap.
- Mechanical Dredging.
- Hydraulic Dredging.
- Upland Commercial Landfill Disposal.
- In-Barge Dewatering.
- Lagoon Dewatering.
- Geotextile Tube Dewatering.
- Mechanical Dewatering.
- Reagent Dewatering.

6.3 Development of Potential Remedial Alternatives

Following the screening evaluation, those technologies and process options considered feasible are assembled into remedial alternatives to address impacted sediment in Mountain Lake. When multiple technologies or process options are considered effective, implementable, and cost-effective, a representative option is chosen or combined with others and used in the development and analysis of remedial alternatives. A detailed analysis of each alternative is performed to identify and recommend the remedial alternative best suited for addressing impacts to sediment in Mountain Lake.

Implementable remedial alternatives were developed by assembling relevant combinations of the retained technologies and process options. Various options are identified above for dredging and dewatering, however only one specific process option is presented in the development of specific alternatives based on site-specific implementation preferences and a perception that the chosen option is the most likely process option to be applied at the Site. These are assumptions for the purpose of developing alternatives to reduce the number of alternative permutations to a manageable number of alternatives that are generally representative of the overall technology type and response action. This should not be inferred as an indication that these process options are necessarily preferred or superior as compared to all other potential process options. Process option selection will ultimately be determined during remedial design or chosen by the Contractor during development of the construction operation plan detailing implementation means and methods.

In particular, two principal dredging processes were retained from the screening analysis, hydraulic and mechanical dredging. Although both processes may be effective at the Site in removing sediments, development of remedial alternatives has been based on hydraulic dredging as representative of wet removal technology. Similarly, there are multiple dewatering processes that may be effective in pre-treating the dredged contaminated sediments prior to disposal. As space constraints will likely be a controlling site constraint, mechanical dredging has been included in the description of remedial alternatives as representative of dewatering processes. Based on these simplifying assumptions, three principal remedial alternatives are considered in this detailed evaluation:

- Alternative 1: No action.
- Alternative 2: Capping.
- Alternative 3: Dredging with Offsite Disposal and Limited Capping.

All alternatives assume that the targeted area of sediment contamination is as described in Section 3. These remedial alternatives are developed to address the RAOs presented in Section 4. The remedial alternatives developed for evaluation are described below in more detail and summarized in Table 6-3.

6.3.1 Alternative 1 – No Action

The No Action Alternative includes no remedial activities. In accordance with the NCP (40 CFR 300.420(e)(6)), the No Action Alternative must be assessed to provide baseline comparison with other alternatives. The No Action Alternative does not include active remediation or monitoring. No cost is associated with this alternative. If the No Action Alternative

is selected, contaminated sediments will continue to pose a potential risk to the health of ecological resources at the Site.

6.3.2 Alternative 2 – Capping

Capping is a well-developed process that has been employed as a remedial response at a number of Superfund sites. Capping involves depositing clean cover material over contaminated sediments. Capping at the Site would be intended to reduce COC concentrations at the sediment surface and reduce the flux of COCs to the water column. The cap would be designed in accordance with USEPA and U.S. Army Corps of Engineers (USACE) guidance to provide long-term chemical isolation and ensure the stability, integrity, and protectiveness of the cap as it is subjected to Site-specific erosive forces, which are anticipated to be limited.

- **Design and Installation:** The cap would be designed to meet the following objectives (ASTSWMO 2007, USEPA 2005, USACE 1998):

  - Provide physical isolation of COCs in sediment from humans and benthic organisms.
  - Provide protection from erosive forces, which can re-suspend sediments and redistribute them to other areas of the Lake.
  - Provide chemical isolation to reduce the flux of COCs into the water column.

  The lower portion of the cap forms an isolation zone that prevents the underlying contaminants from migrating via advection or diffusion into the overlying biologically active zone occupied by plants and benthic organisms. The cap thickness must be sufficient to mitigate the effects of rooting and burrowing of plants and benthic organisms, respectively, which may create preferential pathways for contaminant migration (ASTSWMO 2007, USEPA 2005).

  Caps are generally constructed of granular material (e.g., clean sediment, sand, gravel, rip rap), but may also include geotextile liners. Determination of the required cap thickness is governed by the physical and chemical properties of the contaminated sediment and capping material, bioturbation profile, and potential for consolidation and erosion of the cap (USEPA 1994). As a rule of thumb, 30 centimeters (cm) (approximately 12 inches) is the minimum cap thickness to provide adequate chemical isolation (USEPA 1994). Bioturbation depths are highly variable, but in most freshwater environments, bioturbation can be predicted to extend down to 20 to 40 cm (approximately 8 to 16 inches) for most organisms that would populate a site in great numbers (USACE 2001). Ultimately, cap thickness would likely be governed by the ability of conventional equipment to accurately place the capping material, which corresponds to a minimum cap thickness of 50 to 60 cm (approximately 20 to 24 inches; USEPA 1994).The limits of cap installation, as shown on Figure 6-1 are based on the remedial action area identified in Section 3. A standard cap cross section was assumed to include 12 inches of sand for the chemical isolation layer and 12 inches of sand for the bioturbation layer. Additional thickness to account for consolidation is not included since coarse-grained material (e.g., sand) is proposed for the capping material (USACE 1998). Due to the sheltered nature of the Lake, significant sources of erosion are not anticipated and an armoring layer is unlikely to be required except in near-shore areas such as adjacent to Park Presidio Boulevard (USACE 1998). A typical conceptual design cross section for the cap is shown on Figure 6-2. Based on the capping limits shown on

Figure 6-1 and the conceptual design cross section, it is estimated that approximately 10,390 cubic yards (cy) of clean granular material (e.g., sand) would be required to construct the cap.

Because of the disruptive nature of cap placement, sediment movement may occur during installation of the cap. Re-suspension and release of contaminated sediment may result in residues that redeposit on remaining sediment surfaces and/or newly installed cap surfaces (USEPA 2005, USACE 1998). To mitigate this condition, the capping operation must be conducted with care to minimize re-suspension, and cap installation in layers or lifts may be required to ensure adequate cover of contaminated sediment. Specific cap placement methods to achieve target cap thickness would be assessed during remedial design and the means and methods determined by the Contractor during implementation.

- **Transportation of Cap Material:** A material staging area with near-shore loading facilities would be required to transport the capping materials to marine vessels that are used to place the capping materials in accordance with the design requirements.

  Access to the staging area could be achieved via the existing West Pacific Avenue route, the existing Park Avenue route through the golf course, or via ramps providing direct access to Park Presidio Boulevard. The feasibility of providing direct access to Park Presidio Boulevard is pending. As access to and from the staging area has not yet been determined, truck capacities are not yet known. On the lower end of truck capacity, which might be required to negotiate steep ramps and tight turns onto Park Presidio Boulevard, standard dump trucks can typically haul 10 cy. On the higher end of truck capacity, which might be viable given a West Pacific Avenue routing scenario, transfer dump trucks can typically haul 18 cy. These hauling capacities correspond to 578 to 1,039 truck loads of cap materials.

- **Construction Monitoring:** During construction, a monitoring program would be implemented to track conformance with design plans and specifications during placement of the cap and to monitor the extent to which contaminated sediment is released and re-suspended during cap placement. Construction monitoring would include turbidity and water quality monitoring to measure the re-suspension of capping material and contaminated sediment (USEPA 2005, USACE 1998). The rate of cap placement may need to be adjusted (i.e., slowed) to mitigate water quality effects. Construction monitoring would also include interim and post-construction monitoring of the in-place cap using bathymetric surveys or sediment cores to confirm the thickness of the cap. A pre-construction bathymetric survey has already been completed to establish baseline conditions.

- **Source Control:** A critical component of any remedial action would be the cessation of future discharges of highway runoff to the Lake. The Trust and Caltrans have identified the need for future interception and diversion of the highway runoff, and the associated planning process is underway. Under the Capping Alternative, Caltrans would install and maintain stormwater treatment measures. These may include stormwater interceptor basins (grate inlet skimmer boxes) on drainage pipes to remove particulate matter and petroleum hydrocarbons from the highway runoff before it is discharged to the Lake.

- **Post-Construction Monitoring and Maintenance:** Consistent with USEPA and USACE guidance (USEPA 2005, USACE 1998), long-term monitoring and maintenance of the cap would be required to further ensure its long-term effectiveness and permanence. A properly

designed and installed cap would reduce future maintenance requirements. However, should erosion or damage to the cap occur, the affected area would be identified during post-construction monitoring and subsequently repaired.

A monitoring and maintenance plan would be prepared to identify sampling and analysis activities, data evaluation techniques, and contingent response actions following installation of the cap. Specific monitoring activities likely to be required include (USEPA 2005):

- Periodic bathymetric surveying to confirm cap thickness and stability over time.
- Sampling and analysis of surface sediments and upper cap layer to confirm physical and chemical isolation and assess potential recontamination.
- Water quality sampling and analysis.
- Biological monitoring of benthic communities that may re-colonize the capped area and the bioturbation behavior of benthic organisms that may compromise the cap.

The monitoring and maintenance plan for the Site would include a contingency action plan, which identifies specific measures that would be implemented to address deterioration or damage of the cap or ineffectiveness of the isolation layer as demonstrated by sediment, biotic, and/or water quality data.

As this alternative would leave in place contaminated materials preventing unlimited use and unrestricted exposure, a five-year review would be required pursuant to CERCLA requirements (USEPA 2001). An Operation and Maintenance Plan would be prepared to describe and track operation, maintenance, inspection, and monitoring activities to ensure that the remedy remains protective of the environment.

6.3.3 Alternative 3 – Dredging with Offsite Disposal and Limited Capping

Dredging is a well-developed process that has been employed as a remedial response at a number of Superfund sites. Dredging involves the mechanical or hydraulic removal of contaminated sediments. Some over-dredging is generally expected to ensure that the targeted contaminants are removed (USEPA 2005). Based on Site characterization information and bathymetric survey data, submerged obstructions, such as utilities, debris, boulders, and shallow bedrock that would limit the dredging operations are not expected at the Site.

Dredging is a remedial process operation comprised of multiple components. The key components in a dredging operation typically consist of dredging, transport to a processing facility, pretreatment and/or dewatering, loading, transport, and disposal. A typical process flow schematic for a dredging operation is shown on Figure 6-3.

- **Dredging:** To develop a detailed dredging alternative, hydraulic dredging is described as a representative option for wet sediment removal. Although contractor means and methods would be open to mechanical or hydraulic dredging, it is likely that hydraulic dredging would be proposed by implementation contractors because it minimizes Site impacts and the potential for cross contamination when compared to the other major wet removal option, mechanical dredging (Table 6-2). Hydraulically dredged material would be pumped through

a temporary pipeline or other similar transport to a staging area that would be constructed north of the Lake.

Based on the nature and extent of contamination presented in Section 3 and considering practical implementation constraints associated with conventional dredging equipment, including the removal of sediment windrows and over-dredging allowances, the dredging volume is estimated to be approximately 15,600 cy of in situ sediment (note that this volume is a refinement of the estimated volume in the RI Summary (URS 2011)). A conceptual layout of the dredging limits is shown on Figure 6-4.

Based on physical testing data (URS 2011), the average in situ sediment moisture content is 61 percent and the average dry sediment density is 72 pounds per cubic foot. Based on these data, the total solids quantity in the sediment to be removed is 4,573 cy or 4,417 tons.

Per USEPA guidance (1994), typical hydraulic dredging production data are as follows:

- Dredged solids concentration of 15 percent by weight.
- Dredging production rate of 100 cubic meters per hour.

These production data result in a total dredging quantity of 34,480 cy or 25,032 tons. Note that the estimated dredging volumes may increase during remedial design, which can commonly occur when additional data are collected, engineering analyses are completed, and dredge prisms are refined.

Because of the invasive nature of dredging, sediment movement would occur during dredging. Re-suspension and release of contaminated sediment may result in dredging residues that redeposit on remaining sediment surfaces (USEPA 2005, USACE 2008). To mitigate this condition, the dredging operation would be controlled to minimize re-suspension. Barrier controls such as silt curtains may not be effective as nearly the entire Lake area would be dredged. Multiple-pass dredging and/or over-dredging may be required to ensure adequate removal of contaminated sediment. Operational best management practices (BMPs) for water quality may include applying target production rates consistent with dredging of contaminated sediment, which is generally performed at a slower rate than typical maintenance dredging (USEPA 2005). In most cases, hydraulic dredging has been shown to have less sediment movement than mechanical dredging. During design and implementation, the hydraulic dredging solids concentration, production rates, cutter head design, and swing rate would be optimized to balance the reduction of sediment re-suspension and the time to complete the dredging operation (ASTSWMO 2007).

Hydraulically dredged sediments would be transported via pipeline or other similar transport to a staging area near the Lake where dewatering, loading, and transport operations would be carried out.

- **Geotechnical Stability:** Geotechnical stability of the Park Presidio Boulevard roadway embankment is a prerequisite to performing the dredging operation. Caltrans is currently conducting geotechnical investigations along Park Presidio Boulevard in the vicinity of Mountain Lake to collect information necessary for engineering analysis and design of an embankment stabilization remedy. Based on preliminary assessment of Site conditions,

Caltrans has indicated that installation of a network of stone columns (or similar technology) in the shoulder and possibly traveled way of the roadway may be required to adequately stabilize the embankment for dredging operations in the Lake.

Although Caltrans' embankment stabilization project would protect the roadway from failure during dredging, dredging activities have the potential to contribute to slope failure of the exposed eastern roadway embankment slope along the western edge of the Lake. Slope stability analysis would be required for the dredging design. The results of the slope stability analysis may support vertical cuts in proximity to Park Presidio Boulevard with immediate backfill with rip rap, or may limit dredging cuts to a specified slope, such as 3 (horizontal) to 1 (vertical), as an example. In the event that dredging cut slopes are limited such that not all contaminated sediment targeted for removal could be removed, a cap would be installed, similar to Alternative 2. It is anticipated that this condition would only occur in proximity to Park Presidio Boulevard.

- **Dewatering:** Mechanical dewatering is described as a representative option for dredged material pre-treatment to remove water prior to loading, off-haul, and disposal. It is anticipated that mechanical dewatering would best conform to the space constraints at the Site. Specific equipment options would be assessed during remedial design and may be governed by the Contractor's means and methods.

  Per USEPA guidance (1994), a typical mechanical dewatering production rate is 100 gallons per minute. Interim dredged material storage following dredging and prior to dewatering may be required depending on how the Contractor stages operations. Temporary storage could be in a diked earthen surface impoundment (e.g., temporary lagoon) or tanks.

  Based on chemical testing data (URS 2011), it is not anticipated that the elutriate generated from the dewatering operation would require treatment prior to discharge back to the Lake. However, construction phase sampling and analysis of the elutriate would be conducted to confirm this, and contingencies would be in place to treat the elutriate if required.

- **Off-Hauling:** Per USEPA guidance (1994), a typical dewatered cake solids concentration is 50 percent by weight, which corresponds to an estimated total off-haul quantity of 9,851 cy or 8,835 tons. Access to the staging area could be achieved via the existing West Pacific Avenue route, the existing Park Avenue route through the golf course, or via ramps providing direct access to Park Presidio Boulevard. The feasibility of providing direct access to Park Presidio Boulevard is pending. As access to and from the staging area has not yet been determined, truck capacities are not yet known. On the lower end of truck capacity, which might be required to negotiate steep ramps and tight turns onto Park Presidio Boulevard, standard dump trucks can typically haul 10 cy. On the higher end of truck capacity, which might be viable given a West Pacific Avenue routing scenario, transfer dump trucks can typically haul 18 cy. These hauling capacities correspond to 547 to 985 truck loads.

- **Offsite Disposal:** Chemical testing (URS 2011) indicates that no sample analysis failed the Toxicity Characteristic Leaching Procedure (TCLP) and only one sample analysis failed the lead Soluble Threshold Limit Concentration (STLC). In general, due to dilution factors, a sample has the potential for failing the STLC if the total metals concentration exceeds 10 times the STLC. Metals concentrations can also increase following dewatering operations, depending on the Contractor's means and methods, and Waste Extraction Test

(WET) analysis yielded near 100 percent solubility in some sample analysis (URS 2011). Based on this information, a conservative assessment would be to consider total lead concentrations exceeding 10 times the STLC as characteristic of sediment that would be disposed of at a Class I facility. Due to the uncertainties associated with metals concentrations following dewatering operations and for estimating purposes, it is assumed that an allowance of 10 percent of the total volume of dewatered sediment would require disposal at a Class I facility as RCRA hazardous waste (i.e., 985 cy or 883 tons) and the remaining material would require disposal at a Class I facility as California hazardous waste (i.e., 8,866 cy or 7,951 tons).

- **Construction Monitoring:** Design sediment sampling may be implemented to more accurately determine the depth and locations requiring dredging. Progress bathymetric surveys would be required to monitor the dredging progress with respect to target removal depths and confirmation sediment sampling and analysis would be conducted to confirm that the dredging was completed and the cleanup levels have been achieved. Depending on the confirmation sampling and analysis, additional dredging may be required. Water sampling may be implemented during construction to monitor the effects of sediment re-suspension and release. Water samples may be analyzed for COCs and physical parameters, such as turbidity, may be measured as a real-time tool to help evaluate and control the dredging performance.

- **Source Control:** A critical component of any remedial action would be the cessation of future discharges of highway runoff to the Lake. The Trust and Caltrans have identified the need for future interception and diversion of the highway runoff, and the associated planning process is underway. Under the Dredging Alternative, Caltrans would install and maintain stormwater treatment measures. These may include stormwater interceptor basins (grate inlet skimmer boxes) on drainage pipes to remove particulate matter and petroleum hydrocarbons from the highway runoff before it is discharged to the Lake.

- **Post-Construction Monitoring and Maintenance:** As this alternative targets removal of COCs with concentrations above cleanup levels in sediment, post-construction monitoring and maintenance is not anticipated. Since this alternative does not target leaving in place contaminated materials preventing unlimited use and unrestricted exposure, a five-year review is not anticipated. If limited capping is performed that leaves contaminated materials preventing unlimited use and unrestricted exposure, a five-year review may be required pursuant to CERCLA requirements (USEPA 2001). In this case, an Operation and Maintenance Plan would be prepared to describe and track operation, maintenance, inspection, and monitoring activities to ensure that the remedy remains protective of the environment.

Section 7: Detailed Analysis of Remedial Alternatives

This section presents an analysis of the remedial alternatives for Mountain Lake. To provide a basis for the selection of a preferred alternative, the remedial alternatives developed in Section 6 are analyzed to evaluate the extent to which they meet the RAOs. The remedial alternatives are evaluated against the nine NCP and CERCLA criteria specified in USEPA regulations and guidance (USEPA 1988). The remedial alternatives are first evaluated individually with respect to each criterion, then compared to determine their relative strengths and weaknesses in the context of the evaluation criteria.

7.1 Evaluation Criteria

The detailed analysis of alternatives addresses the statutory requirements for the remedial action. The statutory requirements state that the remedial actions should:

- Be protective of human health and the environment.
- Attain ARARs or provide grounds for invoking a waiver.
- Be cost-effective.
- Utilize permanent solutions and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable.
- Satisfy the preference for treatment that reduces toxicity, mobility, or volume of the targeted contaminants as a principal element (or provide an explanation as to why it does not).

Nine evaluation criteria have been developed as guidelines under NCP and CERCLA to address the statutory requirements identified above, as well as additional technical and policy considerations that have proven to be important to the process of selecting remedial alternatives. The nine evaluation criteria are as follows.

- Overall protectiveness.
- Compliance with ARARs and other guidelines.
- Long-term effectiveness and permanence.
- Reduction of mobility, toxicity, or volume of the targeted contaminants through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.
- State acceptance.
- Community acceptance.

The NCP (40 CFR 300.430(e)(9)(iii)) categorizes these nine criteria into three groups: 1) threshold criteria; 2) balancing criteria; and 3) modifying criteria. Additional criteria provided by the state of California that were also considered for Mountain Lake are presented following the NCP criteria.

The following sections contain descriptions of the evaluation criteria, individual evaluations of each alternative (without regard to the other alternatives), and a comparative evaluation of the alternatives. Descriptions of the remedial alternatives are provided in Section 6.

7.1.1 Threshold Criteria

The first two evaluation criteria are considered *threshold* criteria:

- **Overall Protection of Human Health and the Environment:** This evaluation criterion focuses on how well the alternative would achieve protection of human health and the environment over time and how well it would reduce unacceptable risks associated with contaminants at the Site. That assessment is intended to determine how well the risks posed by each pathway associated with the addressable media are eliminated, reduced, or controlled through removal, containment, treatment, engineered controls, or institutional controls. The evaluation of overall protectiveness criteria addresses the long- and short-term effects of each alternative under consideration. Each alternative is assessed with regard to how well it would mitigate long-term exposure to the targeted contaminants and protect human health and the environment.

- **Compliance with ARARs and Other Guidelines:** To determine if an alternative satisfies ARAR criteria, the effects of federal, state, and local laws, requirements, and regulations, and other institutional considerations relative to the design, operation, and timing of each alternative is evaluated. ARARs and other standards to be considered are identified in Table 5-1.

Threshold criteria must be satisfied as a minimum requirement for selection as the preferred alternative.

7.1.2 Balancing Criteria

The next five evaluation criteria are primary *balancing* criteria:

- **Long-Term Effectiveness and Permanence:** This evaluation criterion examines the remaining risk at the Site following implementation of a remedial action and attainment of the RAOs, with a primary focus on the adequacy and reliability of the implemented remedy and the controls that may be required to manage unacceptable risks associated with any remaining contaminants.

- **Reduction of Toxicity, Mobility, or Volume through Treatment:** This evaluation criterion addresses the extent to which an alternative employs treatment technologies that permanently and significantly reduce the toxicity, mobility, and volume (TMV) of contaminants at the Site. CERCLA and the NCP prefer remedial actions that use treatment to reduce unacceptable site risks by destroying toxic substances, reducing the total mass of toxic substances, irreversibly reducing the mobility of toxic substances, or reducing the total volume of media contaminated by toxic substances.

- **Short-Term Effectiveness:** This evaluation criterion considers the period of time needed to complete the remedy and potential impacts or effects of each alternative on workers, the community, and the environment during the construction and implementation process prior to achieving the RAOs.

- **Implementability:** This evaluation criterion considers the practical, technical, and administrative feasibility (that is, the ease or difficulty) of completing a remedial action and the availability of services and materials required for implementation.

- **Cost:** This evaluation criterion estimates the implementation cost, including capital, operation, and maintenance costs incurred over the life of the project, taking into consideration site-specific factors identified from available information and determined during development of the alternative. A 25 percent contingency is included for capital costs and a 30 percent contingency is included for O&M costs. According to CERCLA guidance, these cost estimates are planning level costs and are developed with an accuracy ranging from 30 percent less to 50 percent more than the estimated cost. This range of costs reflects the conceptual level of design detail applied to feasibility studies; variability of construction means, methods, and materials; time variability in construction costs; the complexity of developing site-specific design criteria following selection of the preferred alternative; and the sensitivity of construction costs to short-term economic factors such as interest rates, inflation, and material costs. The sources for these cost estimates include input from contractors, estimates for similar projects, standard costing guidance documents, and professional judgment.

  The costs of the remedial alternatives are compared using the estimated net present value (NPV) of the alternative. NPV analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to the present. Although it is not yet known how long the preferred remedy would operate, the demonstrated persistence of the COCs and nature of certain alternatives (such as capping) suggest that monitoring of the remedial action could be required for decades. Therefore, the period of performance is limited to 30 years for the purpose of comparative analysis. Costs in each planning year are estimated in constant dollars, representing the general purchasing power at the time of construction. Consistent with USEPA policy (USEPA 2000), a discount rate of seven (7) percent, with a base year of 2012, is assumed in the present value analysis. The cost opinions are summarized in Table 7-1 for each of the three alternatives.

  Although cost factors are not as important as other criteria for selection of alternatives under NCP and CERCLA, they are considered whenever the cost of an alternative far exceeds that of other alternatives without a demonstrated and equivalent difference in protectiveness, implementability, and reliability.

Balancing criteria are used to identify the preferred alternative amongst those alternatives meeting the threshold criteria. The comparison of remedial alternatives is primarily based on these criteria. Risk is an important factor in the analysis of effectiveness and permanence. The analysis evaluates the residual risk after the RAOs have been met. The evaluation also considers the potential impacts on human health and the environment if the remedy fails. The evaluation is performed in a narrative fashion for each of the five balancing criteria.

7.1.3 Modifying Criteria

The last two evaluation criteria are considered *modifying* criteria and do not include risk information:

- **State Acceptance:** This evaluation criterion indicates whether, based on its review of the information, the applicable state regulatory agency finds an alternative acceptable. DTSC acceptance will be evaluated during the review period for this Draft FS/RAP.

- **Community Acceptance:** This evaluation criterion assesses whether community concerns have been addressed by the remedial alternative and whether the community has its own preferred remedial alternative. Community acceptance is evaluated during the public comment period for this Draft FS/RAP.

Modifying criteria further shape the remedial alternatives by taking into account the concerns of state agencies and the public. These criteria are used to modify aspects of the preferred alternative when preparing the Draft FS/RAP. The evaluation of modifying criteria is generally not completed until after public comments are received on the Draft FS/RAP.

7.1.4 Additional State Criteria

Additional criteria provided by the State of California were also considered in the evaluation of remedial alternatives include:

- **California Health and Safety Code (HSC) Section 25356.1:** This state code requires alternative evaluation with respect to the following six criteria:

  - Health and safety risks due to site conditions.

  - The effect of identified COCs on probable present and future uses of contaminated or threatened resources.

  - The effect on probable present and future beneficial uses of available groundwater resources, with a preference for treatment that reduces the TMV of contaminants as opposed to off-site transport and disposal.

  - Site-specific conditions related to potential off-site migration of contaminants and existing background media quality.

  - Short-term and long-term cost effectiveness with consideration as to whether a delayed remedial action could result in increases to cost and/or unacceptable risks to human health or the environment.

  - Potential environmental impacts associated with implementation of a remedial alternative such as land disposal of contaminated material versus treatment to remove or reduce its TMV prior to disposal.

  However, due to the similarity and overlapping considerations of the six HSC criteria and the nine NCP/CERCLA criteria, the detailed analysis presented in this Draft FS/RAP consider all of these evaluation criteria collectively.

- **Interim Advisory for Green Remediation (DTSC 2009):** This state advisory provides guidance on incorporating sustainability and green remediation concepts into remediation projects by using the Green Remediation Evaluation Matrix (GREM) to perform qualitative

comparisons between treatment alternatives. GREMs were prepared for each remedial alternative retained for detailed analysis, and are included as Appendix F.

Based on DTSC guidance (DTSC 2009), the GREMs are not intended as primary evaluation criteria (threshold or balancing criteria) used to make decisions amongst alternatives, but represent additional criteria that may be considered primarily to highlight the relative impact to environmental stressors associated with implementation of each alternative. As such, the GREM are considered in this Draft FS/RAP to be a component of the Modifying Criteria for state acceptance, reflecting DTSC's potential preference for "greener" remedial alternatives.

The GREM will be further considered during design of the selected remedial alternative to identify and potentially mitigate impacts to environmental stressors. The GREM included in this Draft FS/RAP focus on environmental impacts during the construction phase of the remedial alternative.

7.2 Individual Analysis of Remedial Alternatives

These evaluation criteria are used to conduct a detailed analysis of the three potential remedial alternatives in Section 6.3. Application of these criteria is addressed in USEPA regulations and guidance (USEPA 1988). A detailed evaluation of the remedial alternatives is provided in Table 7-2, which assesses each alternative with respect to the threshold, balancing, and modifying criteria. The assessment incorporates the cost analysis discussed above and presented in Appendix G.

As noted previously, while representative process options are identified in the development of remedial alternatives, process options may be appropriately modified during the design and implementation phases of the selected alternative based on engineering considerations, changing site conditions, and/or new information.

The results of this detailed analysis are used to compare the alternatives and support identification of the most appropriate remedial action for the Site. Further evaluation is provided in Section 7.3 with a detailed comparison of the remedial alternatives with respect to the evaluation criteria.

7.3 Comparative Analysis of Remedial Alternatives

The technology assessments and risk management judgments from the individual evaluation criteria assessment are used to qualitatively rank the alternatives based on the comparative advantages and disadvantages of each alternative. The performances of the alternatives are compared for each criterion to evaluate the relative strengths and weaknesses of the alternatives and identify substantive differences among alternatives to facilitate selection of a preferred remedial alternative. Detailed comparison of the remedial alternatives is discussed below and a comparison of the alternatives based on a relative ranking is summarized in Table 7-3.

- **Overall Protection of Human Health and the Environment:** The threshold criterion of overall protectiveness must be met before a remedy can be selected. Alternative 1 (No Action Alternative) does not meet criteria for overall protectiveness because existing chemical impacts to sediment are not addressed. Alternative 2 (Capping) and Alternative 3 (Dredging with Offsite Disposal and Limited Capping) meet this threshold criterion by

eliminating exposure to contaminated sediments through containment or removal. However, capping of the Lake would impair the overall health and functioning of the Lake to support ecological species as the reduced water volume would support increased invasion of emergent species, lowered oxygen levels, and higher nutrient levels.

- **Compliance with ARARs:** The threshold criterion of compliance with ARARs must be met before a remedy can be selected. The No Action Alternative does not comply with ARARs because it is inconsistent with sediment quality objectives for the Site. The Capping and Dredging Alternatives comply with ARARs.

- **Long-Term Effectiveness and Permanence:** The No Action Alternative does not provide long-term effectiveness or permanence. Both the Capping and Dredging Alternatives provide long-term effectiveness and permanence far superior to the No Action Alternative. However, the effectiveness and permanence of the Capping Alternative is dependent upon long-term monitoring and maintenance of the cap. The Dredging Alternative involves removal of contaminated sediments from the Site with no long-term monitoring or maintenance. Therefore, the Dredging Alternative is considered to provide better long-term effectiveness and permanence compared to the Capping Alternative.

- **Reduction of Toxicity, Mobility, and Volume Through Treatment:** The No Action Alternative does not provide any reduction of toxicity, mobility, or volume through treatment. Neither the Capping nor the Dredging Alternatives provide direct treatment of contaminants. The Capping Alternatives provides reduction in the mobility of contaminants, but the effectiveness is dependent upon long-term monitoring and maintenance of the cap. The Dredging Alternative involves removal of contaminated sediments from the Site, thereby reducing the volume of contaminated sediment at the Site. Disposal at a permitted offsite landfill also reduces contaminant mobility. Potential treatment of elutriate following sediment dewatering, if required, may also provide some treatment to reduce contaminant toxicity, mobility, and/or volume. As there are more mechanisms by which the Dredging Alternative satisfies this balancing criterion, the Dredging Alternative is preferred to the Capping Alternative.

- **Short-Term Effectiveness:** The No Action Alternative would have no additional impacts or effects on workers, the community, and the environment because no action would be taken. Both the Capping and Dredging Alternatives provide comparable levels of short-term effectiveness. In particular, both of these alternatives involve impacts associated with construction of a staging area to support the capping and dredging operations, some trucking and transport of capping materials and dredged material, and water quality impacts during placing of the cap and dredging of sediments. It is estimated that the Capping and Dredging Alternatives could be implemented in one construction season. The Capping and Dredging Alternatives are considered equivalent with respect to this balancing criterion.

- **Implementability:** The No Action Alternative is easily implemented as it does not require any remedial action. Both the Capping and Dredging Alternatives provide comparable levels of implementability that are more difficult than the No Action Alternative. In particular, both of these alternatives involve construction means and methods that are well established, require effort to develop and restore a staging area to support the capping and dredging operations, and could be monitored using well-established processes. The Capping and Dredging Alternatives are considered equivalent with respect to this balancing criterion.

- **Cost:** The No Action Alternative has no associated costs and therefore represents the cheapest alternative. The Dredging Alternative at $9.2 million is the most expensive alternative, but offers a higher degree of risk reduction and reliability compared to the less expensive Capping Alternative at $4.9 million. Also, potential cap repairs associated with the long-term maintenance of the cap described in the Capping Alternative could be substantial (i.e., on the order of the initial installation) due to the disruption to surrounding resources required to facilitate cap installation.

- **State Acceptance:** It is anticipated that DTSC would not support the No Action Alternative. Both the Capping and Dredging Alternatives provide reasonable risk reduction for humans and ecological receptors that are expected to satisfy DTSC. The Capping and Dredging Alternatives are considered equivalent with respect to this modifying criterion.

- **Community Acceptance:** It is anticipated that the public will not support the No Action Alternative. It is anticipated that the Capping Alternative will carry a public perception of less exposure reduction compared to the Dredging Alternative since with capping the contaminated sediments are still present at the Site, albeit beneath an engineering containment system. Capping would also decrease water depths within the Lake, which would compromise the Lake's health and is inconsistent with the ecological restoration goals for the Site (Trust, NPS, and GGNPA 2000). It is anticipated that the Dredging Alternative will be preferred by the public as it removes the contaminated sediment from the Site and enhances the overall health of the Lake consistent with the restoration objectives (Trust, NPS, and GGNPA 2000).

The GREM analyses for the alternatives are presented in Appendix F. The No Action Alternative would meet most of the objectives of DTSC's Green Remediation program since there would be no substances released, no physical disturbances, and no resource depletion. The Capping Alternative would not meet all of the objectives of DTSC's Green Remediation program because of dust emissions during construction, diesel particulate matter (DPM) and other greenhouse gas emissions from vehicle exhaust, fossil fuel use, and noise and traffic from haul trucks and construction equipment. Similarly, the Dredging Alternative would not meet all of the objectives of DTSC's Green Remediation program because of odors during construction, DPM and other greenhouse gasses from vehicle exhaust, and fossil fuel use from haul trucks and construction equipment.

As indicated in Table 7-3, the qualitative relative ranking of the alternatives suggests that Alternative 3, Dredging with Offsite Disposal and Limited Capping, best satisfies the evaluation criteria presented in this Draft FS/RAP.

Section 8: Proposed Remedial Alternative

Based on consideration of the screening, detailed, and comparative analyses presented in the previous sections, the Trust selects Alternative 3, Dredging with Offsite Disposal and Limited Capping, as the preferred remedial action. Alternative 3 provides a high level of protection to human health and the environment, is implementable, likely results in the greatest benefit for the cost to implement, and complies with ARARs.

8.1 Remedial Alternative Implementation

Following approval of the Final FS/RAP by DTSC, a Remedial Design Implementation Plan (RDIP) will be developed to better describe the implementation details for the approved remedy. Although mechanical and hydraulic dredging are both feasible, the sequence of work described herein includes hydraulic dredging as representative of wet removal operations. Similarly, there are multiple feasible dewatering processes that could be applied at the Site, but mechanical dewatering is described herein as representative of dewatering processes. The RDIP and construction documents will be prepared to allow the contractor flexibility with respect to means and methods to facilitate removal operations within the Site space and schedule constraints. A conceptual layout of the remedial action is illustrated on Figure 8-1 and the core elements of the proposed remedial alternative briefly described below.

The proposed remedial action entails dredging, transport, dewatering, and offsite disposal of sediments containing COCs at concentrations exceeding cleanup levels. Details of the proposed remedial action will be described in the RDIP, with specific construction requirements developed through the remedial design and included in the construction documents. It is anticipated that the remedial construction activities associated with the proposed remedial action will consist of the following:

- Continuance of public outreach and communication program.
- Installation of project Site controls such as fencing, signage, and appropriate notifications and permitting.
- Preparation of access and staging areas in advance of the dredging operation mobilization. These preparatory activities will likely include:
    - Removal of above-grade vegetation in preparation for dredged material dewatering, handling, and offloading operations.
    - Potentially the construction of temporary access ramps from Park Presidio Boulevard to the staging area near Mountain Lake. These access ramps would remain in place for a limited period. Various haul route options, including use of Park Presidio Boulevard and/or West Pacific Avenue are shown on Figure 8-2.
- Slope stabilization activities, performed by Caltrans, to ensure the stability of the Park Presidio roadway embankment prior to the sediment removal operation. Caltrans will also initiate stormwater runoff treatment as described previously.

- Mobilization of dredging and dredged material processing equipment and infrastructure, including dredge barge, transport pipelines, temporary holding cells, dewatering equipment and/or infrastructure, temporary roadway and lay down areas, and potentially elutriate treatment facilities.

- Dredging of an estimated 15,600 cy of sediment containing COCs exceeding Mountain Lake cleanup levels until confirmation sampling of remaining sediment within the removal limits meets cleanup levels. Figure 6-4 shows the extent of dredging and summarizes the depth of dredging relative to the existing sediment surface. Figure 8-3 shows a conceptual dredging plan and Figure 8-4 shows typical cross sections through the Lake assuming side slopes of 3 (horizontal) to 1 (vertical). Actual slope requirements will be determined by a slope stability analysis performed during remedial design. Table G-2 in Appendix G provides details for the estimated costs of the dredging operation.

- If COCs are detected at concentrations exceeding cleanup levels in samples collected at the limits of dredging, the Trust will consult with DTSC to:

  - Evaluate the risk associated with the remaining COC concentrations.

  - Assess potential impacts of continued dredging on slope stability.

  - Determine if additional dredging is warranted and feasible.

  In areas of acute slope stability issues, such as along Park Presidio Boulevard, additional excavation contingent upon confirmation sampling and analysis is not anticipated. Confirmation sample results will be used solely to document the sediment quality remaining in place.

- Limited backfilling will be performed with clean sand and/or aggregate material in areas of steep slopes and as needed where required for slope stability. In areas for which slope geometry limits sediment removal, such backfill may constitute a partial cap. Conceptual cross sections of these areas are shown on Figure 8-5.

- Re-contouring of the remaining bottom sediments to smooth out the bathymetry, thereby minimize the potential for dead spots in Lake water circulation. The re-contoured bathymetric plan for the Lake bottom will not involve the removal of additional sediment.

- Progress bathymetric surveying to confirm dredging depths. A post-dredging bathymetric survey will be performed to document the total removal of sediments from Mountain Lake. A final bathymetric survey will be performed following re-contouring activities to document the bottom sediment topography.

- Temporary sediment storage and dewatering of dredged material.

- Waste characterization, transport, and disposal of dewatered dredged material to appropriately permitted landfills.

- Testing and potential treatment of elutriate generated during the dredged material dewatering operations. Testing and treatment of elutriate will be in compliance with ARARs and specified in the RDIP.

As part of the dredging operations, confirmation sampling and analysis for COCs in sediment will be performed to verify that material left in place meets cleanup levels or to document the quality of sediment to remain where slope stability prevents sediment removal. Confirmation samples will be analyzed for the COCs: lead and TPHmo. Although not identified as a COC, due to potential analytical interferences (see Appendix D), confirmation samples will be collected and analyzed for cadmium at locations where existing samples have cadmium concentrations exceeding its cleanup level. Similarly, as requested by DTSC, confirmation samples will also be collected and analyzed for antimony at locations where existing samples have reporting limits exceeding 3.0 mg/kg (the background threshold value for Colma Formation).

Results of confirmation sediment analyses will be compared to cleanup levels in Table 3-1 to assess whether additional dredging should be considered. If the concentrations of all COCs analyzed are below cleanup levels, then dredging activities will be terminated. For confirmation samples containing one or more COCs at concentrations exceeding cleanup levels, the occurrence and concentration of the COC will be evaluated to assess the relationship to a Site-specific release. If the COC concentration appears to be related to a Site-specific release, sediment will be further dredged and the newly dredged area will be re-sampled and analyzed for the COC that triggered the additional dredging. If the COC concentration does not appear to be related to a Site-specific release, the confirmation sample results for the COC constituent exceeding the cleanup level will be evaluated using a compound-specific 95 percent UCL of the mean and the UCL compared to the cleanup level to assess whether that COC poses residual risk. Concentrations of metals that appear to represent background in naturally occurring sediment or fill material will be evaluated using existing Site data and background data to assess whether the metal concentrations are related to a Site-specific release. The Trust will consult with DTSC regarding confirmation sample results, potential additional dredging, and partial cap areas. Additional details related to confirmation sediment sampling, analytical test methods, sample frequency, and decision logic for additional dredging will be included in the RDIP.

Backfill material that may be used to partially cap areas where potential slope stability issues limit sediment removal will be fill imported from off-site or local source areas. The potential backfill material will meet the following minimum requirements prior to use as backfill in Mountain Lake:

- Potential fill material will be sampled and analyzed at each source at a frequency and analytical suite consistent with DTSC guidance (DTSC 2001).
- The concentration of chemical constituents in potential fill material will be compared to Site-specific cleanup and background levels identified in this Draft FS/RAP to protect human health and the environment.
- Potential fill material will be compatible with Site-specific restoration plans.

If limited capping is performed that leaves contaminated materials preventing unlimited use and unrestricted exposure, a five-year review may be required pursuant to CERCLA requirements (USEPA 2001). In this case, an Operation and Maintenance Plan would be prepared to describe and track operation, maintenance, inspection, and monitoring activities to ensure that the remedy remains protective of the environment.

To obtain funding from available sources, remediation activities are targeted to be complete by May 2014.

8.2 Project Controls during Implementation

Temporary staging areas will be re-graded, imported or locally borrowed clean fill placed to provide proper drainage, disturbed ground surfaces protected with erosion control measures, and revegetation implemented consistent with restoration goals, as necessary. Erosion control measures are discussed in Appendix H. Post-construction erosion control monitoring will be performed during the first year following completion of the remedial action, with maintenance and repair activities performed as needed. Details on these measures will be included in the Storm Water Pollution Prevention Plan (SWPPP) that will be prepared for the construction project.

To mitigate potential impacts to the existing cultural and ecological resources, construction activities will be coordinated with Trust cultural and natural resources personnel. Specific information regarding the Site preparation activities, dredging, dredged material handling, construction staging, off-hauling, haul roads, traffic controls, air monitoring, dust and odor controls, erosion controls, and other implementation details regarding the proposed remedial action will be described in the RDIP and design documents, as necessary. Construction scheduling and the use of BMPs during implementation of the proposed remedial action will help reduce emissions and minimize potential impacts to human health and the environment. Project control measures to be included during implementation of the Mountain Lake remedial action to minimize impacts on existing resources are described in Appendix H. Specific plans containing the details of these measures will be submitted to DTSC separately or included in the RDIP.

By combining the above elements, the proposed remedial action will meet the RAOs and will protect potential receptors and the environment during implementation of the proposed remedial action.

8.3 California Environmental Quality Act

In accordance with CEQA, DTSC has evaluated the potential environmental impacts of the proposed remedial alternative for Mountain Lake in an Initial Study (IS), and has prepared a Draft Negative Declaration for the remediation project. The scope of the IS includes consideration of potential impacts to traffic and transportation, air quality, noise, cultural and biological resources, and greenhouse gas emissions, among other topics, attributed to the proposed remedial action. DTSC has found that although there will be limited minor and short-term impacts, implementation of the proposed remedial alternative will improve the overall environmental quality of Mountain Lake, and therefore would have no significant negative impact on the environment. The IS and Draft Negative Declaration are included in Appendix I of this Draft FS/RAP.

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Tables

Table 2-1: Summary of Sediment Sampling Activities in Mountain Lake

Sample Collection Date	Sponsor	Samples Collected By	Number of Samples	Analytes	Comments
1990-1995	U.S. Army	Dames & Moore[a]	4 shallow samples	Inorganics, SVOCs[g], VOCs[h], pesticides	
1998	Presidio Trust	EKI[b]	Depth-composited core samples from 5 locations	Metals, PCBs[i], Pesticides, chlorinated herbicides, SVOCs, TPH[j], VOCs, nitrates	
2001	University of California, Berkeley	Reidy (for Paleoecological Masters Thesis)[c]	74 samples from sediment cores	Metals via XRF	Independent paleoecological study of the Lake, not performed under remediation investigations
			18 sediment surface samples	Metals	
2001	Presidio Trust	URS[d]	80 samples from 15 sediment cores	Metals, TPH, VOCs, total cyanide. Select locations also analyzed for nitrates, pesticides, grain size, moisture content.	
			4 samples from 3 storm drain inlets	Metals, TPH, cyanide	
2004	Presidio Trust	URS[e]	82 samples from 25 sediment cores	Metals, organochlorine pesticides, cyanide	
2011	Presidio Trust	Kennedy/Jenks[f]	15 samples from 6 locations in southern portion of Lake	Metals, organochlorine pesticides, TPH, moisture content	

Table 2-1: Summary of Sediment Sampling Activities in Mountain Lake

Notes

(a) Source is *Final Remedial Investigation Report, Presidio Main Installation* (Dames & Moore 1997).
(b) Source is *Report of Sediment Sampling at Mountain Lake* (EKI 1998).
(c) Source is *Evidence of Environmental Change over the Last 20 Years at Mountain Lake, in the Northern San Francisco Peninsula* (Reidy 2001).
(d) Source is *Mountain Lake Sediment Investigation, Final Report* (URS 2001).
(e) Source is *Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco* (URS 2011).
(f) Source is Letter Report – Sediment Sampling at Mountain Lake, The Presidio Trust, San Francisco, California (Kennedy/Jenks 2012).
(g) SVOCs = semivolatile organic compounds.
(h) VOCs = volatile organic compounds.
(i) PCBs = polychlorinated biphenyls.
(j) TPH = total petroleum hydrocarbons.

Table 2-2: Summary of Surface Water and Sediment Elutriate Sampling Activities in Mountain Lake

Sample Collection Date	Sponsor	Samples Collected By	Number of Samples	Type	Analytes
1990-1995	U.S. Army	Dames & Moore[(a)]	6	Surface water	Inorganics, SVOCs[(d)], VOCs[(e)], organochlorine pesticides, herbicides, PCBs[(f)], TPH[(g)]
2000	Presidio Trust	EKI[(b)]	6	Surface water	Cyanide, lead, chlorinated pesticides
2004	Presidio Trust	URS[(c)]	7	Sediment Elutriate	Leachable metals

Notes

(a) Source is *Final Remedial Investigation Report, Presidio Main Installation* (Dames & Moore 1997).
(b) Source is *Draft Sampling Results for Selected Public Health Service Hospital Sites* (EKI 2000).
(c) Source is *Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco* (URS 2011).
(d) SVOCs = semivolatile organic compounds.
(e) VOCs = volatile organic compounds.
(f) PCBs = polychlorinated biphenyls.
(g) TPH = total petroleum hydrocarbons.

Table 3-1: Mountain Lake Sediment Cleanup Levels

Potential Chemical of Concern	Ecological Cleanup Level (mg/kg)[a]	
	Serpentinite	Colma
Inorganic Chemicals		
Arsenic	19	19
Cadmium	1.9	1.1
Chromium	1,700	140
Copper	114	114
Lead	82	82
Mercury	0.62	0.62
Nickel	4,500	110
Selenium	1.6[b]	1.6[b]
Vanadium	74	90
Zinc	230	230
Pesticides		
alpha-BHC	0.008	0.008
beta-BHC	0.013	0.013
gamma-BHC (Lindane)	0.003	0.003
delta-BHC	0.0075	0.0075
Chlordane	0.01	0.01
4,4'-DDD	0.016	0.016
Petroleum Compounds		
TPHd	144	144
TPHmo	144	144

Notes

(a) Cleanup levels are based upon ecological freshwater sediment criteria and background metals concentrations for the Colma and Serpentinite formations. Source is Table 7-3 and Table 7-5 from *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water* (EKI 2002). Colma formation and serpentinite formations are considered likely, based upon previous sediment sampling, to be encountered during sediment remediation of Mountain Lake. Other soil types, such as greenstone, are also expected to be encountered during remediation.

(b) For selenium, cleanup level is based on special-status species (EKI 2002).

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
CHEMICAL-SPECIFIC ARARs AND TBCs				
Federal Chemical-Specific ARARs and TBCs				
Safe Drinking Water Act (SDWA)	42 USC § 300g-1	The National Contingency Plan (NCP) at 40 CFR §§300.43(e)(2)(i)(B)-(D) states that maximum contaminant level goals (MCLGs), established under the SDWA, that are set at levels above zero should be attained by remedial actions for surface water or groundwater that are current or potential sources of drinking water. For contaminants of concern (COCs) in groundwater that do not have MCLGs, or if the MCLGs have been set at zero, the remedial actions should achieve Maximum Contaminant Levels (MCLs).	Relevant and appropriate	Mountain Lake is located within the Lobos Creek groundwater basin, a drinking water supply. The surface water cleanup levels for Mountain Lake meet or are more stringent than Federal drinking water criteria (MCLs).
Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X of TSCA)	15 U.S.C. §2681,2683, and 2688; 40 Code of Federal Regulations (CFR) Section 745.65(c) and 745.227(h)(4)	66 Fed. Reg. 1206, 1238 (5 January 2001) revised 40 CFR Part 745 to establish a hazard standard of 400 mg/kg for lead in bare soil in a play area at residential sites and child-occupied facility sites.	Relevant and appropriate	Lead has been detected in sediment at Mountain Lake. While sediment in the lake is not in a play area at a residential site or a child-occupied facility, freshwater sediment cleanup levels for Mountain Lake meet or are more stringent than residential land use levels.
U.S. EPA Office of Solid Waste and Emergency Response (OSWER) Lead Guidance	OSWER Directive #9355.4-12 (Revised Interim Soil Lead Guidance for CERCLA sites and RCRA Corrective Action Facilities, July 1994); OSWER #9200.4-27P (Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, August 27, 1998)	Outlines approach to determining protective levels for lead in soils at CERCLA sites and identifies 400 parts per million (ppm) as screening level for lead in soil for residential land use.	To be considered	Lead has been detected in sediment at Mountain Lake. While land use at Mountain Lake is recreational, freshwater sediment cleanup levels for Mountain Lake meet or are more stringent than residential land use levels.
U.S. EPA, Region 9, Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites	U.S. EPA (May, 2010) (http://www.epa.gov/region9/superfund/prg/index.html)	RSLs are risk-based concentrations which can be used to evaluate whether a chemical release may pose a risk that warrants further investigation. RSLs are not legally enforceable standards. They are used for site "screening" and should not be used as cleanup levels for a CERCLA site until the other remedy selections identified in the relevant portions of the National Contingency Plan (NCP), 40 CFR Part 300, have been evaluated and considered.	To be considered	The cleanup levels for the Presidio were developed using a risk-based approach similar to the development of RSLs.
California Toxics Rule (CTR)	33 USC §1313(c)(2)(B); 40 CFR §131.38(b)(1), (2)	The California Toxics Rule sets forth freshwater and saltwater criteria for a number of metals and chemical compounds.	Applicable	Mountain Lake is located within the Lobos Creek groundwater basin. The surface water cleanup levels for Mountain Lake meet or are more stringent than the criteria established in the CTR.
State Chemical-Specific ARARs and TBCs				
California Regional Water Quality Control Board, San Francisco Bay Region (Water Board), Water Quality Control Plan (Basin Plan) – Chapter 3: Water Quality Objectives	Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13240-13241, Basin Plan, Chapter 3	Chapter 3 of the Basin Plan sets forth water quality objectives for surface water and groundwater.	Relevant and appropriate	Mountain Lake is located within the Lobos Creek groundwater basin. The surface water cleanup levels for Mountain Lake meet or are more stringent than the criteria established in the Basin Plan.

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
Domestic Water Quality and Monitoring Regulations	Cal. Health and Safety Code §11635, 22 CCR §§64431, 64432, 64432.1, 64432.2, 64444, 64444.5	These sections of the California Code of Regulations, part of the state water quality standards, establish MCLs for organic and inorganic chemicals in drinking water.	Relevant and appropriate where, on a chemical by chemical basis, the standard is more stringent than federal standard	Mountain Lake is located within the Lobos Creek groundwater basin, a drinking water supply. The surface water cleanup levels for Mountain Lake meet or are more stringent than California drinking water criteria (MCLs).
California Department of Public Health (CDPH) Drinking Water Program	CDPH Drinking Water Notification Level	Notification levels are health-based advisory levels established by CDPH for chemicals in drinking water that lack maximum contaminant levels (MCLs). When chemicals are found at concentrations greater than their notification levels, certain requirements and recommendations apply.	To be considered	Mountain Lake is located within the Lobos Creek groundwater basin, a drinking water supply. The surface water cleanup levels for Mountain Lake meet or are more stringent than notification levels.
Safe Drinking Water Act (SDWA)	Cal. Health and Safety Code § 116375, 22 CCR § 64449	This section of the SDWA establishes secondary MCLs for chemicals in drinking water that adversely affect its odor, taste, or appearance. They are desirable goals and are not enforceable.	To be considered	Mountain Lake is located within the Lobos Creek groundwater basin, a drinking water supply. The surface water cleanup levels for Mountain Lake meet or are more stringent than California drinking water criteria (MCLs).
State Water Resources Control Board (SWRCB) Resolution No. 88-63	Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13140	The resolution states that all surface and groundwaters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply, unless the surface or groundwaters contain total dissolved solids ("TDS") in excess of 3,000 milligrams per liter ("mg/L"), the waters contain high levels of contamination, or the water source does not provide sufficient water to supply a well capable of producing 200 gallons per day.	To be considered	Mountain Lake is located within the Lobos Creek groundwater basin, a drinking water supply. The cleanup standards of SWRCB Resolution No. 88-63 have been incorporated into the cleanup criteria for Mountain Lake. The surface water cleanup levels for Mountain Lake meet or are more stringent than California drinking water criteria (MCLs).
Water Board Order No. R2-2003-0080, Revised Site Cleanup Requirements and Rescission of Order No. 91-082 and Order No. 96-070. 96-070; U.S. Army Corps of Engineers (USACE), Fuel Product Action Level Development Report (FPALDR), Final, Oct. 1995 (soil cleanup levels)	Porter-Cologne Water Quality Control Act promulgated under California Water Code	Order No. R2-2003-0080 includes soil cleanup levels for petroleum hydrocarbons and a number of petroleum-related constituents including carcinogenic and noncarcinogenic polynuclear aromatic hydrocarbons (PAHs), benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert-butyl ether (MTBE), and lead: soil cleanup levels for the protection of human health (Table 1); soil cleanup levels for the protection of ecological receptors (Table 2); soil cleanup levels for the protection of water quality at detectable levels (Table 3); soil cleanup levels for the protection of water quality at drinking water standards (Table 4); and soil cleanup levels for Crissy Field (Table 5).	To be considered	The cleanup levels for petroleum hydrocarbons and related constituents in sediment for Mountain Lake meet or are more stringent than Board Order R2-2003-0080 Site Cleanup Requirements and FPALDR soil cleanup levels.
		Order No. R2-2003-0080 also includes point-of-compliance concentrations for soil and water for petroleum hydrocarbons, BTEX, and/or MTBE for the saltwater protection zone of the Presidio (Table 6) and the proposed freshwater stream (Table 7).		Mountain Lake is not located within an ecological protection zone as defined in Order No. R2-2003-0080.
		Order No. R2-2003-0080 also specifies that groundwater cleanup levels shall meet drinking water standards (i.e. MCLs) using EPA/California MCLs as a basis.		Mountain Lake is located within the Lobos Creek groundwater basin, a drinking water supply. The surface water cleanup levels for Mountain Lake meet or are more stringent than Federal and California drinking water criteria (MCLs).
Water Board Environmental Screening Levels (ESLs)	Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, May 2008 (http://www.swrcb.ca.gov/sanfranciscobay/esl.shtml)	ESLs can be used to evaluate whether a chemical release may pose a risk that warrants further investigation. ESLs are not legally enforceable standards. They are used for site "screening".	To be considered	The cleanup levels for the Presidio were developed using a risk-based approach similar to the development of ESLs.

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
DTSC Leadspread, Computer Model, Version 7.0	Leadspread 7, DTSC Lead Risk Assessment Spreadsheet (http://www.dtsc.ca.gov/AssessingRisk/leadspread.cfm)	A State of California computer model which calculates human health preliminary remediation goals for lead in soil based on DTSC default factors and exposure assumptions based on planned land-use.	To be considered	Lead has been detected in sediment at Mountain Lake. Land use at Mountain Lake is recreational. The recreational cleanup level for lead in soil at the Presidio, calculated with the DTSC Leadspread model, is 500 mg/kg.
Presidio-Wide Cleanup Levels	*Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water*, October 2002 (Revised May 2006)	The Cleanup Level Document presents cleanup levels for soil, sediment, groundwater, and surface water that are protective of human health and ecological habitat at the Presidio. The cleanup levels were developed under DTSC guidance and are anticipated to be applied to new decision documents for the Presidio.	To be considered	The sediment and surface water cleanup levels for Mountain Lake are based on the criteria established in the Cleanup Level Document.
LOCATION-SPECIFIC ARARs AND TBCs				
Federal Location-Specific ARARs and TBCs				
National Historic Preservation Act (NHPA)	16 USC §§ 470–470x-6; 36 CFR §§ 800.1–.16, 60.2 (effect of listing in National Register), 65.2 (effect of designation as National Historic Landmark), 68.1–.4 (Dept. of Interior [DOI] standards for historic property projects assisted by the National Historic Preservation Fund)	This Act is applicable to the entire Presidio, since it is designated in the National Register as a historic landmark.	Applicable	
	The Trust Programmatic Agreement	The Programmatic Agreement among the Advisory Council on Historic Preservation, the State Historic Preservation Officer, the Trust and NPS, sets forth the procedures to implement the historic compliance process of Section 106 of the NHPA.	To be considered	.
Archeological Resources Protection Act (ARPA)	16 USC §§ 470aa–470mm; 43 CFR §§ 7.1–.37 (DOI regulations for protection of archeological and historical resources)	ARPA prohibits excavation of, damage to, or destruction of archeological resources on public lands without a permit issued by the federal land manager.	Applicable	The procedural permit requirement is not applicable to on-site remedial action. However, the substantive requirements of ARPA apply to remedial actions affecting archeological resources, Native American resources, or artifacts at the Presidio.
Federal Endangered Species Act (ESA)	16 USC §§ 1531(c)(1); 1532; 1533(d); 1536(a)–(d), (g), (h); 1538(a)(1)(B), (a)(1)(G), (a)(2)(B), (a)(2)(E); 1539(a), (c), (d); 1540(a)–(c); 50 CFR §§ 11.1–11.26, 13.1–13.29, 402.01–402.16, 424.01–424.21	Under the ESA, federal agencies must make sure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or cause the destruction or adverse modification of critical habitat. Two federal endangered or threatened bird species have been recorded as casual visitors to the Presidio and vicinity: marbled murrulet, and snowy plover. Four federal threatened or endangered plant species have been identified at various locations at the Presidio: Raven's manzanita, Presidio clarkia, Marin dwarf flax, and San Francisco lessingia.	Applicable	Threatened or endangered species and critical habitat for the species under the ESA are not known to occur in the vicinity of Mountain Lake.
Archeological and Historic Preservation Act (AHPA)	16 USC §§ 469–469c-2; 43 CFR §§ 7.1-3.7 (DOI regulations for protection of archeological and historic resources)	AHPA requires federal agencies, prior to engaging in activities that could cause irreparable loss of scientific, prehistorical, historical, or archeological data, to notify the Secretary of the Interior of the threatened data and the proposed activities, and to preserve the data or request that the Secretary do so. The DOI must conduct a survey and recovery effort if it finds the data are significant and may be irrevocably lost without such action.	Applicable	

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
Native American Graves Protection and Repatriation Act (NAGPRA)	25 USC §§ 3001-3013; 43 CFR §§ 10.1-.17	NAGPRA establishes a system for determining ownership and proper disposal/removal of Native American cultural items discovered in federal lands and requires inventorying and identification of those items. Such items must be returned to the relevant tribe.	Applicable	
Migratory Bird Treaty Act	16 USC §§ 703–708; 50 CFR §§ 10.12, 10.13	The Act prohibits the taking of migratory birds, their nests and their eggs, unless permitted by the Secretary of the Interior. Migratory birds have been observed at the Presidio.	Applicable	
Golden Gate National Recreation Area (GGNRA) Act	16 USC § 460bb–460bb-5, purposes of Section 1	Among the purposes stated in Section 1 of the GGNRA Act are to preserve the recreation area, to the degree possible, in its natural setting, and protect it from development and uses that would destroy the scenic beauty and natural character of the area.	Applicable	
Presidio Trust Act	The Presidio Trust Act, Section 104(a) of Public Law 104-333 as amended; 16 U.S.C §460bb appendix	The Trust shall manage the leasing, maintenance, rehabilitation, repair, and improvement of property within the Presidio under its administrative jurisdiction using the authorities provided in this section, which shall be exercised in accordance with the purposes set forth in Section 1 of the act, entitled "An Act to establish the Golden Gate National Recreation Area in the State of California, and for other purposes," approved 27 October 1972 (Public Law 92-589; 86 Stat. 1299; 16 USC 460bb), and in accordance with the general objectives of the General Management Plan for the Presidio. Resolution 99-11 of the Presidio Trust Board sets forth the general objectives which are not explicit in the General Management Plan Amendment.	Applicable	
Vegetation Management Plan (VMP)	*Presidio of San Francisco Vegetation Management Plan and Environmental Assessment*, December 2001	The VMP guides the management of vegetative resources within the Presidio, including enhancing, restoring, and rehabilitating native and planted vegetation at the Presidio. The VMP establishes the vegetative zones for the Presidio.	To be considered	
Presidio Trust Management Plan (PTMP)	*Presidio Trust, Presidio Trust Management Plan, Land Use Policies for Area B of the Presidio of San Francisco*, May 2002	The PTMP provides guidelines for the management and improvement of Area B of the Presidio. The PTMP emphasizes preservation and enhancement of the Presidio's cultural, natural, scenic, and recreational resources for public use.	To be considered	
Federal Coastal Zone Management Act (CZMA); California Government Code, title 7.2 (including McAteer-Petris Act); San Francisco Bay Conservation and Development Commission's (BCDC) San Francisco Bay Plan.	16 USC 1453, 1456; Cal. Gov. Code 66602.1, 66605, 66632; Cal. Code Regs., title 14 10300-10316; BCDC's San Francisco Bay Plan's water Quality Policies (pp.10-11), Recreation Policies (pp. 32-35), Public Access Policies (pp.36-37)	Remedial actions that affect any land or water use or natural resource of the coastal zone must comply with CZMA section 307 which mandates that federal agency activities be consistent to the maximum extent practicable with the enforceable policies of approved State management programs. BCDC's San Francisco Bay Plan policies include: protecting and increasing wetlands, maintenance of Bay water quality, protecting the Bay through erosion control, minimizing the impact of polluted runoff from projects, increasing recreational opportunities adjacent to the Bay, and providing maximum public access to the Bay.	Applicable	As federal property, by definition Mountain Lake is excluded from the coastal zone. Further, remediation activities should not result in coastal effects since Mountain Lake is an isolated water of the U.S.

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
Clean Water Act (CWA)	33 USC §1344; 33 CFR §323, 320-330; 40 CFR 230, 232	Section 404 of the CWA regulates the placement of dredged and fill material into waters of the U.S., including wetlands. The Act authorizes the issuance of permits for such discharges as long as the proposed activity complies with environmental requirements specified in Section 404(b)(1) of the CWA. The U.S. Army Corps of Engineers (USACE) has primary responsibility for the permit program and issues Section 404 permits. Section 404 of the CWA requires that states certify compliance of federal permits or licenses with state water quality requirements and other applicable state laws. Under Section 401, states have authority to review any federal permit or license that may result in a discharge to wetlands and other waters under state jurisdiction.	Applicable	The procedural permit requirement is not applicable to on-site remedial action at Mountain Lake. Potential USACE jurisdictional wetlands cover 2.10 acres around the perimeter of the lake. The Mountain Lake East Arm wetland is approximately 0.40 acre and extends across a depressional area on either side of the East Arm drainage.
Federal wetlands regulations and state wetland policy	Executive Order 11990; 40 CFR § 6.302.(a), (d), (g); CA Fish & Game Commission's Wetlands Policy	Executive Order 11990 requires federal agencies conducting certain activities to avoid, to the extent practicable, adverse impacts associated with the destruction or loss of wetlands. The Cal. Dept. of Fish & Game Commission's wetlands policy instructs the Dept. of Fish & Game to recommend protection, preservation, restoration, enhancement and expansion of wetlands when the Dept. of Fish & Game acts in an advisory role.	Executive Order - Relevant and appropriate CA Wetlands Policy – To be considered	Potential USACE jurisdictional wetlands cover 2.10 acres around the perimeter of the lake. The Mountain Lake East Arm wetland is approximately 0.40 acre and extends across a depressional area on either side of the East Arm drainage. Approximately 3.13 acres of the Mountain Lake area, including the East Arm, contains USFWS wetland habitat vegetation.
State Location-Specific ARARs and TBCs				
Basin Plan, Wetlands Protection Management	Porter-Cologne Water Quality Control Act promulgated under California Water Code, § 13240-13241, Basin Plan, pp. 4-49 to 4-51	The Basin Plan reaffirms the goal of the California Wetlands Conservation Policy of ensuring no net loss of wetlands.	To be considered	Potential USACE jurisdictional wetlands cover 2.10 acres around the perimeter of the lake. The Mountain Lake East Arm wetland is approximately 0.40 acre and extends across a depressional area on either side of the East Arm drainage. Approximately 3.13 acres of the Mountain Lake area, including the East Arm, contains USFWS wetland habitat vegetation.
California Regulations for Discovery of Human Remains	Cal. Health & Safety Code §§ 7050.5	The Cal. Health & Safety Code establishes intentional disturbance, mutilation, or removal of interred human remains as a misdemeanor. This Code requires that further excavation or disturbance of land, upon discovery of human remains outside of a dedicated cemetery, cease until a county coroner makes a report. This Code requires a county coroner to contact the Native American Heritage Commission within 24 hours if the coroner determines that the remains are not subject to his or her authority and if the coroner recognizes the remains to be those of a Native American.	To be considered	
California Endangered Species Act (CESA)	Cal. Fish & Game Code §§ 2053–2054, 2081, 2080.1, 2081.1; 14 CCR §§ 670.2, 670.5, 783.1-783.6; Cal. Fish & Game Code § 2014	The California ESA provides authority similar to the Federal ESA for the protection of threatened and endangered species listed by the State. Four California endangered or threatened plant species have been identified at the Presidio: Raven's Manzanita, Presidio clarkia, Marin dwarf flax, and San Francisco Lessingia. Three California endangered or threatened bird species have been recorded as casual visitors to the Presidio and vicinity: bald eagle, marbled murrulet, and willow flycatcher.	To be considered	Threatened or endangered species under the California ESA are not known to occur in the vicinity of Mountain Lake.
California Native Plant Protection Act	Cal. Fish & Game Code § 1908; 14 CCR §§ 783.1–783.6	The California Native Plant Protection Act prohibits the taking of endangered or rare native plants, unless authorized by an incidental take permit. The Presidio has a number of endangered or rare plants specified under the California Native Plant Protection Act.	To be considered	Endangered or rare native plant species under the California Native Plant Protection Act are not known to occur in the vicinity of Mountain Lake.
California Fish & Game Code regarding protection of birds, mammals, reptiles, or amphibia	Cal. Fish & Game Code §§ 3503, 3503.5, 3511, 3513; 14 CCR § 747	The California Fish & Game Code prohibits taking, possessing, or destroying certain birds, their nests, and their eggs; mammals; reptiles; or amphibia. Migratory and other birds have been observed at the Presidio. Remedial actions that include removal of vegetation that may provide nests for migratory birds may require additional review.	To be considered	

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [a]
ACTION-SPECIFIC ARARs AND TBCs				
Federal Action-Specific ARARs and TBCs				
Resource Conservation and Recovery Act (RCRA)	40 CFR §§260-299; Subtitle C (hazardous waste requirements); State of California citation: Cal. Health & Safety Code, Title 22	RCRA is the primary federal law governing the disposal of hazardous and non-hazardous or municipal solid waste passed by Congress in 1976 and amended in 1984 by Hazardous and Solid Waste Amendments (HSWA). RCRA Subtitle C sets standards for the classification of hazardous waste, and requirements governing handling, management, transportation, treatment, and off-site disposal of these wastes. As specified in the Consent Agreement, the Trust addresses releases of (1) hazardous substances and hazardous waste at the Presidio under its hazardous substances and hazardous waste program overseen by the DTSC; and (2) non-hazardous petroleum hydrocarbons at the Presidio under its petroleum program overseen by the Water Board.	Relevant and appropriate	
	40 CFR §§257-258; Subtitle D (non-hazardous or municipal solid waste requirements); State of California citation: Cal. Health & Safety Code, Title 27	RCRA Subtitle D focuses on state and local governments as the primary planning, regulating, and implementing entities for the management of non-hazardous solid waste. Under Subtitle D, EPA developed federal criteria for the proper design and operation of municipal solid waste landfills (MSWLFs) and other solid waste disposal facilities. Pursuant to 42 USC § 7926, the State of California is authorized to implement the federal RCRA Program for solid waste. Federal statutes may apply to areas not covered by the state program, or where incorporated by reference.	Relevant and appropriate	
Toxic Substances Control Act (TSCA)	15 USC §§ 2602, 2605(e) (regulation of polychlorinated biphenyls [PCBs]); 40 CFR 761.1-761.3 (definitions) & Subparts C (§§ 761.40-.45)(marking of PCBs and PCB items), D (§§ 761.50-.79) (storage and disposal of PCBs), N-R (§§ 761.260-.359) (sampling and analysis of PCB waste	TSCA regulates the use and disposal of various chemicals, including PCBs. Subpart D of 40 CFR Part 761 outlines disposal and cleanup procedures for wastes with a PCB concentration of at least 50 ppm [40 CFR §§ 761.60-.61] and prohibits the unpermitted discharge of PCBs to navigable waters or a treatment works at more than 3 parts per billion (ppb) concentration [id. § 761.50(a)(3)]. Certain PCBs in soil must be cleaned up and disposed of in accordance with Section 761.61. Certain liquid PCBs must be incinerated or otherwise disposed of in accordance with Section 761.60(a) or (e) [id. § 761.61(b)]. TSCA also contains specified requirements for labeling of containers and equipment with PCB-containing materials, and of transport vehicles carrying a certain amount of liquid PCBs (id. § 761.40).	Relevant and appropriate	PCBs are not chemicals of concern at Mountain Lake.
Clean Water Act (CWA)	33 USC §1342	Section 402 of the CWA regulates discharges of pollutants under the National Pollutant Discharge Elimination System (NPDES). The storm water discharges program is regulated by the State Water Board for certain municipal, industrial, and construction storm water discharges through NPDES permits. NPDES permits include requirements to prevent or reduce discharges of pollutants that cause or contribute to violations of water quality objectives.	Relevant and appropriate	The procedural permit requirement is not applicable to on-site remedial action at Mountain Lake.

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [a]
Fish and Wildlife Coordination Act	16 USC §§ 661-663(c)	If stream realignment or modification is proposed or authorized by a Federal agency in an area not under its land management authority, then 16 USC § 662(a) requires the Federal agency to consult with U.S. Fish and Wildlife Service and the DOI to prevent loss or damage to wildlife as a result of the project. Under 16 USC § 662(h), projects carried out by Federal agencies with respect to Federal lands under their jurisdiction are exempt from and not applicable to these provisions.	To be considered	
State Action-Specific ARARs and TBCs				
Consent Agreement for the Remediation of Hazardous Substances at the Presidio of San Francisco (Consent Agreement)	Consent Agreement Among the California Department of Toxic Substances Control, the Presidio Trust, and the US Department of the Interior, National Park Service for the Remediation of Hazardous Substances at the Presidio of San Francisco (August 30, 1999)	The Consent Agreement establishes responsibilities and procedures between these parties for cleanup of releases of hazardous substances and hazardous waste at the Presidio under CERCLA and RCRA, specifically governing cleanup of nine Operable Units (OUs). The Trust addresses releases of hazardous substances and hazardous waste at the Presidio under its hazardous substances and hazardous waste program overseen by the DTSC. The definition of hazardous substances governed under CERCLA excludes petroleum hydrocarbons, as specified in the NCP at 40 CFR, Part 300.5. Accordingly, the Trust addresses releases of petroleum hydrocarbons at the Presidio under its petroleum program overseen by the Water Board.	To be considered	
Institutional controls on soil and groundwater	California Civil Code § 1471; Cal. Health & Safety Code § 25355.5(a)(1)(C); CCR tit. 22 § 67391.1(e)	Provides conditions under which land use restrictions will apply to successive owners of land. The substantive provision is 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 language provides authority for establishing a durable institutional control that will be implemented through incorporation of restrictive environmental covenants that run with the land in both the federal deed at the time of transfer of the property and in the Covenant to Restrict Use of Property with DTSC to be executed at the time of transfer. Whenever DTSC determines that it is not feasible to record a land use covenant for property owned by the federal government, such as transfers from one federal agency to another, DTSC and federal government shall use other mechanisms to ensure that future land use will be compatible with the levels of hazardous materials, hazardous wastes or constituents, or hazardous substances which remain on the property. Examples include: amendments to the federal government facility master plan, physical monuments, or agreements between the federal government facility and DTSC. The Presidio Trust's LUCMRR for Area B serves as the implementation and enforcement plan to meet the requirements of this Code. The LUCMRR describes the procedures used to implement LUCs at Area B sites at the Presidio.	Relevant and appropriate	
Basin Plan - Chapter 4: Effluent Limitations	Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13240-13241, Basin Plan, pages 4-8 to 4-11	Limitations to construction-related storm water discharges are described in this provision.	To be considered	

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [a]
Discharge of Treated Groundwater Table 4-1: Discharge Prohibitions	Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13240-13241, Basin Plan, pp. 4-17 to 4-18; Table 4-1	Table 4-1 more broadly describes discharge prohibitions (e.g., with respect to toxic substances, solid wastes, silt, sediments, oil, and petroleum by-products). Page 4-17 of the Basin Plan refers to SWRCB Resolution No. 88-160, Disposal of Extracted Groundwater from Cleanup Projects, which urges dischargers of groundwater extracted from site clean-up projects to reclaim their effluent. It states that when reclamation is not feasible, discharges must be piped to a municipal treatment plant or discharged under a National Pollutant Discharge Elimination System (NPDES) permit authorizing the discharge from these sites.	To be considered	
Surface Water Protection	Porter-Cologne Water Quality Control Act promulgated under California Water Code, § 13240-13241, Basin Plan pp. 4-28, 4-32, 4-40 to 4-41	Surface Water Protection and Management through nonpoint source control is regulated by the Water Board. Under the Construction General Permit 99-08-DWQ, the Water Board requires a Notice of Intent (NOI) to be filed prior to construction, a Storm Water Pollution Prevent Plan (SWPPP) to be prepared and implemented, and a Notice of Termination to be filed upon construction completion for construction activities involving disturbance of one acre or greater total land. Permit conditions address pollutant and waste discharges occurring during construction activities and the discharge of pollutants in runoff after construction. The Erosion and Sediment Control program establishes guidelines for the regulation of erosion and sedimentation for the protection of beneficial uses of water due to the impairment by sediment.	To be considered	The procedural permit requirement is not applicable to on-site remedial action at Mountain Lake.
Hazardous Waste Requirements - Generation, Transport, and Disposal Regulations	State of California citation: Cal. Health & Safety Code §§ 25100–25249, 25250–25250.26, 25260–25929; 22 CCR §§ 66260.1–68500.35. Federal citation: 42 USC §§ 6901–6991i; 40 CFR Parts 260–282. §§ 25100-25166.5, 25179.1–.12 (land disposal restrictions [LDRs]), 25244–25244.24 (waste reduction and recycling); 22 CCR §§ 66260.10–66262.41, 66264.1–.172, 66265.16–199; 66268.10–.44, .105–113 (LDRs + treatment standards); 49 CFR Parts 172, 173, 178, 179 (transportation) [incorporated by reference]	Pursuant to 42 USC § 7926, the State of California is authorized to implement the federal RCRA Program. Federal statutes may apply to areas not covered by the state program, or where incorporated by reference.	Relevant and appropriate	
Medical Waste Handling Requirements	Cal. Health and Safety Code 117600-118360; SF Municipal Health Code §§ 1501-1514	Medical waste is required to undergo certain treatment requirements prior to disposal so that it can be characterized as a "solid" waste. Without such treatment, land disposal of medical waste is not permitted.	Relevant and appropriate	Based on existing site data, medical waste is not expected to be present at Mountain Lake.
Solid (Nonhazardous) Waste Requirements	Cal. Pub. Res. Code §40000-40201, 43000-44820; 27 CCR §§ 20005-20278	These requirements govern disposal of nonhazardous solid waste and closure and post closure of solid waste management units.	To be considered	
Clean Closure Requirements	27 CCR § 20380(d)(2); 27 CCR § 21090(f); CCR § 21410	For clean closure, all waste, waste residues, contaminated containment systems components, contaminated subsoil, and all other contaminated materials are removed or decontaminated at closure pursuant to the specific requirements for landfills, etc. Clean closure renders the landfill no longer a threat to water quality.	Relevant and appropriate	

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
Closure, Post-Closure Maintenance and Land Use Restrictions	Cal. Health and Safety Code §§ 25100-25124 (definitions), 25208-25208.17 (special rules for surface impoundments), 25209-25209.7 (land treatment units); 25245-25249 (financial responsibility and closure and maintenance of facilities), 25297.15, 25299.10-25299.99.3 (closure of/corrective action regarding USTs); 22 CCR §§ 66264.110-66264.120, 66265.110-66265.120; 67217 (post-closure care)	Provisions of the California Health and Safety Code and implementing regulations govern the method and timing of closure of certain types of locations with material above hazardous waste levels (e.g., landfills), and the required post-closure care of those facilities, including meeting associated financial requirements (H & S Code 25208-25208.17, 25245-25249 financial responsibility and closure and maintenance of facilities); 22 CCR 66264.110-66264.148, 66264.228 (surface impoundments); 22CCR 66264.258 (waste piles); H & S Code 25209-25209.7; 22CCR 66264.280 (land treatment units); 66264.310 (landfills); 66264.351 (incinerators).	To be considered	
Federal Clean Air Act (CAA), certain Bay Area Air Quality Management District (BAAQMD) Regulations	BAAQMD Regulations (see citations below)	Implementation of federal Clean Air Act requirements has been delegated, in part, to the State of California. The BAAQMD is the local implementing agency. Where BAAQMD requirements have been incorporated into the State Implementation Plan (SIP) and approved by EPA, they are federally-enforceable. Where BAAQMD requirements have not been incorporated into the SIP and approved by EPA, they are not federally enforceable.	Relevant and appropriate	
	Air Resources Board Executive Order G-02-026, Resolution 0128, Modification to Section 93105 of Title 17 of the CCR, Asbestos Air-borne Toxic Control Measures for Construction, Grading, Quarrying, and Surface Mining Operations	The Model Rule addresses potential asbestos releases that may occur during construction, grading, quarrying, and surface mining on areas that contain naturally occurring asbestos. Excavation in serpentine rock may result in the emission of naturally occurring asbestos. Such activities in areas larger than 1 acre will require a dust mitigation plan.	To be considered	
	BAAQMD Regulation 7; Regulation 8, Rule 40; and Regulation 9, Rule 2	These requirements regulate the emission of odorous substances, organic compounds, and hydrogen sulfide.	Relevant and appropriate	
	BAAQMD Regulation 8, Rule 15	BAAQMD Regulation 8, Rule 15 prohibits the use of certain types of liquid and emulsified asphalts (those that would emit large amounts of organic compounds). This rule was approved into the SIP on 22 March 1995, as amended by BAAQMD on 1 June 1994.	Relevant and appropriate	
California prohibitions on polluting waters of the State	Cal. Fish & Game Code § 5650	Cal. Fish & Game Code § 5650(a) prohibits depositing enumerated substances, including "any substance or material deleterious to fish, plant life, or bird life" into the waters of the state.	To be considered	
Underground Storage Tank (UST) Regulations	California Code of Regulations, Title 23, Chapter 16, Article 11	UST regulations protect waters of the state from discharges of hazardous substances from USTs.	Relevant and appropriate	No USTs are known to be present at Mountain Lake.

Table 5-1: Applicable or Relevant and Appropriate Requirements

ARAR	Citation	Description	ARAR Determination	Comments [(a)]
Water Board Order No. R2-2003-080	Porter-Cologne Water Quality Control Act promulgated under California Water Code Section 13304	Order No. R2-2003-0080, Task 16, outlines requirements for Contingency Petroleum Sites.	To be considered	
San Francisco Bay Water Board UST Program	California Health and Safety Code, Division 20, Chapters 6.7 and 6.75	The San Francisco Bay Water Board UST Program gives local agencies the authority to oversee investigation and cleanup of UST leak sites.	Relevant and appropriate	No USTs are known to be present at Mountain Lake.
City and County of San Francisco UST Regulations	San Francisco Health Code, Article 21	These regulations describe procedures that the San Francisco Department of Public Health requires UST owners and operators to follow in removing USTs.	To be considered	No USTs are known to be present at Mountain Lake.
City of San Francisco Noise Regulations	City of San Francisco Code, Article 29 § 2907 and 2908	These regulations describe provisions to regulate noise during operation of construction equipment and when performing construction work at night. Nighttime construction (between 8 p.m. to 7 a.m.) to erect, construct, demolish, excavate for, alter, or repair any building or structure if the noise level created thereby is in excess of the ambient noise level by 5 dBA requires a permit by the Director of Public Works.	To be considered	
San Francisco Public Utilities Commission, Permit No. 05-0246 Industrial User Class II Wastewater Permit, dated February 7, 2005	San Francisco Municipal Code: Public Works Code, Article 4.1	Permit No. 05-0246 from the San Francisco Public Utilities Commission authorizes the Trust to discharge wastewater into the City and County of San Francisco sewerage system, provided that such wastewater discharges are performed in accordance with the conditions set forth in this permit. Discharge to the sewer of groundwater from dewatering must meet these requirements.	To be considered	
Department of Fish and Game's Lake and Streambed Alteration Program	Cal. Fish & Game Code §§ 1600-1607	These regulations require a state or local agency who proposes a project that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any stream or use materials from a streambed to notify the Dept. of Fish & Game before beginning the project. If Dept. of Fish & Game determines that the proposed project may substantially adversely affect existing fish or wildlife resources, the project proponent would need to obtain a Lake or Streambed Alteration Agreement from the Dept. of Fish & Game and the proposed project, unless it is otherwise exempt, would have to be reviewed in accordance with the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.).	To be considered	

Notes:

(a) Locations for remote staging areas will be identified prior to remedial activities. Remote staging areas will have similar action- and chemical-specific ARARs and TBCs as Mountain Lake. Location-specific ARARs and TBCs may be more or less stringent, depending on the location of the staging area.

Table 6-1: Summary of GRAs, Technologies, and Process Options for Mountain Lake Sediment Remediation

General Response Action	Remedial Technology	Process Option	Description
No Action	Not Applicable	Not Applicable	No remedial action is implemented.
Institutional Controls	Government Controls	Commercial Fishing Bans	Prohibits commercial fishing for specific species or sizes of fish or shellfish.
		Water Body Use Restrictions	Prohibits navigation in the lake to prevent damage to caps, in-situ treatment, etc.
	Proprietary Controls	Land Use/Access Restrictions	Property restrictions (e.g., deed restrictions, easements, or covenants) associated with real estate documents or physical boundaries (i.e., fencing).
	Enforcement and Permit Tools	Permit Processes or Provisions of Administrative Orders or Consent Decrees	Legal tools (e.g., administrative orders, permits, or Consent Decrees) that limit specific site activities or place requirements on activities (e.g., monitoring and reporting).
	Informational Devices	Fish Consumption Advisories	Information provided to the public by government entities recommending acceptable fish consumption rates and preparation techniques.
Monitored Natural Recovery	Monitored Natural Recovery	Monitored Natural Recovery	Use of existing natural physical, chemical, and biological process to contain, destroy, or reduce contaminant bioavailability or toxicity. Involves extensive monitoring.
	Enhanced Monitored Recovery	Clean Material Layer	Enhancing monitored natural recovery through increased burial by placing a thin (e.g., six inches) layer of sand.
Containment in Place	Capping	Conventional Sand Cap	Physical isolation using a sand layer placed over contaminated sediment.
		Conventional Sand/Clay Cap	Physical isolation using sand and clay layers placed over contaminated sediment.
		Armored Cap	Physical isolation of contaminants using sand and rip rap layers placed over contaminated sediment.
		Composite Cap (e.g. HDPE, Geotextile)	Introduction of heavy-duty composite mats into a typical cap cross section to provide further protection from damage by erosion, scouring, heavy equipment, or other forces.
		Active Cap	Placing a reactive cap (e.g., activated carbon or organoclay) to reduce contaminant flux through the capping material.

Table 6-1: Summary of GRAs, Technologies, and Process Options for Mountain Lake Sediment Remediation

General Response Action	Remedial Technology	Process Option	Description
In-Situ Treatment	Biological	Slurry Bioremediation	Enhancement of biological degradation by adding nutrients and other amendments to the sediment.
		Phytoremediation	Planting vegetation that will take up contaminants.
		Aerobic or Anaerobic Biodegradation	Biological degradation by microorganism in the presence or absence of oxygen.
		Imbiber Beads	Absorption of organic contaminants onto spherical plastic particles.
	Physical-Immobilization	Solidification/Stabilization	Binding contaminants in the sediment by forming a solid matrix through the addition of reagents.
		Vitrification	Application of high electrical current to heat sediment above 2,400°F to fuse it into a glassy solid.
		Electrochemical Oxidation	Application of an electrical current to create redox reactions that degrade organic compounds.
		Carbon/Other Amendments	Reduction in bioavailability of organic compounds by mixing granular activated carbon with sediment.
Removal	Dry Removal	Excavation	Diversion of water to create non-submerged conditions (i.e., installation of sheet piles coffer dams) and then sediment removal using conventional land-based equipment (e.g., excavators, backhoes, etc.).
	Wet Removal	Mechanical Dredging	Barge-based removal of sediment in in-situ conditions using clamshell or bucket type equipment, typically with barge transport and dewatering.
		Hydraulic Dredging	Slurry removal of sediments using various cutter and suction heads (e.g., cutterhead, horizontal auger, plain suction, pneumatic, or specialty dredge), typically with pipeline transport and ex-situ treatment to dewater.

Table 6-1: Summary of GRAs, Technologies, and Process Options for Mountain Lake Sediment Remediation

General Response Action	Remedial Technology	Process Option	Description
Disposal/ Confinement	Upland Commercial Landfill	Upland Commercial Landfill	Regulated and permitted disposal sites at which solid waste is buried between layers of soil and other materials to mitigate contamination of surrounding soil, groundwater, and surface water.
	Confined Aquatic Disposal	Confined Aquatic Disposal	Submerged pits that are filled and then covered with clean material (i.e., capped).
	Confined Disposal Facility	Confined Disposal Facility	A separate disposal facility specifically designed and constructed to mitigate transport of contaminants to surrounding soil and surface water.
Ex-Situ Treatment	Physical – Dewatering	In-Barge Dewatering	Passive gravity settling in a barge with slow release of elutriate back into the lake.
		Lagoon Dewatering	Passive gravity settling in a diked confinement with periodic discharge of elutriate.
		Geotextile Tube Dewatering	Dewatering through a geotextile membrane that allows water to pass but retains sediment particles.
		Mechanical Dewatering	Dewatering using filter presses or similar equipment.
		Reagent Dewatering	Additional of reagents to sediment slurry to chemically absorb excess water.
		Particle Separation	Segregation of coarse grained material that may be less contaminated and potentially suitable for beneficial reuse.
	Physical - Immobilization	Cement Solidification/Stabilization	Use of Portland cement to solidify and stabilize contaminated sediments.
		Sorbent Clay Solidification/Stabilization	Use of sorbent clays (i.e., bentonite) to solidify and stabilize contaminated sediments.
		Asphalt Emulsion	Removal of water and binding of contaminants using asphalt emulsion.
		Solar Detoxification	Use of concentrated sunlight to break down and destroy toxic compounds.

Table 6-1: Summary of GRAs, Technologies, and Process Options for Mountain Lake Sediment Remediation

General Response Action	Remedial Technology	Process Option	Description
Ex-Situ Treatment (cont'd)	Biological Methods	Composting	Composting induced reduction in contaminant concentrations using large scale land treatment.
		Biopiles	Biopile induced reduction in contaminant concentrations using large scale land treatment.
		Fungal Biodegradation	Fungi induced reduction in contaminant concentrations using large scale land treatment.
		Slurry-Phase Treatment	Biological treatment in slurry form.
		Enhanced Biodegradation	Mixing sediment with oxygen, reducing agents, nutrients, and microorganisms to accelerate natural biodegradation processes.
	Chemical	Acid Extraction	Extracting contaminants from sediments by washing with acids.
		Solvent Extraction	Extracting contaminants from sediments by washing with solvents.
	Physical – Separation	Sediment Washing	Washing sediments with water and an oxidizing agent to remove contaminants.
	Thermal Methods	Incineration	Decomposition of organic compounds at temperatures above 900°C (1,650°C).
		Pyrolysis	Decomposition of organic compounds at temperatures above 430°C (800°F) in the absence of oxygen.
		Thermal Desorption	Volatilization of organic compounds and water at low temperatures of 320 to 560°C (600 to 1,000°F) or high temperature with of 90 to 320°C (200 to 600°F)off gas transport and treatment (e.g. thermal oxidation or recovery unit).
		High Pressure Oxidation	Use of high temperatures and pressures to break down organic compounds via wet air oxidation or supercritical water oxidation.
		Vitrification	Contaminated sediments are heated in a rotary kiln or furnace at temperatures up to 1,600°C (2,900°F).

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
No Action	Not Applicable	Not Applicable	**LOW:** Does not meet RAOs	**HIGH:** Does not require any effort to implement.	**LOW:** There are no associated costs.	Required for consideration by NCP.
Institutional Controls	Government Controls	Commercial Fishing Bans	**LOW:** Mountain Lake is not used for commercial fishing. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**HIGH:** Mountain Lake is not used for commercial fishing.	**LOW:** Mountain Lake is not used for commercial fishing.	Screened out due to limited effectiveness.
		Water Body Use Restrictions	**LOW:** Mountain Lake is not used for recreational activities on the lake. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**HIGH:** Mountain Lake is not used for recreational activities on the lake.	**LOW:** Mountain Lake is not used for recreational activities on the lake.	Screened out due to limited effectiveness.
	Proprietary Controls	Land Use/Access Restrictions	**LOW:** Future use of Mountain Lake involves shoreline recreation that would be impeded by perimeter fencing. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**MODERATE:** Public resistance is anticipated to be high, which would likely impede implementation.	**LOW:** Depending on the construction details, fencing can generally be installed at a low cost.	Screened out due to limited effectiveness.
	Enforcement and Permit Tools	Permit Processes or Provisions of Administrative Orders or Consent Decrees	**LOW:** Land uses other than limited recreational and scenic are not contemplated for the lake currently or in the future. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**LOW:** Would required participated and coordination with DTSC to setup restrictions and requirements. No actual field work required.	**LOW:** Primarily administrative and oversight costs.	Screened out due to limited effectiveness.
	Informational Devices	Fish Consumption Advisories	**LOW:** Mountain Lake is not used for fishing. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**HIGH:** Mountain Lake is not used for fishing.	**LOW:** Mountain Lake is not used for fishing.	Screened out due to limited effectiveness.
Monitored Natural Recovery	Monitored Natural Recovery	Monitored Natural Recovery	**LOW:** Not anticipated to be effective for the principal contaminant, lead. Burial mechanism is not consistent with current and future lake function. Does not adequately address exposure of ecological receptors to contaminants. Unlikely to meet RAOs.	**HIGH:** Capital improvements are not required. Predictive modeling and development of a detailed and comprehensive monitoring program is required.	**MODERATE:** Predictive modeling and extensive ongoing monitoring of ecological quality parameters.	Screened out due to limited effectiveness.
	Enhanced Monitored Recovery	Clean Material Layer	**LOW:** Generally effective for organic contaminants and not anticipated to be effective for the principal contaminant, lead. Burial mechanism is not consistent with current and future lake function. Does not adequately address exposure of ecological receptors to contaminants. Unlikely to meet RAOs.	**MODERATE:** Installation of a thin sand layer is implementable with regards to erosion and slope stability issues. However, final installed sand layer configuration may be inconsistent with future lake beneficial uses.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; extensive ongoing monitoring of ecological quality parameters.	Screened out due to limited effectiveness.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
Containment in Place	Capping	Conventional Sand Cap	**MODERATE:** May address exposure of ecological receptors to contaminants. However, may compromise ecological and hydrologic function of lake. May partially meet RAOs.	**MODERATE:** Engineered caps are implementable with regards to erosion and slope stability issues. However, final installed cap configuration may be inconsistent with future lake beneficial uses.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of cap integrity.	Retained in accordance with EPA recommendations (EPA 2005).
		Conventional Sand/Clay Cap	**MODERATE:** May address exposure of ecological receptors to contaminants. Addition of clay is not responsive to principal contaminant, lead. May compromise ecological and hydrologic function of lake. May partially meet RAOs.	**MODERATE:** Engineered caps are implementable with regards to erosion and slope stability issues. However, final installed cap configuration may be inconsistent with future lake beneficial uses.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of cap integrity.	Screened out as redundant with conventional sand cap.
		Armored Cap	**MODERATE:** May address exposure of ecological receptors to contaminants. Generally does not provide enhanced effectiveness compared to conventional sand cap. However, may be required to address limited areas with slope stability sensitivities. May compromise ecological and hydrologic function of lake. May partially meet RAOs.	**MODERATE:** Engineered caps are implementable with regards to erosion and slope stability issues. However, final installed cap configuration may be inconsistent with future lake beneficial uses.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of cap integrity.	Retained for limited application in areas of potential submerged slope stability issues.
		Composite Cap (e.g. HDPE, Geotextile)	**MODERATE:** May address exposure of ecological receptors to contaminants. Generally does not provide enhanced effectiveness compared to conventional sand cap. In general, the lake is a low energy environment in which erosion is not anticipated to significantly compromise an installed cap. May compromise ecological and hydrologic function of lake. May partially meet RAOs.	**MODERATE:** Engineered caps are implementable with regards to erosion and slope stability issues. However, final installed cap configuration may be inconsistent with future lake beneficial uses.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of cap integrity.	Screened out as redundant with conventional sand cap.
		Active Cap	**MODERATE:** May address exposure of ecological receptors to contaminants. Addition of reactive layers is not anticipated to be responsive to principal contaminant, lead. May compromise ecological and hydrologic function of lake. May partially meet RAOs.	**MODERATE:** Engineered caps are implementable with regards to erosion and slope stability issues. However, final installed cap configuration may be inconsistent with future lake beneficial uses.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of cap integrity.	Screened out as redundant with conventional sand cap.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
In-Situ Treatment	Biological	Slurry Bioremediation	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**MODERATE:** Existing bathymetric surveys and sediment cores do not indicate the presence of obstructions that would limit implementation.	**MODERATE:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.
		Phytoremediation	**LOW:** Water depth would limit the application of this process to the perimeter of the lake, which is not collocated with the contaminated sediment. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**LOW:** Implementation would require extensive filling of the lake to create conditions conducive to planting and harvesting.	**MODERATE:** Requires labor intensive planting operation and ongoing harvesting and disposal costs.	Screened out due to limited effectiveness and implementability.
		Aerobic or Anaerobic Biodegradation	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**MODERATE:** Existing bathymetric surveys and sediment cores do not indicate the presence of obstructions that would limit implementation.	**MODERATE:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.
		Imbiber Beads	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**HIGH:** Distribution of beads could be accomplished simply from a small vessel.	**MODERATE:** Requires specialized material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.
	Physical-Immobilization	Solidification/Stabilization	**LOW:** May address exposure of ecological receptors to contaminants. Would likely compromise ecological and hydrologic function of lake. Unlikely to meet RAOs.	**MODERATE:** Existing bathymetric surveys and sediment cores do not indicate the presence of obstructions that would limit implementation.	**MODERATE:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.
		Vitrification	**LOW:** May address exposure of ecological receptors to contaminants. Would likely compromise ecological and hydrologic function of lake. Unlikely to meet RAOs.	**MODERATE:** Existing bathymetric surveys and sediment cores do not indicate the presence of obstructions that would limit implementation.	**MODERATE:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.
		Electrochemical Oxidation	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**MODERATE:** Existing bathymetric surveys and sediment cores do not indicate the presence of obstructions that would limit implementation.	**HIGH:** Requires careful installation of temporary in-lake infrastructure; performance monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.
		Carbon/Other Amendments	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead. Does not address exposure of ecological receptors to contaminants. Does not meet RAOs.	**MODERATE:** Existing bathymetric surveys and sediment cores do not indicate the presence of obstructions that would limit implementation.	**MODERATE:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring of sediment quality.	Screened out due to limited effectiveness.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
Removal	Dry Removal	Excavation	**HIGH:** With proper management of re-suspension and residuals, this response would effectively remove contaminants. Addresses exposure of ecological receptors to contaminants. Would likely meet RAOs.	**LOW:** There are technical infeasibility issues related to water management and slope stability that prevent dewatering of the lake. In particular, dewatering the lake may destabilize Park Presidio, a concern explicitly expressed by Caltrans (Caltrans 2012), and the rate of groundwater inflow to the lake would likely generate too much water to manage over the course of the removal operations.	**HIGH:** Requires dewatering; careful excavation to limit cross contamination; potentially additional material dewatering and handling; loading, transport, and disposal.	Screened out due to limited implementability.
	Wet Removal	Mechanical Dredging	**HIGH:** With proper management of re-suspension and residuals, this response would effectively remove contaminants. Addresses exposure of ecological receptors to contaminants. Would likely meet RAOs.	**MODERATE:** Dredging is technically feasible at the site, although space is limited for dewatering operations and access is limits for off-haul operations. Slope stability issues along Park Presidio would require further analysis and may required combining removal with capping.	**HIGH:** Requires mobilization of specialized equipment; careful dredging operations to limit re-suspension and residual contaminated sediment; intermediate transport via trucks or conveyor system to an onsite temporary dredged material handling area; potentially additional material dewatering and handling; loading, transport, and disposal.	Retained in accordance with EPA recommendations (EPA 2005). However, to simplify the evaluation process, a single process option would be chosen to represent the wet removal technology, as described in the text. Therefore, further analysis would be based on hydraulic dredging as representative of wet removal.
		Hydraulic Dredging	**HIGH:** With proper management of re-suspension and residuals, this response would effectively remove contaminants. Addresses exposure of ecological receptors to contaminants. Would likely meet RAOs.	**MODERATE:** Dredging is technically feasible at the site, although space is limited for dewatering operations and access is limits for off-haul operations. Slope stability issues along Park Presidio would require further analysis and may required combining removal with capping.	**HIGH:** Requires mobilization of specialized equipment; careful dredging operations to limit re-suspension and residual contaminated sediment; intermediate transport via pipeline to an onsite temporary dredged material handling area; material dewatering and handling; loading, transport, and disposal.	Retained in accordance with EPA recommendations (EPA 2005). Preferred over mechanical dredging as it better minimizes cross contamination with the surrounding areas.
Disposal/ Confinement	Upland Commercial Landfill	Upland Commercial Landfill	**HIGH:** Design, operated, and monitored to meet federal and state regulatory criteria. Slightly greater risk of short-term impacts due to transport distances.	**HIGH:** There are many facilities available in California and nearby states with the capacity to accept the volume of sediment anticipated.	**HIGH:** Trucking is the only viable alternative for the site and disposal fees can be substantial.	Retained.
	Confined Aquatic Disposal	Confined Aquatic Disposal (CAD)	**HIGH:** A CAD would be designed and built to provide permanent effective containment of contaminated sediment with adequate controls on contaminant mobility and erosion of the CAD cap.	**LOW:** Installation of a CAD within Mountain Lake is not in accordance with the future development plans for the lake. There are no adjacent sites suitable for installation of a CAD.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring and reporting.	Screened out due to limited implementability.
	Confined Disposal Facility	Confined Disposal Facility (CDF)	**HIGH:** A CDF would be designed and built to provide permanent effective containment of contaminated sediment with adequate controls on contaminant mobility and CDF stability.	**LOW:** Installation of a CDF within the Presidio is not consistent with future development plans for the park. There are no adjacent sites suitable for installation of a CDF.	**HIGH:** Requires material import, staging, and handling; careful installation and construction monitoring; ongoing monitoring and reporting.	Screened out due to limited implementability.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
Ex-Situ Treatment	Physical – Dewatering	In-Barge Dewatering	**MODERATE:** Passive gravity dewatering is dependent upon environmental factors such as evaporation and precipitation rates. This process would likely limit production rates and would require additional material handling and transport to an off-haul staging area, resulting in additional opportunities for cross contamination.	**LOW:** In-barge dewatering would required near shore unloading facilities for which there is limited or no areas available around the perimeter of the lake.	**LOW:** This is a passive gravity dewatering process that simply requires mobilization of dewatering barge.	Retained as a potential process component of mechanical dredging. However, further analysis would be based on hydraulic dredging as representative of wet removal. Therefore, in-barge dewatering is not further evaluated.
		Lagoon Dewatering	**MODERATE:** Passive gravity dewatering is dependent upon environmental factors such as evaporation and precipitation rates. This process would likely limit production rates and would require a large area of land, which may hamper onsite operations.	**LOW:** A large staging area is required within close proximity to the lake and it may take significant time to sufficiently dewater the dredged material to meet water quality standards and offsite disposal requirements.	**MODERATE:** Some earthwork operations would be required to prepared the diked areas. Mitigation measures would also be required to address cross contamination with soil and groundwater in the staging area.	Retained as an interim storage stage of a multi-stage dewatering system.
		Geotextile Tube Dewatering	**HIGH:** This process is expected to be effective in dewatering dredged material.	**MODERATE:** A moderately sized staging area is required within close proximity to the lake and it may take significant time to sufficiently dewater the dredged material (depending on the actual particle size distribution) to meet water quality standards and offsite disposal requirements.	**MODERATE:** Requires specialized materials; pumping facilities; and potentially material re-handling following dewatering.	Retained as a potential process component of dredging. However, further analysis would be based on mechanical dewatering as a representative process option. Therefore, geotextile tube dewatering is not further evaluated.
		Mechanical Dewatering	**HIGH:** This process is expected to be highly effective in dewatering dredged material. There are a number of mechanical processes that can be employed to accomplish the dewatering.	**HIGH:** A smaller staging area is required and dewatering times are expected to be shorter. Specialized equipment mobilization is required and electrical power supply.	**HIGH:** Requires specialized equipment and power to implement.	Retained as a representative process option.
		Reagent Dewatering	**HIGH:** This process is expected to be highly effective in dewatering dredged material. There are a number of mechanical processes that can be employed to accomplish the dewatering.	**HIGH:** A smaller staging area is required and dewatering times are expected to be shorter. Specialized material and mixing facilities required.	**HIGH:** Requires specialized materials, equipment, and power to implement.	Retained as a potential process component of dredging. However, further analysis would be based on mechanical dewatering as a representative process option. Therefore, reagent dewatering is not further evaluated.
		Particle Separation	**LOW:** Contaminants are associated fine and coarse grained particles at the site. Particle separation would not provide any benefit.	**MODERATE:** A moderately sized staging area is required within close proximity to the lake. Specialized equipment mobilization is required and electrical power supply.	**HIGH:** Requires specialized equipment and power to implement.	Screened out due to limited effectiveness.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
Ex-Situ Treatment (cont'd)	Physical - Immobilization	Cement Solidification/Stabilization	**MODERATE:** Would likely reduce leaching of contaminants, but would still required offsite disposal.	**HIGH:** A smaller staging area is required. Specialized material and mixing facilities required. Material loading, transport, and offsite disposal would still be required.	**HIGH:** Requires specialized materials, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out as it does not eliminate the need for offsite disposal.
		Sorbent Clay Solidification/Stabilization	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**HIGH:** A smaller staging area is required. Specialized material and mixing facilities required. Material loading, transport, and offsite disposal would still be required.	**HIGH:** Requires specialized materials, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out due to limited effectiveness.
		Asphalt Emulsion	**MODERATE:** Would likely reduce leaching of contaminants, but would still required offsite disposal.	**HIGH:** A smaller staging area is required. Specialized material and mixing facilities required. Material loading, transport, and offsite disposal would still be required.	**HIGH:** Requires specialized materials, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out as it does not eliminate the need for offsite disposal.
		Solar Detoxification	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**HIGH:** A smaller staging area is required. Specialized equipment mobilization is required and electrical power supply. Material loading, transport, and offsite disposal would still be required.	**HIGH:** Requires specialized materials, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out due to limited effectiveness.
	Biological Methods	Composting	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A large staging area is required within close proximity to the lake, it may take significant time to sufficiently treat contaminants, and it may require extensive mitigation measures to control air emissions and prevent rainfall infiltration. High concentrations of contaminants can also be toxic to microorganisms.	**MODERATE:** Requires repeated material handling; possibly application of amendments; mitigation of cross contamination in the treatment area; performance monitoring.	Screened out due to limited effectiveness.
		Biopiles	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A large staging area is required within close proximity to the lake, it may take significant time to sufficiently treat contaminants, and it may require extensive mitigation measures to control air emissions and prevent rainfall infiltration. High concentrations of contaminants can also be toxic to microorganisms.	**MODERATE:** Requires repeated material handling; possibly application of amendments; mitigation of cross contamination in the treatment area; performance monitoring.	Screened out due to limited effectiveness.
		Fungal Biodegradation	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A large staging area is required within close proximity to the lake, it may take significant time to sufficiently treat contaminants, and it may require extensive mitigation measures to control air emissions and prevent rainfall infiltration. High concentrations of contaminants can also be toxic to microorganisms.	**MODERATE:** Requires repeated material handling; possibly application of amendments; mitigation of cross contamination in the treatment area; performance monitoring.	Screened out due to limited effectiveness.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
Ex-Situ Treatment (cont'd)	Biological Methods (cont'd)	Slurry-Phase Treatment	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A large staging area is required within close proximity to the lake, it may take significant time to sufficiently treat contaminants, and it may require extensive mitigation measures to control air emissions and prevent rainfall infiltration. High concentrations of contaminants can also be toxic to microorganisms.	**MODERATE:** Requires repeated material handling; possibly application of amendments; mitigation of cross contamination in the treatment area; performance monitoring.	Screened out due to limited effectiveness.
		Enhanced Biodegradation	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A large staging area is required within close proximity to the lake, it may take significant time to sufficiently treat contaminants, and it may require extensive mitigation measures to control air emissions and prevent rainfall infiltration. High concentrations of contaminants can also be toxic to microorganisms.	**MODERATE:** Requires repeated material handling; possibly application of amendments; mitigation of cross contamination in the treatment area; performance monitoring.	Screened out due to limited effectiveness.
	Chemical	Acid Extraction	**LOW:** May be effective is leaching metals from sediment, but would then require treatment and/or disposal of leachate. Essentially substitutes one onsite contaminated media for another.	**MODERATE:** A moderately sized staging area is required within close proximity to the lake. Specialized materials and equipment mobilization is required and electrical power supply. Safety issues require mitigation due to hazardous materials introduced.	**HIGH:** Requires specialized materials, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out due to limited effectiveness.
		Solvent Extraction	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**MODERATE:** A moderately sized staging area is required within close proximity to the lake. Specialized materials and equipment mobilization is required and electrical power supply. Safety issues require mitigation due to hazardous materials introduced.	**HIGH:** Requires specialized materials, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out due to limited effectiveness.
	Physical - Separation	Sediment Washing	**LOW:** Unlikely to provide treatment to sufficiently low levels. Would require treatment and/or disposal of wash water. Essentially creates an additional onsite contaminated media.	**MODERATE:** A moderately sized staging area is required within close proximity to the lake. Specialized materials and equipment mobilization is required and electrical power supply.	**HIGH:** Requires source of clean water, equipment, and power to implement. Due to lack of onsite disposal space, would still require offsite disposal.	Screened out due to limited effectiveness.

Table 6-2: Summary of Screening Evaluation

General Response Action	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Screening Comments
Ex-Situ Treatment (cont'd)	Thermal Methods	Incineration	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A moderately sized staging area is required within close proximity to the lake. Specialized equipment mobilization is required. Mitigation of air pollution and extensive permitting is required.	**HIGH:** Requires specialized equipment and power to implement.	Screened out due to limited effectiveness and implementability.
		Pyrolysis	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A moderately sized staging area is required within close proximity to the lake. Specialized equipment mobilization is required. Mitigation of air pollution and extensive permitting is required.	**HIGH:** Requires specialized equipment and power to implement.	Screened out due to limited effectiveness and implementability.
		Thermal Desorption	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A moderately sized staging area is required within close proximity to the lake. Specialized equipment mobilization is required. Mitigation of air pollution and extensive permitting is required.	**HIGH:** Requires specialized equipment and power to implement.	Screened out due to limited effectiveness and implementability.
		High Pressure Oxidation	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A moderately sized staging area is required within close proximity to the lake. Specialized equipment mobilization is required. Mitigation of air pollution and extensive permitting is required.	**HIGH:** Requires specialized equipment and power to implement.	Screened out due to limited effectiveness and implementability.
		Vitrification	**LOW:** Generally intended for organic contaminants and not anticipated to be effective for the principal contaminant, lead.	**LOW:** A moderately sized staging area is required within close proximity to the lake. Specialized equipment mobilization is required. Mitigation of air pollution and extensive permitting is required.	**HIGH:** Requires specialized equipment and power to implement.	Screened out due to limited effectiveness and implementability.

Notes

(a) Options retained for development of remedial alternatives and further evaluation are indicated by grey shading:

Table 6-3: Summary of Remedial Alternatives

Alternative		Description
1	No Action	No remedial action is implemented.
2	Capping	The alternative involves the installation of conventional sand cap across most of the lake area to isolate underlying contaminated sediments from potential human and environmental receptors. The key remedy components are as follows: • Design in accordance with EPA and USACE guidance. • Preparation of a staging and access areas for cap material handling and transport to over-water installation equipment. This may include installation of ramp access to Park Presidio. • Mobilization of specialized marine equipment to place the cap and material delivery. • Careful placement of cap material to minimize release and re-suspension of cap material and/or contaminated sediment. • Construction phase monitoring of the cap placement and residuals. • Installation and maintenance of stormwater treatment measures to control runoff from Park Presidio Blvd. • Long-term monitoring and reporting of cap integrity and effectiveness following installation of the cap.
3	Dredging with Offsite Disposal and Limited Capping	The alternative involves removal, processing, and offsite disposal of approximately 15,600 cubic yards of sediment, with limited capping of contaminated sediments left in place in areas due to slope stability constraints. The key remedy components are as follows: • Preparation of a staging area for dredged material processing. This may include installation of ramp access to Park Presidio. • Mobilization of specialized marine equipment to dredge sediments and process the dredged material. • Wet removal (i.e., dredging) of contaminated sediments. It is likely that hydraulic dredging would be used to minimize release and re-suspension of contaminated sediment, although the contractor's means and methods would not be constrained and mechanical dredging could also be employed. This operation may involve multi-pass dredging and/or over-dredging. • Limited sediment removal with capping in areas of slope stability constraints. • Pipeline or other similar transport of dredged material to the staging area. • Mechanical dewatering of dredged material. • Waste profiling, loading, and transport to an offsite landfill. • Installation and maintenance of stormwater treatment measures to control runoff from Park Presidio Blvd. • Construction phase monitoring of the potential residuals, sediment quality, and elutriate quality.

Table 7-1: Comparison of Total Cost of Remedial Alternatives

Description	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Dredging and Offsite Disposal with Limited Capping
Total Project Duration (Years)	0	30	1
Undiscounted Capital Cost[(a)]	No Costs	$4.0 Million	$9.2 Million
Undiscounted Annual O&M Cost[(a)]	No Costs	$73 Thousand	No Costs
Undiscounted Periodic Costs[(a)]	No Costs	$84 Thousand	No Costs
Total Present Value of Alternative (Discount Rate of 7%[(b)])	No Costs	$4.9 Million	$9.2 Million

Notes

(a) Quantities and costs are not based on an engineering design, but rather reflect a conceptual level assessment of system components and are based on experience at the Site and with similar projects. This opinion of costs is estimated to range from -30% to +50% accuracy.

(b) Source: United States Environmental Protection Agency (USEPA). 200b. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. July 2000.

Table 7-2: Detailed Evaluation of Remedial Alternatives

Evaluation Criteria		Alternative 1: No Action	Alternative 2: Capping and Monitoring	Alternative 3: Dredging with Offsite Disposal and Limited Capping
Threshold Criteria	Overall Protection of Human Health and the Environment	• Not protective of human health and the environment.	• Protective of human health and the environment by eliminating potential contact with contaminated sediment. • Cap could permanently, negatively affect health of lake and associated habitat by decreasing volume of lake water and inhibiting water circulation. • Placement of the cap would provide protection of human health and the environment by reducing COC concentrations at the sediment surface and reducing flux to the water column. • The cap would be designed in accordance with EPA and USACE guidance to provide long-term chemical isolation and ensure cap stability, integrity, and protectiveness. • Effectiveness depends in part on cap design and absence of residual soluble COCs.	• Protective of human health and the environment because contaminated sediment with chemical concentrations exceeding cleanup levels is permanently removed from the Site and disposed of in a permitted landfill, controlling potential future exposure to humans and the environment.
	Compliance with ARARs	• Does not comply with ARARs.	• Complies with all ARARs.	• Complies with all ARARs.
Balancing Criteria	Long-Term Effectiveness	• Would not prevent long-term exposure.	• Provides long-term and permanent protection from exposure to contaminated sediment when implemented with maintenance and monitoring requirements. • Is inconsistent with future lake restoration goals. • The cap would be designed in accordance with EPA and USACE guidance to provide long-term chemical isolation and stability. It is expected that the installed cap would be stable over the long-term and would protect underlying contaminated sediments from erosion under future conditions, thereby minimizing residual risks associated with remaining contaminants. • Long-term monitoring and maintenance of the cap is required to further ensure its long-term effectiveness and permanence, consistent with EPA and USACE guidance.	• Effective in the long-term. • Residual risks associated with re-suspension and release of contaminated sediment during the dredging activities would be minimized or eliminated by dredging operation procedures, implementation of multi-pass removal, and/or over-dredging. • Sediment removed during dredging would be disposed of at an offsite permitted landfill, which would provide effective long-term management of the dredged material, controlling potential future exposure to humans and the environment. • Long-term monitoring is not anticipated.
	Reduction of Toxicity, Mobility, or Volume through Treatment	• Would not result in a reduction of toxicity, mobility, or volume of contaminants or contaminated sediment.	• Reduces the mobility of contaminants in sediment as a function of the cap's isolation barrier characteristics. • Does not reduce toxicity or volume of contaminants or contaminated sediment as the alternative does not include treatment or removal.	• Reduces the volume of contaminated sediment on Site. • Does not directly reduce the toxicity or mobility of contaminants. However, the toxicity of RCRA hazardous waste would be reduced when treated at an offsite facility prior to disposal and the mobility of contaminants would be reduced via disposal in a permitted offsite landfill. • Additionally, if elutriate sampling and analysis indicates that treatment is required prior to discharge back to the lake, then overall contaminant toxicity, mobility, and volume may be reduced following the dewatering activities.

Table 7-2: Detailed Evaluation of Remedial Alternatives

Evaluation Criteria		Alternative 1: No Action	Alternative 2: Capping and Monitoring	Alternative 3: Dredging with Offsite Disposal and Limited Capping
Balancing Criteria (cont'd)	Short-Term Effectiveness	• Would have no additional impacts or effects on workers, the community, and the environment because no action would be taken.	• Short-term impacts would be expected during implementation. • Placement of the cap would affect benthic organisms and available habitat. • Construction controls and monitoring for dust, odor, and other emissions would be required during material handling and cap installation activities. • Traffic impacts accompany delivery of materials. • Water quality in the lake may be affected during cap placement, primarily due to temporary increases in turbidity. • There should be low potential for health impacts to the community and workers during cap placement. • Staging needs for cap placement may disrupt local community during placement. • Short-term impacts would occur over one construction season. • Complete biota recovery would take several years if at all.	• Short-term impacts would be expected during implementation. • Sediment removal would temporarily affect benthic organisms, but ultimately provide better quality habitat for the future. • Construction controls and monitoring for dust, odor, and other emissions would be required during removal activities. • Traffic impacts accompany off-hauling activities. • Water quality in the lake may be affected during dredging, primarily due to temporary increases in turbidity associated with re-suspension and release of sediments during removal. • There should be low to moderate potential for health impacts to the community and workers from contaminant release during dredging, staging, transport, and disposal. • Staging needs for dredged material processing may disrupt local community during these operations. • Short-term impacts would occur over one construction season. • Complete biota recovery is expected to occur within a few years.
	Implementability	• Easily implemented as no remedial actions would be conducted.	• Administratively and technically implementable. • Cap placement methods are generally well-established. • Would require removal of some trees and planting areas to prepare a staging area and provide shoreline access for preparation of the cap materials and transportation of the cap materials form the staging area to the lake. • Necessary personnel for the various capping activities, including crane and loader operators, GPS surveyors, monitoring and implementation crews are readily available. • It is likely that suitable capping materials could be obtained from local sources. • Relatively easy to repair cap in case of localized erosion or disruption, but could be difficult or costly to implement sediment removal if cap is shown to be ineffective. • Methods for monitoring cap integrity and contaminant migration within cap are relatively well established.	• Administratively and technically implementable. • Dredging methods are generally well-established. • Disposal in upland landfills is a well-established technique. • Would require removal of some trees and planting areas to prepare a staging area. • Necessary equipment, personnel, and services are expected to be available in sufficient supply from a number of marine and specialty dredging contractors. • Fully supports future intended land uses. • Implementation of additional remedial actions, such as monitored natural recovery or capping, is relatively easy if dredging is shown to be ineffective. • Monitoring methods for sediment cleanup levels and short-term releases form dredging are relatively well-established.
	Cost	• There are no costs associated with this alternative.	• Moderate to high capital cost. • Moderate long-term maintenance and monitoring costs.	• High capital cost. • No long-term operation, maintenance, and monitoring costs.

Table 7-2: Detailed Evaluation of Remedial Alternatives

Evaluation Criteria		Alternative 1: No Action	Alternative 2: Capping and Monitoring	Alternative 3: Dredging with Offsite Disposal and Limited Capping
Modifying Criteria	State/Regulatory Agency Acceptance	• Not favored by the regulatory agencies.	• Likely acceptable to DTSC.	• Acceptable to DTSC.
	Attainment of Green Remediation Goals	• Does not meet the green remediation goals.	• Meets most green remediation goals. • Emissions would consist of vehicle and equipment emissions. • Natural resources required would include fill soil for cap and fuel for vehicles and equipment. • Temporary physical disturbances would be created (noise, dust, and traffic).	• Would not meet most of the objectives of the DTSC Green Remediation program. • Implementation of this technology would result in the greatest amount of disturbances including traffic, noise, dust, odors, and increased risk of traffic-related death or injury from the trucks transporting and disposing of the dredged material.
	Community Acceptance	• Not favored by the community.	• Community acceptance is evaluated during the public comment period for this Draft FS/RAP. Based on community input received during early public participation events, the community generally prefers Alternative 3 to this alternative.	• Community acceptance is evaluated during the public comment period for this Draft FS/RAP. Based on community input received during early public participation events, this alternative is generally acceptable to the community.

Table 7-3: Qualitative Comparison of Remedial Alternatives[a]

	Evaluation Criteria	Alternatives		
		1-No Action	**2-Capping**	**3-Dredging**
Threshold Criteria	Overall protection of human health and the environment	Does not meet criteria	Meets criteria	Meets criteria
	Compliance with applicable or relevant and appropriate requirements (ARARs)	Does not meet criteria	Meets criteria	Meets criteria
Balancing Criteria	Long-term effectiveness and permanence	3	2	1
	Reduction of mobility, toxicity, or volume through treatment	3	2	1
	Short-term effectiveness	1	2	2
	Implementability	1	2	2
	Cost	1	2	3
	Sum of Rankings:	**9**	**10**	**9**
Modifying Criteria	State acceptance	Likely unfavorable	Likely favorable	Likely favorable
	Attainment of Green Remediation Goals	Not achieved	Mostly achieved	Minimally achieved
	Community acceptance	Likely unfavorable	Likely favorable, but not as preferred as Alternative 3	Likely favorable

Notes

(a) Alternatives were ranked, with "1" considered the best and "3" the worst. Ties were assigned the lowest common value.

Figures

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Project Location
SAN FRANCISCO
OAKLAND
BERKELEY
Alameda
Richmond
San Rafael
Vallejo
Napa
Santa Rosa
Petaluma
Fairfield
Vacaville
Concord
Walnut Creek
San Mateo
Redwood City
San Jose
Santa Clara
Sunnyvale
Mountain View
Palo Alto
Menlo Park
Daly City
Pacifica
Burlingame
Hayward
Fremont
Pittsburg
Antioch
Benicia
Martinez
Novato
Sausalito
Tiburon
Mill Valley
Larkspur
Corte Madera
Fairfax
San Anselmo
Ross
San Ramon
Dublin
Pleasanton
Livermore
Castro Valley
San Leandro
Union City
Newark
Milpitas
Los Gatos
Cupertino
Campbell
Farallon Islands
Point Reyes Station
Inverness
Olema
Bolinas
Stinson Beach
Duxbury Point
Point Bonita
Point Lobos
Point San Pedro
Pillar Point
Half Moon Bay
Moss Beach
Montara
Pacifica
Colma
Brisbane
San Bruno
South San Francisco
Millbrae
Foster City
San Carlos
Belmont
Hillsborough
Woodside
Atherton
Los Altos
Los Altos Hills
Portola Valley
Monta Vista
La Honda
San Gregorio
Cordelia
Suisun City
Rio Vista
Montezuma
Birds Landing
Collinsville
Rodeo
Hercules
Pinole
El Sobrante
Pleasant Hill
Lafayette
Orinda
Moraga
Alamo
Danville
Diablo
Clayton
Concord
Pacheco
Martinez
Crockett
Mare Island
Vallejo
Black Point
Novato
Nicasio
Olema
Inverness
Pt Reyes Sta
Drakes Estero
Tomales
Marshall
Hicks Mtn
Burdell Mtn
Petaluma
Penngrove
Two Rock
Fallon
Sebastopol
Graton
Occidental
Freestone
Bodega
Bodega Bay
Valley Ford
Bloomfield
Cotati
Rohnert Park
Cunningham
Glen Ellen
Sonoma
El Verano
Schellville
Big Bend
Lakeville
Fairfield
Napa Junc
Napa
Yountville
Oakville
Rutherford
Kenwood
Santa Rosa
Mt Vaca
Allendale
Dixon
Elmira
Dozier
Liberty Farms
Libfarm
Dudley
Mt Diablo
Marsh Gr Res
Tassajara
Sunol
Pleasanton
Livermore
Indian Gr
Arroyo Hondo
Berryessa
Milpitas
Alviso
Newark
Fremont
Union City
Hayward
Castro Valley
San Leandro
Dublin
San Ramon
Tassajara
Diablo
Danville
Moraga
Orinda
Lafayette
Walnut Creek
Pleasant Hill
Clayton
Concord
Pittsburg
Antioch
Rio Vista
Montezuma
Birds Landing
Collinsville
Sherman
Benicia
Martinez
Pacheco
Crockett
Rodeo
Hercules
Pinole
El Sobrante
Richmond
El Cerrito
Albany
Emeryville
Piedmont
Alameda
San Leandro
San Lorenzo
Mt Eden
Castro Valley
Hayward
Union City
Newark
Fremont
Sunol
Pleasanton
Livermore
Milpitas
Berryessa
Los Gatos
Los Altos
Los Altos Hills
Portola Valley
Monta Vista
Cupertino
Campbell
Santa Clara
Sunnyvale
Mountain View
Palo Alto
Menlo Park
Atherton
Woodside
Redwood City
Belmont
San Carlos
Foster City
Hillsborough
San Mateo
Millbrae
San Bruno
South San Francisco
Brisbane
Colma
Daly City
Pacifica
Burlingame
Montara
Moss Beach
El Granada
Miramar
Pillar Point
Half Moon Bay
Point San Pedro
Point Lobos
Point Bonita
Sausalito
Tiburon
Mill Valley
Larkspur
Corte Madera
Fairfax
San Anselmo
Ross
San Rafael

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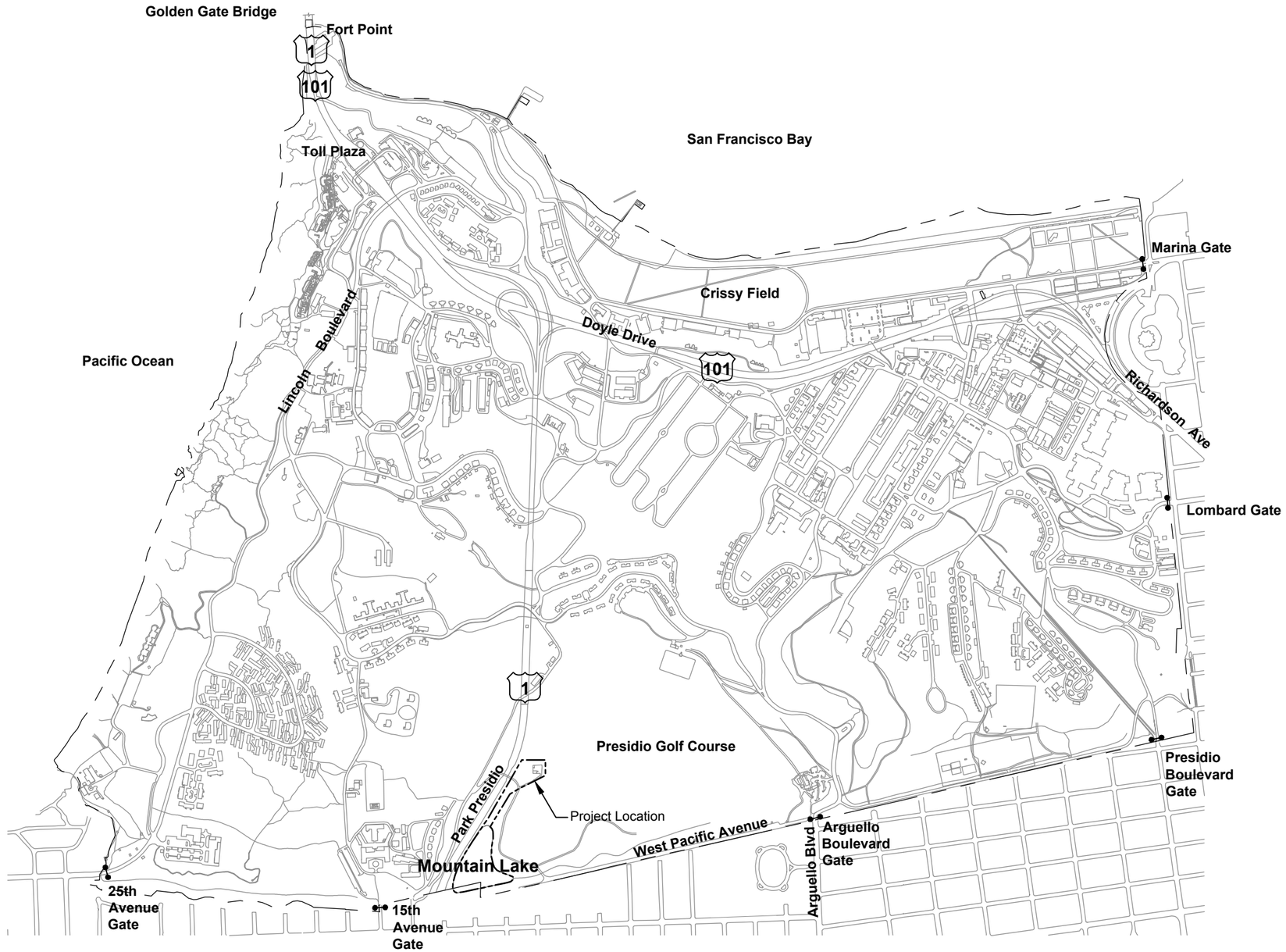

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Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Site Location Map

K/J 1165014*00
March 2012

Figure 1-2

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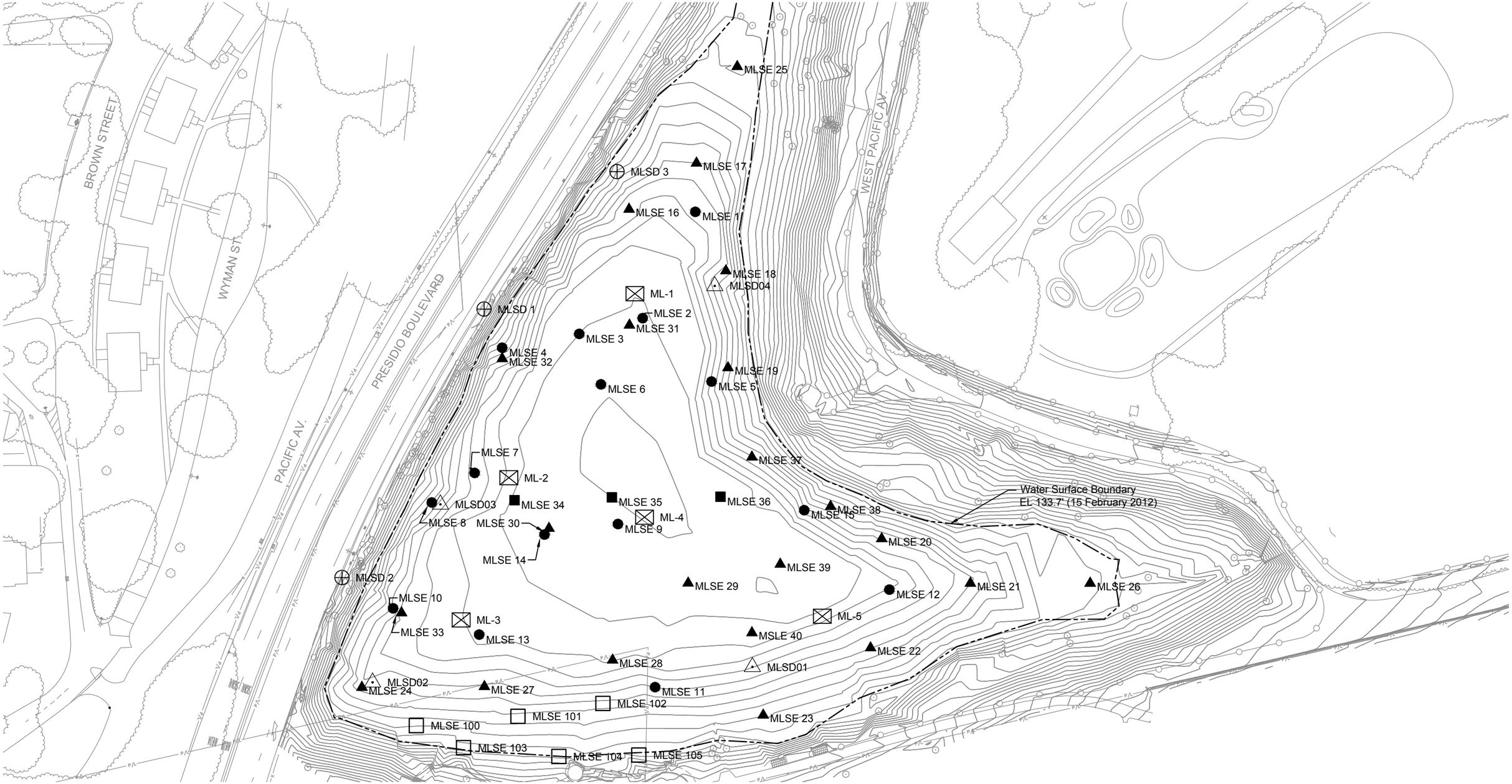

LEGEND

Lake Surface Boundary	
MLSD 1	Storm Drain Inlet
MLSE 35	Archaeological Sampling Location (2004)
ML-4	EKI Composite Sediment Sample (1998)
MLSD01	Army Shallow Sediment Sampling Locations (1997)
City of San Francisco/Presidio Trust Property Line	
MLSE 28	Chemical/Physical Sampling Location (2004)
MLSE 11	Sediment Sampling Location (2001)
MLSE 104	Sediment Sampling Location (2011)

N

0 45 90 135

1"=90'

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San Francisco, California

Sampling Locations

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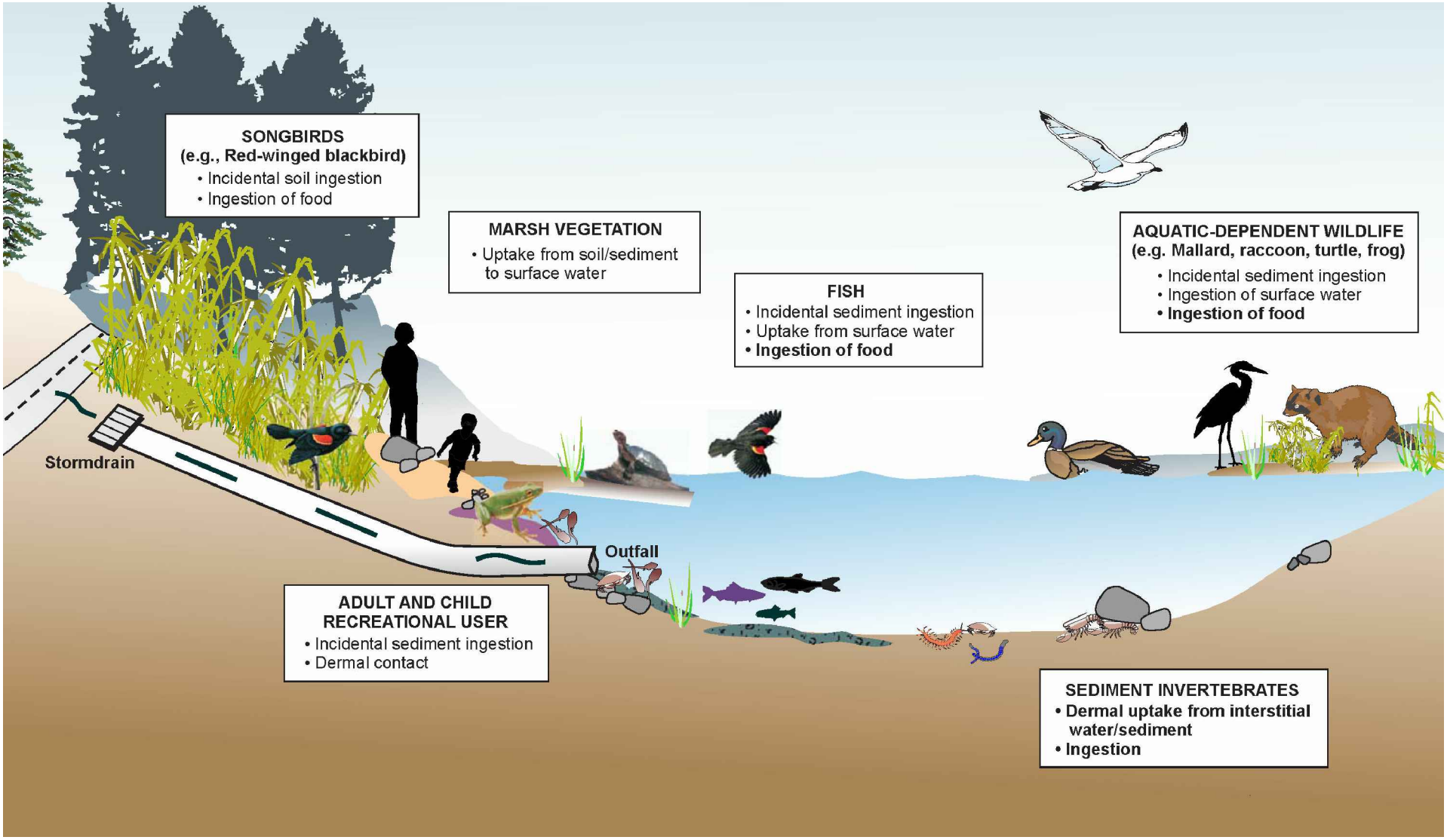
Figure 2-1



Source: URS Corporation. July 2011. Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco, California. URS Corporation, San Francisco, California.

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Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Conceptual Site Model

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Figure 3-1

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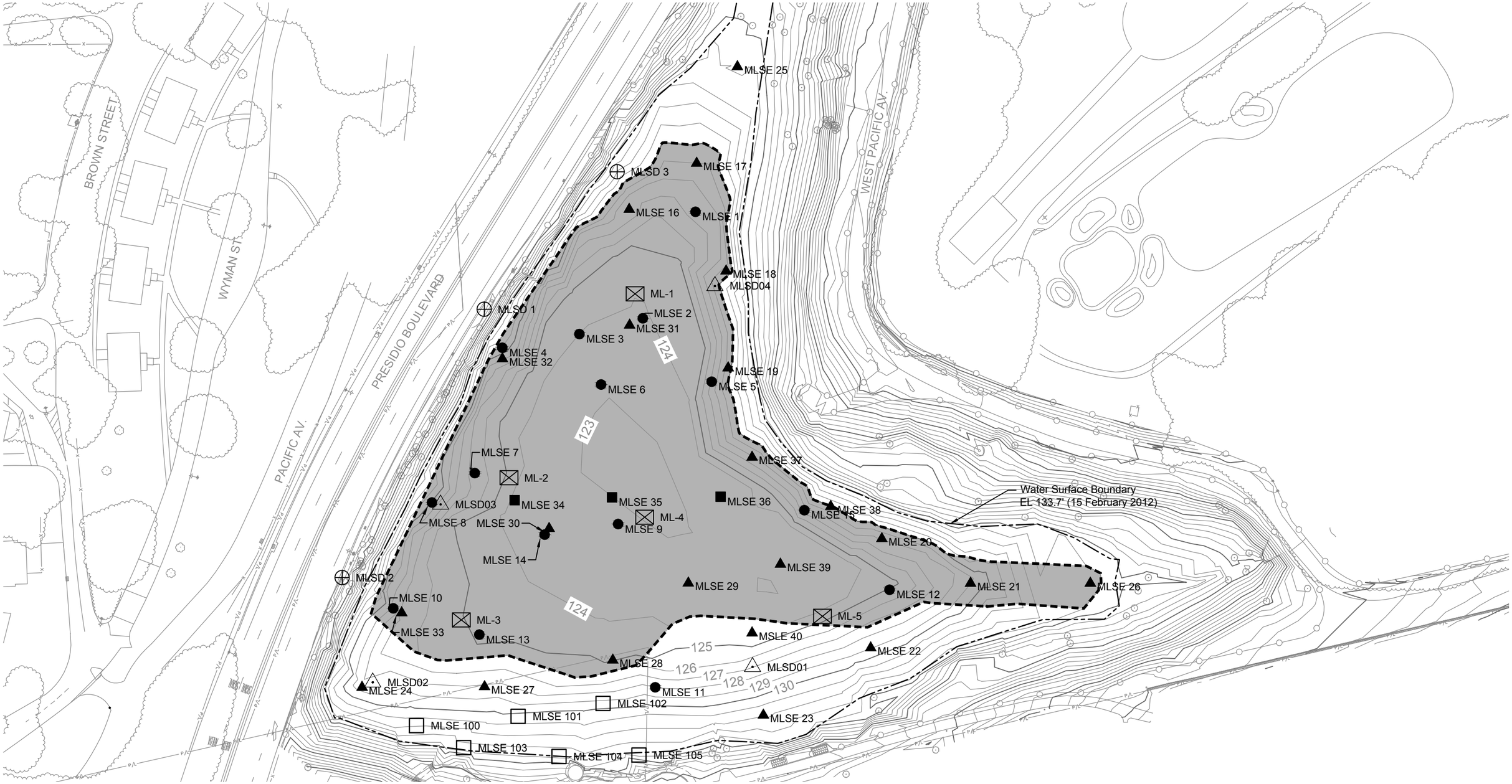

LEGEND

- Limits of Cap
- Lake Surface Boundary
- City of San Francisco/Presidio Trust Property Line

N

0 45 90 135

1"=90'

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San Francisco, California

Capping Conceptual Layout

K/J 1165014*00
March 2012

Figure 6-1

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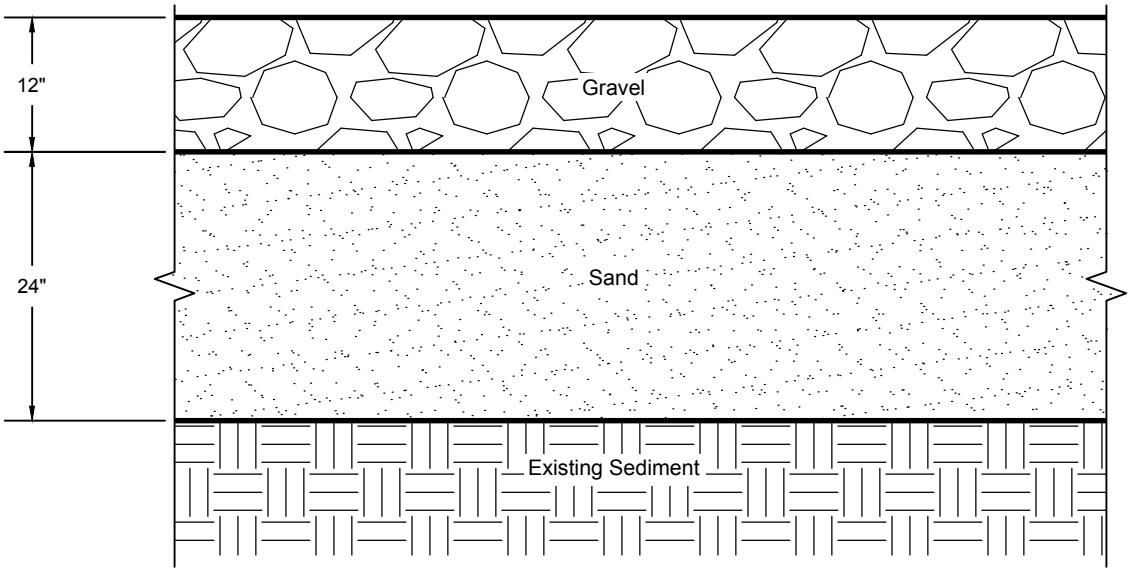

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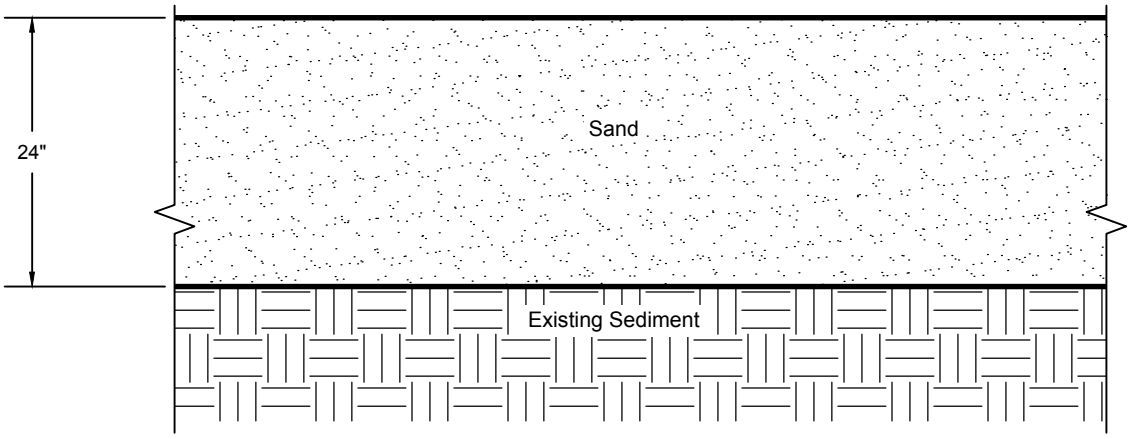

Option No. 2
Not to Scale

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Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Capping Conceptual Design Cross Section

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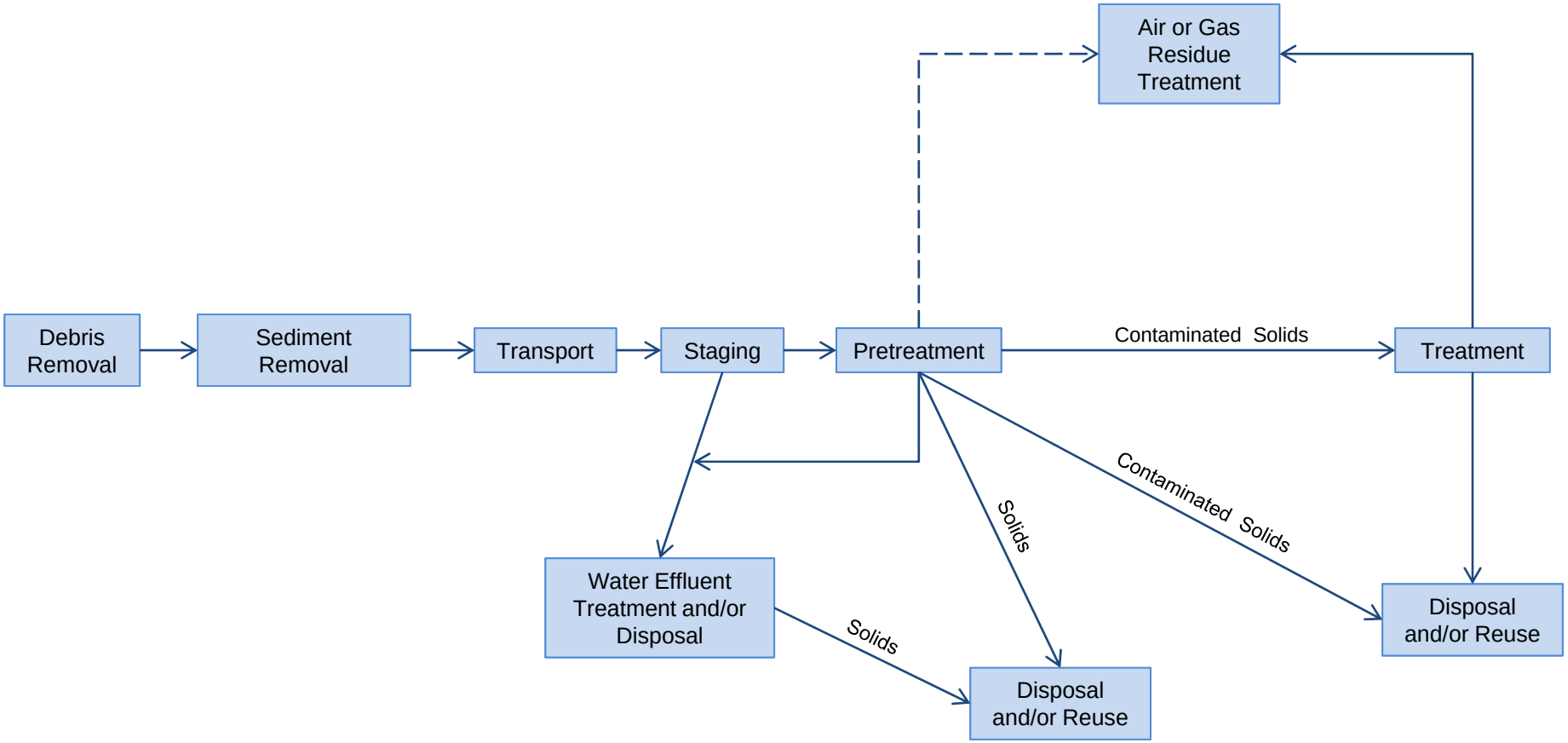
Figure 6-2



Kennedy/Jenks Consultants

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Feasibility Study – Remediation of Mountain Lake
San Francisco, California
Dredging Process Flow Schematic

K/J 1165014*00
March 2012

Figure 6-3

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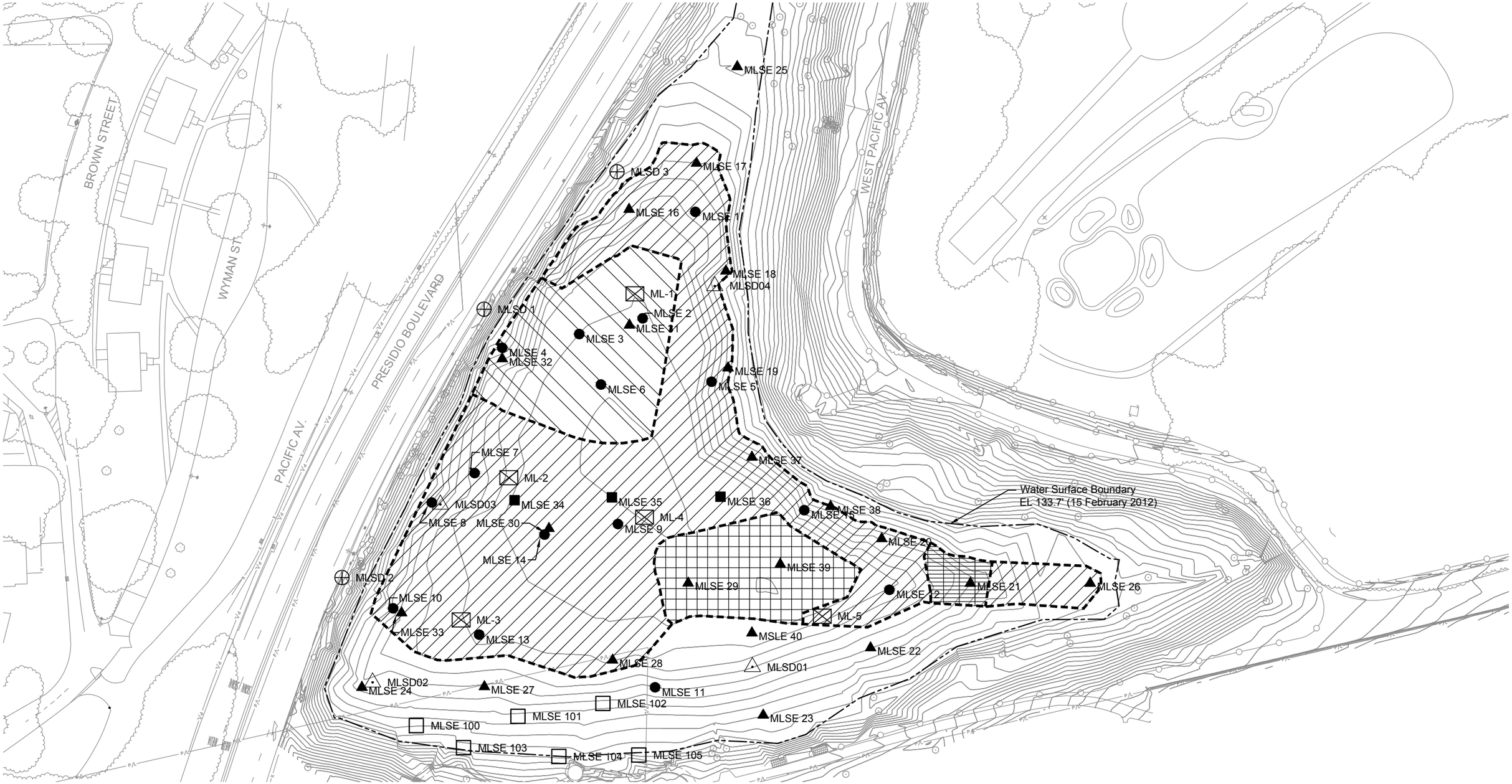

LEGEND

- 2.5-Feet Dredge Depth
- 4.5-Feet Dredge Depth
- 5.5-Feet Dredge Depth
- 6.5-Feet Dredge Depth
- Dredge Limits
- City of San Francisco/Presidio Trust Property Line
- Lake Surface Boundary

0 45 90 135
1"=90'

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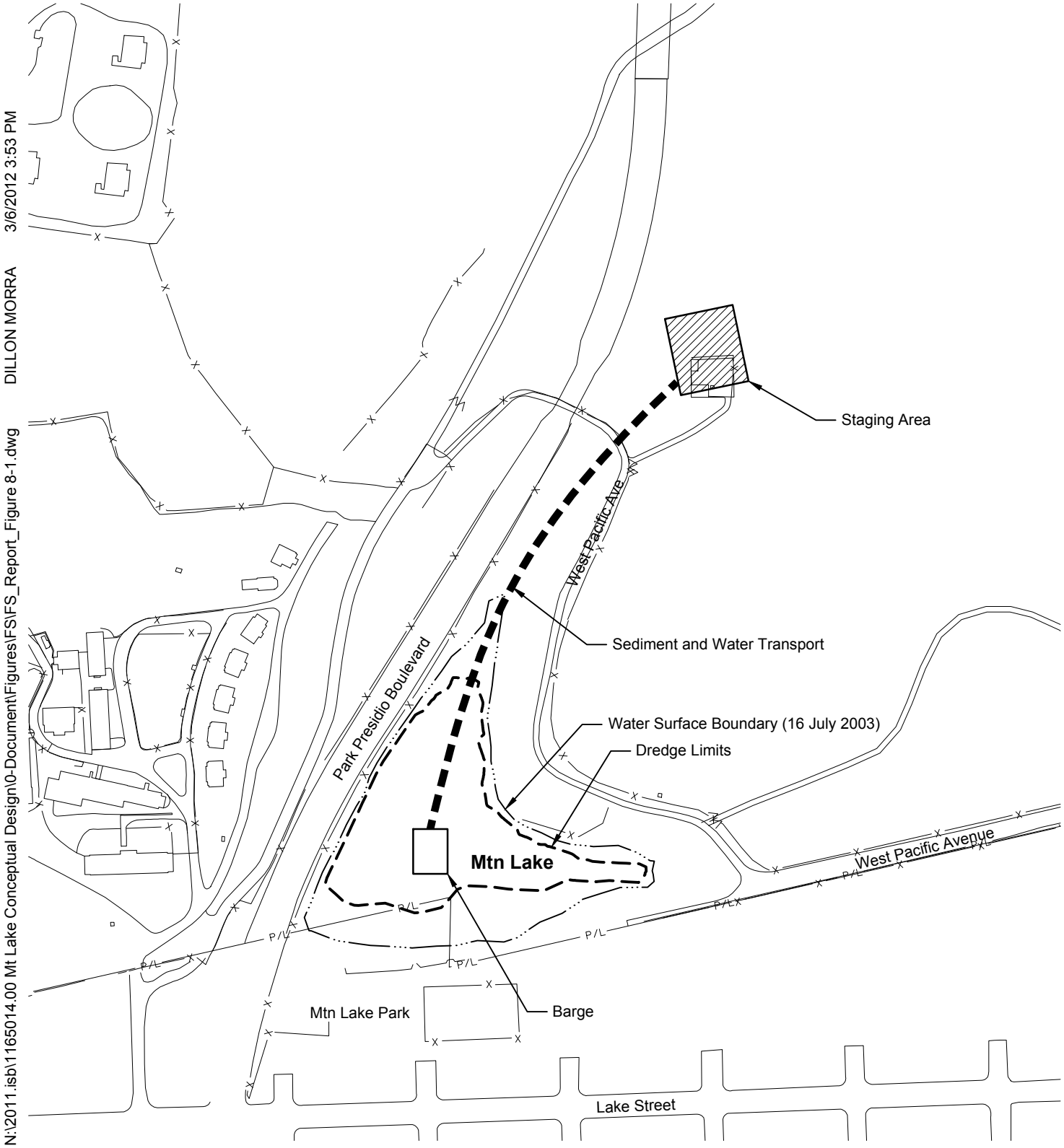
Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Dredging Conceptual Layout

K/J 1165014*00
March 2012

Figure 6-4



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N

0 300 600

Approximate Scale: 1"=300'

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San Francisco, California
Feasibility Study - Remediation of Mountain Lake

Conceptual Plan for Dredging, Material Handling, and Staging Area

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Figure 8-1

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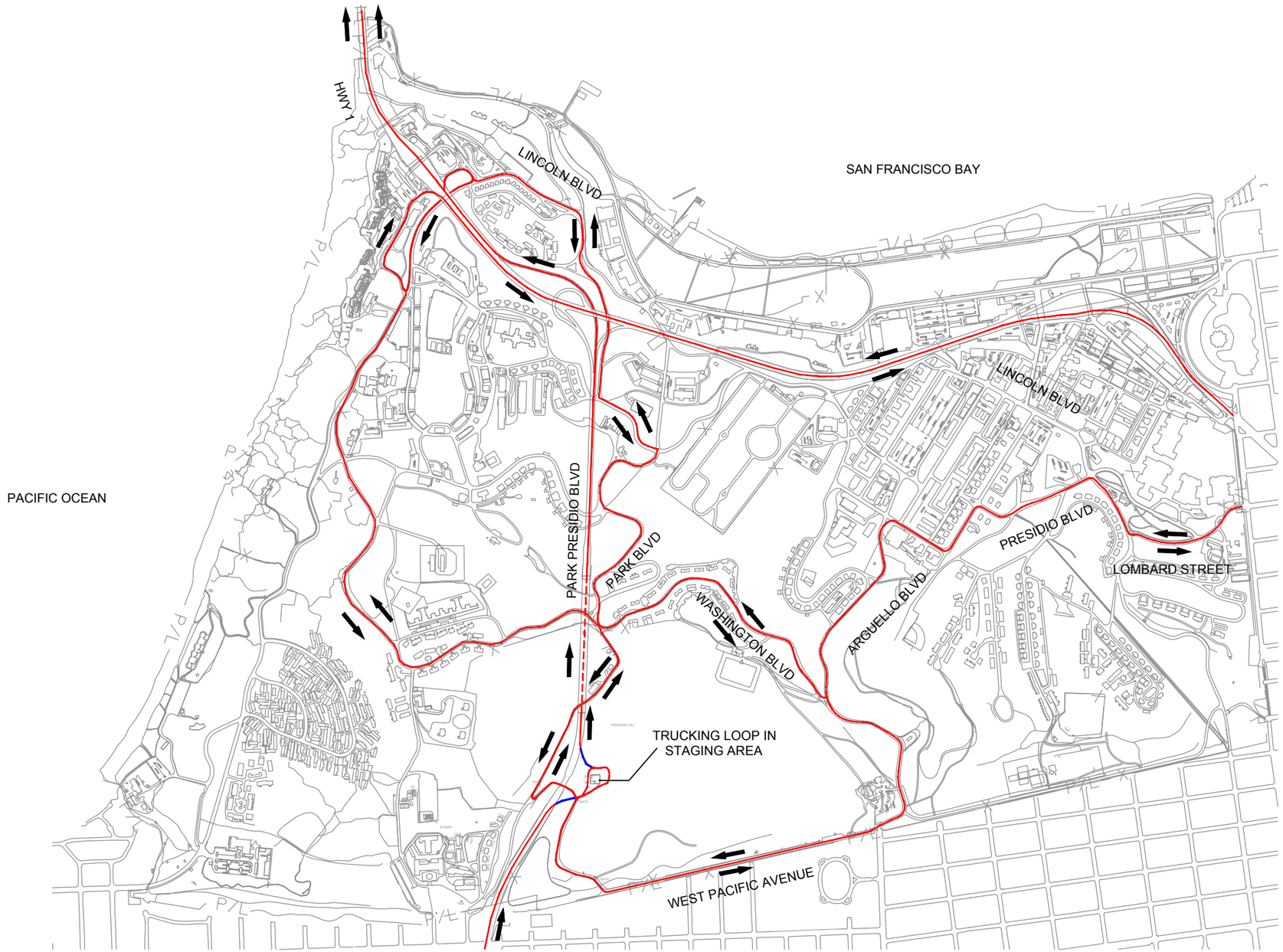

Notes:

1. The Marina Blvd, Gorgas Ave, and Highway 1 toll plaza gates may also be used as alternatives for Presidio egress/ingress.
2. No entry or exit of project trucks into or out of the Presidio will be allowed via Arguello Blvd, Presidio Blvd, 15th Ave, or 25th Ave.
3. Site feature map provided by Mactec.
4. Maintain and Repair West Pacific Ave access (if used).
5. Contractor shall maintain and repair staging area.
6. Contractor shall be aware that other construction in and around the Presidio is occurring and that not all roadways may be open and available.

LEGEND

- Possible Hauling Routes
- Temporary Traffic Ramp
- Haul Route Traffic Flow Directions

N

0 1100 2200

Approximate Scale: 1"=1100'

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Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Haul Route Options

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March 2012

Figure 8-2

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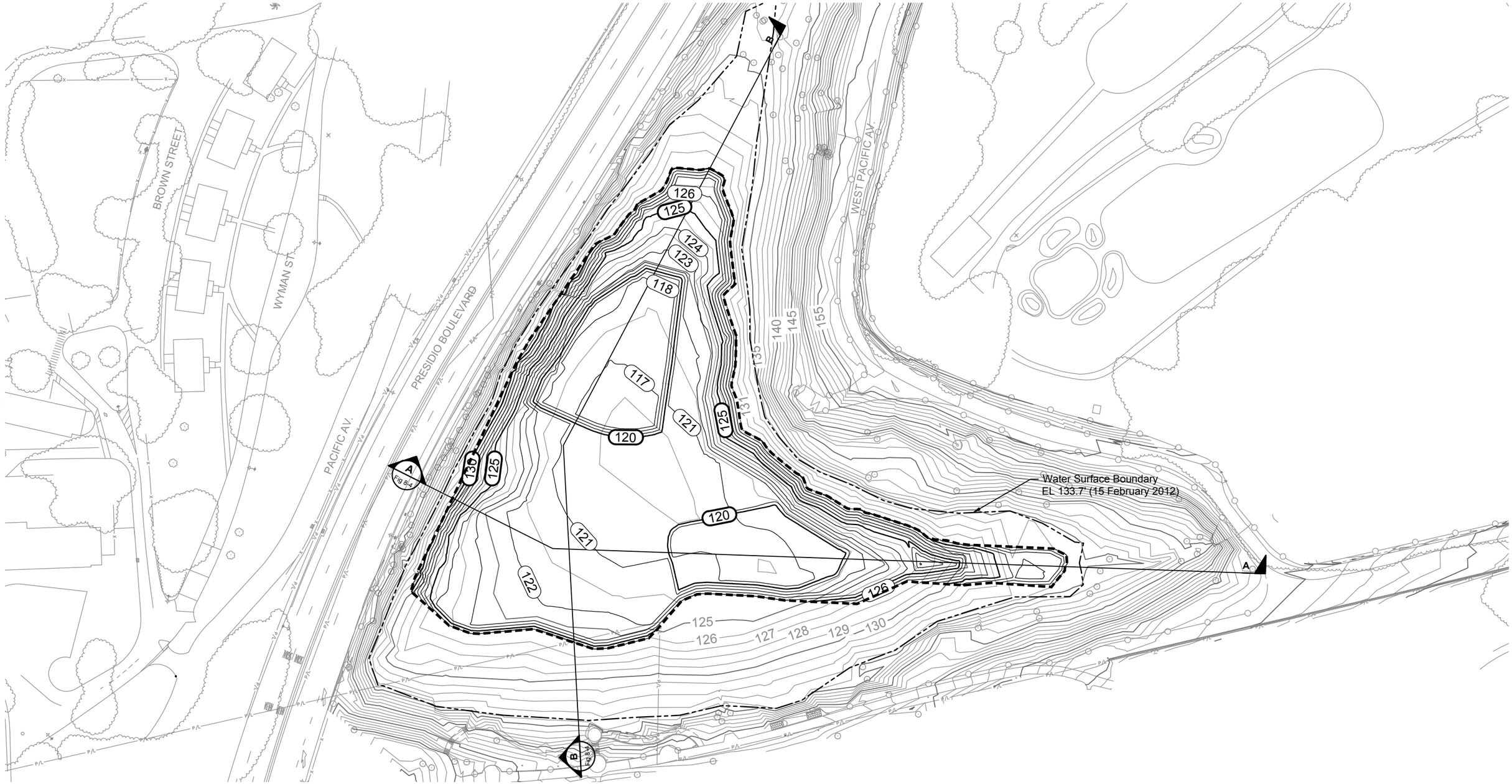

LEGEND

Dredge Limits

Lake Surface Boundary

City of San Francisco/Presidio Trust Property Line

N

0 100 200

1"=100'

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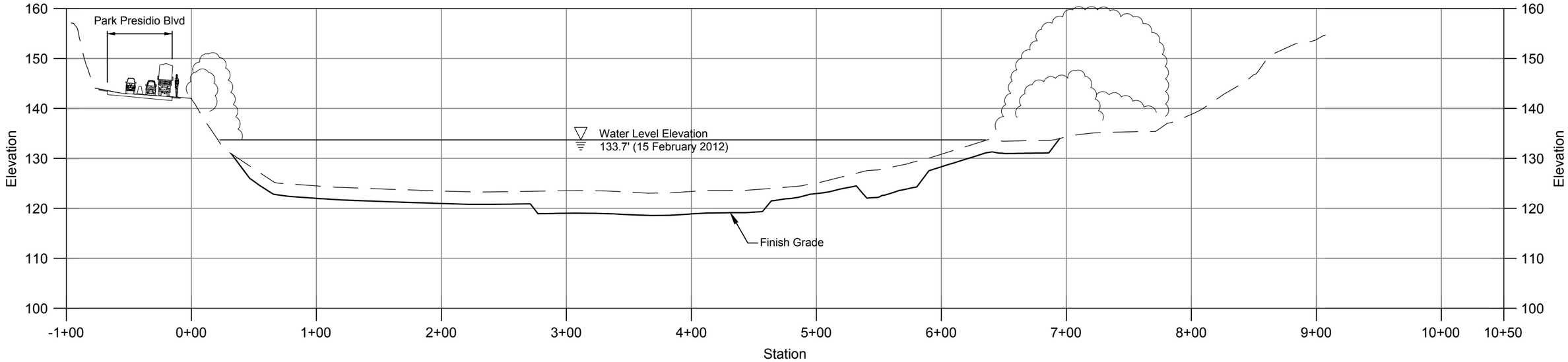
The Presidio Trust
Feasibility Study - Remediation of Mountain Lake
San Francisco, California

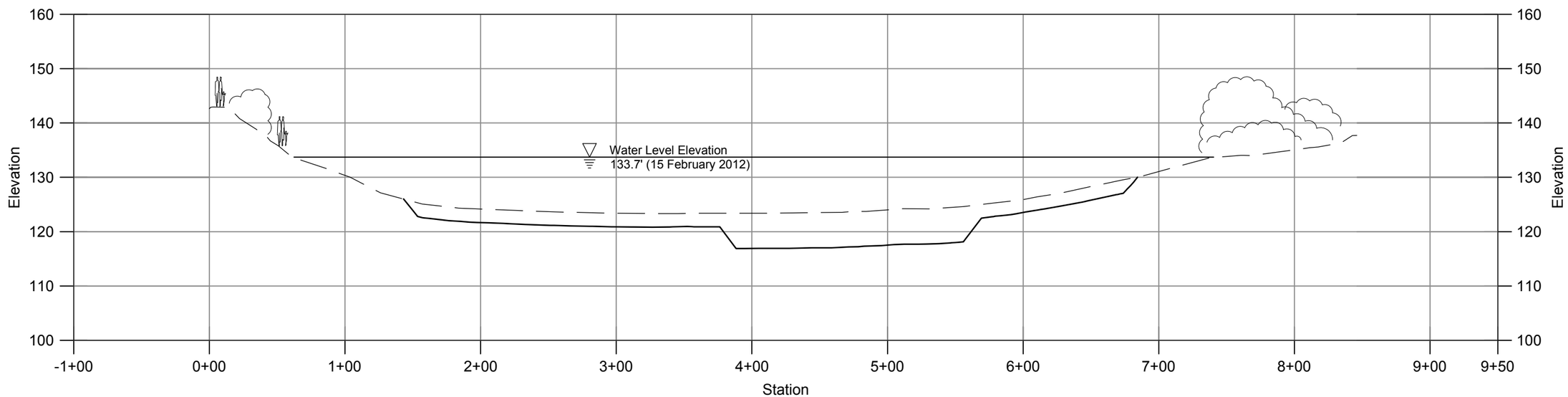
Dredging Plan

K/J 1165014*00
March 2012

Figure 8-3



Section A



Section B

0 40 80 120
Horizontal: 1"=80'

0 10 20 30
Vertical: 1"=20'

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Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Typical Dredging Cross Sections

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March 2012

Figure 8-4

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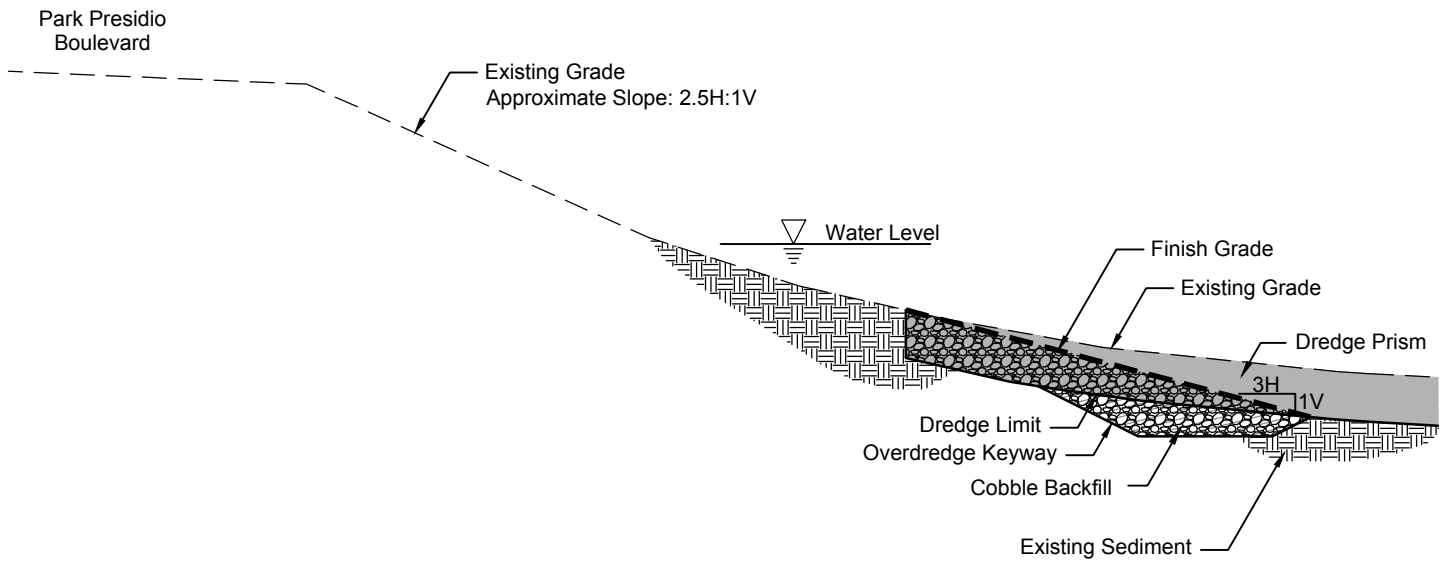
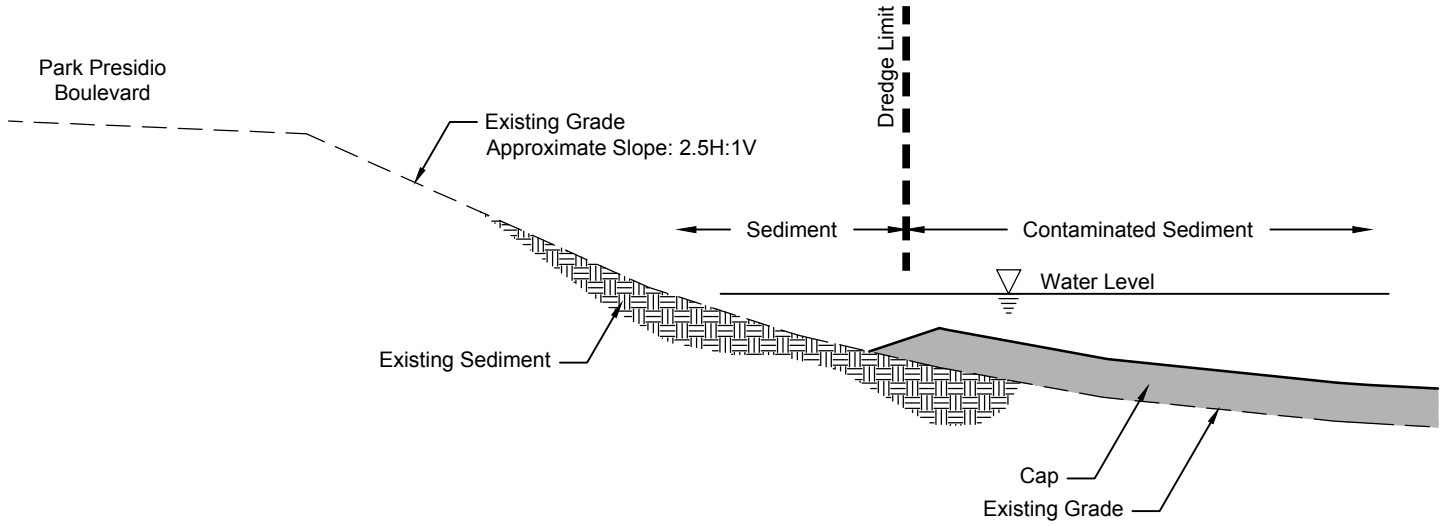


Vertical Cut and Backfill Option

Not to Scale



Limited Capping Option

Not to Scale

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Feasibility Study - Remediation of Mountain Lake
San Francisco, California

Slope Stabilization Conceptual Design
Cross Section

K/J 1165014*00
March 2012

Figure 8-5

Appendix A

Sediment and Surface Water Analytical Data
(Reproduced from URS 2011 and Kennedy/Jenks 2012)

TABLE 2
METALS RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**3**	**19**	**3,100**	**7,200**	**1.1**	**140**	**50**	**114**	**82**	**0.62**	**522**	**110**	**1.6**	**1**	**3.7**	**90**	**230**
MLSD01	D&M, 1997	-	<2.50	**24.0**	-	-	**51.2**	**6.58**	**4.71**	**19.2**	<0.050	-	**20.7**	-	-	-	**50.1**	**36.7**
MLSD02	D&M, 1997	-	<2.50	**26.8**	-	-	**73.9**	**5.50**	**6.09**	**25.3**	**0.069**	-	**21.6**	-	-	-	**44.8**	**24.1**
MLSD03	D&M, 1997	-	<2.50	**27.7**	-	-	**50.1**	**5.09**	**5.16**	**34.4**	<0.050	-	**19.1**	-	-	-	**36.0**	**21.5**
MLSD04	D&M, 1997	-	<2.50	**28.5**	-	-	**74.3**	**6.40**	**6.85**	<7.44	<0.050	-	**21.3**	-	-	-	**66.3**	**21.2**
ML-1 (9.7-0.3)comp	EKI, 1998	ND	**1.6**	**19**	ND	**0.24**	**22**	**3.9**	**10**	**93**	ND	ND	**23**	ND	ND	ND	**14**	**57**
ML-2 (19.5-2)comp	EKI, 1998	ND	**2.1**	**29**	ND	<0.13	**33**	**5.8**	**5.4**	**2.4**	ND	ND	**20**	ND	ND	ND	**25**	**17**
ML-3 (19.4-5)comp	EKI, 1998	ND	**2.1**	**23**	ND	**0.15**	**32**	**5.1**	**8.2**	**40**	ND	ND	**24**	ND	ND	ND	**22**	**34**
ML-4 (19.5-5)comp	EKI, 1998	ND	**4.2**	**20**	ND	**0.16**	**27**	**3.6**	**9.7**	**47**	ND	ND	**22**	ND	ND	ND	**17**	**38**
ML-5 (14.7-0.3)comp	EKI, 1998	ND	**2.9**	**30**	ND	<0.13	**41**	**6.8**	**7.2**	**15**	ND	ND	**33**	ND	ND	ND	**30**	**32**
MLSD 1 (0.1)	URS, 2001	**5.9 J**	<3.9	**150**	<2.0	**12**	**190**	**26**	**310**	**250**	**0.81**	**2.6**	**120**	<1.6	<2.0	<3.9	**110**	**2900**
MLSD 1 (0.25)	URS, 2001	<0.89 UJ	<1.3	**40**	<0.63	**0.98**	**30**	**5.6**	**16**	**26**	<0.063	<1.3	**28**	<0.51	<0.63	<1.3	**21**	**200**
MLSD 2 (0.1)	URS, 2001	**3.4 J**	**3.0**	**110**	<0.99	**3.3**	**89**	**11**	**610**	**560**	**0.23**	**3.9**	**61**	<0.79	<0.99	<2.0	**44**	**570**
MLSD 3 (0.5)	URS, 2001	**1.5 J**	<1.4	**110**	<0.68	**1.8**	**28**	**6.6**	**95**	**120**	**0.091**	**1.8 J**	**31**	<0.54	<0.68	<1.4	**24**	**430**
MLSE 1 (0.5)	URS, 2001	<0.93	<1.3	**24 J**	<0.66	<0.66	**31**	**4.8 J**	**6.1**	**27**	<0.066	<1.3	**34 J**	<0.53	<0.66	<1.3	**16 J**	**53**
MLSE 1 (1)	URS, 2001	<0.90	<1.3	**31**	<0.64	<0.64	**37**	**7.2**	**6.8**	**15**	<0.064	<1.3	**50**	<0.51	<0.64	<1.3	**18**	**41**
MLSE 1 (2)	URS, 2001	<0.83 UJ	<1.2	**26 J**	<0.59	<0.59 UJ	**36 J**	**5.9 J**	**5.2 J**	**4.2 J**	<0.059	<1.2 UJ	**30 J**	<0.47 UJ	<0.59	<1.2 UJ	**18 J**	**27 J**
MLSE 1 (6)	URS, 2001	<2.8 UJ	<3.9	**130**	<2.0	<2.0 UJ	**140**	**26**	**31**	**32**	<0.20	<3.9 UJ	**150**	<1.6 UJ	<2.0	<3.9 UJ	**100**	**74**
MLSE 1 (7)	URS, 2001	<2.7 UJ	**10**	**100**	<1.9	**3.3**	**110**	**38**	**15**	<3.9	<0.19 UJ	<3.9	**110**	<1.5	<1.9	<3.9	**70**	**49**
MLSE 1 (9)	URS, 2001	<0.92 UJ	<1.3	**100**	<0.66	<0.66	**53**	**9.3**	**9.8**	**3.4**	<0.066 UJ	<1.3	**25**	<0.53	<0.66	<1.3	**43**	**23**
MLSE2 (0.5)	URS, 2001	<5.0 UJ	<7.2	**180**	<3.6	**5.0**	**150**	**25**	**130**	**1200**	**0.73**	<7.2	**170**	<2.9	<3.6	<7.2	**81**	**670**
MLSE2 (1)	URS, 2001	<3.5 UJ	<5.0	**140**	**0.63J**	**4.1**	**120**	**23**	**87**	**1000**	**0.55**	<5.0	**150**	<2.0	<2.5	<5.0	**70**	**530**
MLSE2 (2)	URS, 2001	<2.7 UJ	<3.9	**120**	<1.9	**2.5**	**110**	**19**	**47**	**290**	**0.28**	<3.9	**140**	<1.5	<1.9	<3.9	**68**	**220**
MLSE2 (5)	URS, 2001	<2.5 UJ	<3.5	**170**	**0.60J**	**2.3**	**160**	**22**	**36**	**76**	**0.19**	<3.5	**210**	<1.4	<1.8	<3.5	**88**	**86**
MLSE 2 (6)	URS, 2001	<2.7 UJ	<3.8	**160**	<1.9	<1.9	**190**	**17**	**24**	**13**	<0.19 UJ	<3.8	**150**	<1.5	<1.9	<3.8	**110**	**54**
MLSE 2 (8)	URS, 2001	<4.5 UJ	<6.5	**79**	<3.2	<3.2	**110**	**26**	**18**	<6.5	<0.32 UJ	<6.5	**120**	<2.6	<3.2	<6.5	**78**	**55**
MLSE3 (0.5)	URS, 2001	<3.1 UJ	<4.4	**120**	<2.2	**3.0**	**92**	**19**	**67**	**630**	**0.39**	<4.4	**120**	<1.8	<2.2	<4.4	**68**	**320**
MLSE3 (1)	URS, 2001	<2.5 UJ	<3.6	**160**	<1.8	**2.5**	**130**	**22**	**44**	**140**	**0.24**	<3.6	**160**	<1.4	<1.8	<3.6	**82**	**150**
MLSE3 (2)	URS, 2001	<2.4 UJ	<3.5	**180**	**0.57**	**2.2**	**150**	**20**	**38**	**65**	**0.20**	<3.5	**200**	<1.4	<1.7	<3.5	**90**	**97**
MLSE3 (6)	URS, 2001	<5.1 UJ	<7.2	**79**	<3.6	**2.2J**	**100**	**22**	**21**	**7.5**	**0.073 J**	**1.1J**	**120**	<2.9	<3.6	<7.2	**74**	**59**
MLSE 3 (7)	URS, 2001	<4.8 UJ	<6.9	**120**	<3.5	<3.5	**190**	**49**	**32**	**7.4**	<0.35 UJ	<6.9	**210**	<2.8	<3.5	<6.9	**140**	**100**
MLSE 3 (9)	URS, 2001	<4.4 UJ	<6.2	**50**	<3.1	<3.1	**110**	**34**	**19**	<6.2	<0.31 UJ	<6.2	**120**	<2.5	<3.1	<6.2	**76**	**61**
MLSE 4 (0.5)	URS, 2001	<0.87	<1.2	**29**	<0.62	**0.77**	**27**	**4.1**	**22**	**100**	<0.062	<1.2	**30**	<0.49	<0.62	<1.2	**14**	**190**
MLSE 4 (1)	URS, 2001	<1.2	<1.7	**61**	<0.83	**2.1**	**29**	**3.7**	**70**	**2000 J**	**0.14**	**2.5**	**30**	<0.66	<0.83	<1.7	**19**	**240**
MLSE 4 (2)	URS, 2001	**5.4**	<1.5	**57**	<0.73	**0.95**	**180**	**2.8**	**31**	**1200**	**0.12**	**29**	**24**	<0.58	<0.73	<1.5	**18**	**99**
MLSE 4 (6)	URS, 2001	<0.86	**1.8**	**25**	<0.61	<0.61	**28**	**5.3**	**5.1**	**25**	<0.061	<1.2	**32**	<0.49	<0.61	<1.2	**16**	**20**
MLSE5 (0.5)	URS, 2001	<1.7 UJ	<2.5	**44**	<1.2	**0.77J**	**44**	**6.7**	**17**	**100**	**0.078 J**	<2.5	**38**	<0.99	<1.2	<2.5	**25**	**74**
MLSE5 (1)	URS, 2001	<0.98 UJ	<1.4	**24**	<0.70	<0.70	**28**	**4.6**	**7.0**	**39**	<0.070	<1.4	**21**	<0.56	<0.70	<1.4	**13**	**34**
MLSE5 (2)	URS, 2001	<1.4 UJ	<2.0	**54**	<1.0	**0.68J**	**64**	**8.2**	**12**	**17**	<0.10	<2.0	**48**	<0.81	<1.0	<2.0	**38**	**32**
MLSE5 (5)	URS, 2001	<1.1 UJ	<1.5	**61**	<0.76	**0.67J**	**50**	**6.2**	**10**	**2.9**	<0.076	<1.5	**20**	<0.61	<0.76	<1.5	**39**	**23**

TABLE 2
METALS RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**3**	**19**	**3,100**	**7,200**	**1.1**	**140**	**50**	**114**	**82**	**0.62**	**522**	**110**	**1.6**	**1**	**3.7**	**90**	**230**
MLSE6 (0.5)	URS, 2001	<4.0	<5.8	180	0.69J	4.7	150	20	120	1000	0.72	<5.8	150	<2.3	0.51J	<5.8	86	530
MLSE6 (1)	URS, 2001	<3.1	2.1J	150	0.52J	3.5	130	21	68	590	0.73	<4.4	140	<1.8	<2.2	<4.4	81	320
MLSE6 (2)	URS, 2001	<2.8	<4.0	140	<2.0	2.6	130	22	48	180	0.28	<4.0	160	<1.6	<2.0	<4.0	79	190
MLSE6 (5)	URS, 2001	<2.8	<4.0	180	0.57J	2.3	140	19	50	110	0.28	<4.0	170	<1.6	<2.0	<4.0	85	180
MLSE 6 (6)	URS, 2001	<2.7 UJ	<3.9	200	<1.9	2.2	160	24	54	100	0.25 J	<3.9	220	<1.5	<1.9	<3.9	97	190
MLSE 6 (8)	URS, 2001	<2.4 UJ	<3.5	170	<1.7	1.8	190	20	28	36	<0.17 UJ	<3.5	200	<1.4	<1.7	<3.5	110	68
MLSE7 (0.5)	URS, 2001	<1.3	<1.8	39	<0.92	0.89J	35	7.8	17	150	0.097	<1.8	46	<0.73	<0.92	<1.8	23	92
MLSE7 (1)	URS, 2001	<1.4	<1.9	45	<0.97	0.74J	59	9.3	9.6	36	<0.097	<1.9	55	<0.78	<0.97	<1.9	32	43
MLSE7 (2)	URS, 2001	<2.4	<3.4	130	<1.7	1.5J	140	16	23	12	0.074 J	<3.4	140	<1.4	<1.7	<3.4	97	48
MLSE7 (6)	URS, 2001	<4.3	<6.1	85	<3.0	2.7J	93	23	17	3.3	<0.30	<6.1	96	<2.4	<3.0	<6.1	73	48
MLSE 7 (7)	URS, 2001	<4.2 UJ	<6.0	100	<3.0	3.2	110	30	19	<6.0	<0.30 UJ	<6.0	120	<2.4	<3.0	<6.0	84	58
MLSE 7 (9)	URS, 2001	<4.0 UJ	<5.8	82	<2.9	3.5	80	26	19	<5.8	<0.29 UJ	<5.8	88	<2.3	<2.9	<5.8	57	49
MLSE 8 (0.5)	URS, 2001	<2.5 UJ	<3.6	120	<1.8	1.0	150	15	26	7.0	0.091 J	<3.6	120	<1.4	<1.8	<3.6	97	45
MLSE 8 (1)	URS, 2001	<4.1 UJ	<5.9	110	<2.9	1.4J	120	22	31	6.0	0.095 J	<5.9	130	<2.3	<2.9	<5.9	93	56
MLSE 8 (2)	URS, 2001	<5.1 UJ	<7.3	110	<3.7	2.1J	99	26	27	6.1	0.053 J	<7.3	120	<2.9	<3.7	<7.3	74	56
MLSE 8 (6)	URS, 2001	<2.6 UJ	2.1	260	0.57	2.5	160	24	30	11	0.094 J	<3.7	81	<1.5	<1.8	<3.7	120	79
MLSE 8 (7)	URS, 2001	<0.95 UJ	<1.4	110	<0.68	<0.68	44	8.9	11	3.1	<0.068 UJ	<1.4	26	<0.54	<0.68	<1.4	37	23
MLSE 8 (9)	URS, 2001	<0.86 UJ	<1.2	84	<0.61	<0.61	48	9.5	9.1	3.1	<0.061 UJ	<1.2	26	<0.49	<0.61	<1.2	41	18
MLSE 9 (0.5)	URS, 2001	<3.3 UJ	<4.7	240	0.61J	4.3	170	22	88	510	0.52	<4.7	190	<1.9	<2.3	<4.7	97	360
MLSE 9 (1)	URS, 2001	<3.2 UJ	<4.5	220	0.54J	3.3	160	21	75	290	0.44	<4.5	190	<1.8	<2.3	<4.5	90	270
MLSE 9 (2)	URS, 2001	<2.5 UJ	<3.6	210	0.62J	2.7	180	26	46	94	0.40	<3.6	230	<1.5	<1.8	<3.6	97	190
MLSE 9 (5)	URS, 2001	<2.4 UJ	<3.4	190	0.58J	2.6	200	26	40	67	0.20	<3.4	280	<1.4	<1.7	<3.4	93	110
MLSE 9 (6)	URS, 2001	<4.9 UJ	<7.0	100	<3.5	<3.5	100	20	23	30	<0.35 UJ	<7.0	120	<2.8	<3.5	<7.0	76	75
MLSE 9 (8)	URS, 2001	<4.8 UJ	<6.9	80	<3.4	<3.4	82	22	17	<6.9	<0.34 UJ	<6.9	90	<2.7	<3.4	<6.9	68	51
MLSE10(0.5)	URS, 2001	<0.87	<1.2	39	<0.62	0.55	30	5.6	13	23	<0.062	-	31	<0.50	<0.62	<1.2	22	32
MLSE10(1)	URS, 2001	<1.3	13	68	<0.90	1.4	36	5.7	64	690	0.23	-	35	<0.72	<0.90	<1.8	25	200
MLSE10(2)	URS, 2001	<2.4	<3.5	99	<1.7	1.0	110	14	21	27	0.10	-	98	<1.4	<1.7	<3.5	82	45
MLSE10(6)	URS, 2001	<0.97	<1.4	78	<0.69	0.71	50	9.0	11	3.0	<0.069	-	27	<0.55	<0.69	<1.4	36	24
MLSE11(0.5)	URS, 2001	<0.84	<1.2	17	<0.60	<0.60	35	4.7	5.4	8.6	<0.060	-	24	<0.48	<0.60	<1.2	26	20
MLSE11(1)	URS, 2001	<0.83	<1.2	17	<0.59	<0.59	39	4.6	5.2	6.9	<0.059	-	23	<0.47	<0.59	<1.2	27	17
MLSE11(2)	URS, 2001	<0.81	<1.2	16	<0.58	<0.58	25	4.2	5.8	3.6	<0.058	-	21	<0.46	<0.58	<1.2	19	16
MLSE11(6)	URS, 2001	<0.80	<1.1	15	<0.57	0.50	40	5.6	6.2	1.8	<0.057	-	27	<0.46	<0.57	<1.1	33	15
MLSE 12 (0.5)	URS, 2001	<2.0 UJ	<2.9	160	0.54	2.1	180	24	37	44	0.16	<2.9	290	<1.2	<1.5	<2.9	78	69
MLSE 12 (1)	URS, 2001	<1.8 UJ	<2.5	92	<1.3	1.5	110	15	21	60	0.11 J	<2.5	130	<1.0	<1.3	<2.5	59	160
MLSE 12 (2)	URS, 2001	<1.6 UJ	<2.3	130	<1.1	1.8 J	160	16	19	25	0.061 J	<2.3 UJ	230	<0.92 UJ	<1.1	<2.3 UJ	71	48
MLSE 12 (5)	URS, 2001	<3.6 UJ	<5.1	89	<2.6	4.0	120	30	21	7.9	<0.26	<5.1	110	<2.0	<2.6	<5.1	84	62
MLSE 12 (6)	URS, 2001	<3.2 UJ	<4.6	74	<2.3	3.6	87	28	17	11	<0.23 UJ	<4.6	120	<1.8	<2.3	<4.6	64	72

TABLE 2
METALS RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**3**	**19**	**3,100**	**7,200**	**1.1**	**140**	**50**	**114**	**82**	**0.62**	**522**	**110**	**1.6**	**1**	**3.7**	**90**	**230**
MLSE 12 (8)	URS, 2001	<1.1 UJ	4.0	28	<0.79	0.81	60	11	5.6	3.2	0.099 J	<1.6	33	<0.63	<0.79	<1.6	56	23
MLSE13(0.5)	URS, 2001	<2.2	<3.2	100	<1.6	2.7	97	21	75	370	0.16	-	120	<1.3	<1.6	<3.2	52	340
MLSE13(1)	URS, 2001	<3.2	<4.5	150	0.55	1.7	170	21	42	18	0.09	-	180	<1.8	<2.3	<4.5	130	59
MLSE13(2)	URS, 2001	<2.9	<4.2	150	0.50	1.5	160	16	33	28	0.12	-	140	<1.7	<2.1	<4.2	120	66
MLSE13(5)	URS, 2001	<5.6	<8.0	93	<4.0	2.2	93	25	42	19	0.058	-	110	<3.2	<4.0	<8.0	67	72
MLSE 13 (6)	URS, 2001	<4.9 UJ	<7.0	94	<3.5	<3.5	96	25	19	<7.0	<0.35 UJ	<7.0	110	<2.8	<3.5	<7.0	70	60
MLSE 13 (8)	URS, 2001	<4.9 UJ	<7.0	110	<3.5	<3.5	100	24	21	<7.0	<0.35 UJ	<7.0	110	<2.8	<3.5	<7.0	73	58
MLSE14 (0.5)	URS, 2001	<4.4	<6.3	200	0.53J	4.5	140	20	120	880	0.74	<6.3	150	<2.5	<3.1	<6.3	75	520
MLSE14 (1)	URS, 2001	<3.2	2.6J	180	0.55J	4.2	140	21	100	810	0.47	<4.6	150	<1.8	<2.3	<4.6	79	480
MLSE14 (2)	URS, 2001	<2.2	<3.2	160	0.50J	2.0	120	22	44	92	0.30	<3.2	170	<1.3	<1.6	<3.2	74	180
MLSE14 (5)	URS, 2001	<3.7	<5.3	100	<2.6	1.3J	130	17	30	14	0.10 J	<5.3	110	<2.1	<2.6	<5.3	90	50
MLSE 14 (6)	URS, 2001	<5.9 UJ	<8.4	87	<4.2	<4.2	88	24	19	<8.4	<0.42 UJ	<8.4	110	<3.4	<4.2	<8.4	61	62
MLSE 14 (8)	URS, 2001	<4.6 UJ	<6.5	92	<3.3	<3.3	94	24	19	<6.5	<0.33 UJ	<6.5	97	<2.6	<3.3	<6.5	73	54
MLSE15 (0.5)	URS, 2001	<1.3	<1.9	46	<0.95	0.55J	60	5.3	9.9	27	0.11	<1.9	35	<0.76	<0.95	<1.9	36	30
MLSE15 (1)	URS, 2001	<1.1	1.3J	41	<0.79	<0.79	47	8.7	6.9	32	<0.079	<1.6	47	<0.63	<0.79	<1.6	33	27
MLSE15 (2)	URS, 2001	<0.88	<1.3	23	<0.63	<0.63	32	2.6	2.7	3.7	<0.063	<1.3	13	<0.50	<0.63	<1.3	19	11
MLSE15 (5)	URS, 2001	<0.86	2.2	34	<0.62	<0.62	37	9.2	8.1	2.4	<0.062	<1.2	29	<0.49	<0.62	<1.2	35	17
DUP012401-1 [MLSD-1 (0.25)][a]	URS, 2001	<0.88 UJ	1.1J	39	<0.63	0.91	31	6.0	51	19	0.062 J	<1.3	33	<0.50	<0.63	<1.3	22	210
DUP012401-2 [MLSD-2 (0.1)][a]	URS, 2001	1.1 J	<1.4	100	<0.72	1.7	51	8.2	370	320	0.12	<1.4	41	<0.58	<0.72	<1.4	28	440
DUP012401-3 [MLSD-3 (0.5)][a]	URS, 2001	4.6 J	<1.6	140	<0.78	1.9	38	5.7	110	150	0.072	11 J	33	<0.62	<0.78	<1.6	22	430
DUP012401-4 [MLSE-8 (1)][a]	URS, 2001	<4.7	<6.6	92	<3.3	<3.3	93	21	29	<6.6	<0.33	<6.6	110	<2.7	<3.3	<6.6	75	48
DUP012401-5 [MLSE-8 (2)][a]	URS, 2001	<4.9 UJ	<7.0	110	<3.5	<3.5	94	27	34	<7.0	<0.35	<7.0	120	<2.8	<3.5	<7.0	71	54
DUP012401-6 [MLSE-4 (1)][a]	URS, 2001	<1.0	<1.5	61	<0.73	1.3	35	3.1	50	930 J	0.10	<1.5	27	<0.59	<0.73	<1.5	19	130
DUP012401-7 [MLSE-1 (0.5)][a]	URS, 2001	<0.96 UJ	<1.4	55 J	<0.69	0.80 J	59	11 J	12	14	<0.069	<1.4 UJ	75 J	<0.55 UJ	<0.69	<1.4 UJ	33 J	51
DUP012401-8 [MLSE-1 (2)][a]	URS, 2001	<1.5 UJ	<2.1	59 J	<1.0	1.0 J	77 J	13 J	16 J	19 J	<0.10	<2.1 UJ	82 J	<0.84 UJ	<1.0	<2.1 UJ	46 J	55 J
MLSE 16 (1)	URS, 2005	<1.1 UJ	4.7	40 J	<0.45	<1.1	57	8.5	13 J	120 J	0.53	<4.5	52	1.4	<1.1	<1.1	37 J	70 J
MLSE 16 (2)	URS, 2005	<1.5 UJ	11	72 J	<0.62	<1.5	89	18	12 J	7.5 J	<0.12	<6.2	77	3.6	<1.5	<1.5	68 J	45 J
MLSE 16 (5)	URS, 2005	<1.3 UJ	20	40 J	<0.51	<1.3	98	32	15 J	2.6 J	<0.11	<5.1	110	4.9	<1.3	<1.3	63 J	64 J
MLSE 16 (6)	URS, 2005	-	20	-	-	-	-	-	-	-	-	-	-	5.6	-	-	-	-
MLSE 16 (7)	URS, 2005	-	3.8 J	-	-	-	-	-	-	-	-	-	-	1.2 J	-	-	-	-
MLSE 17 (1)	URS, 2005	<0.65	4.7	48 J	0.33	0.8	57	8.7	24 J	440 J	0.13	<2.6	62	0.83	<0.65	<0.65	33 J	210 J
MLSE 17 (2)	URS, 2005	<0.27 UJ	2.5	37 J	0.22	<0.27	55	8.3	5.5 J	9.3 J	<0.022	<1.1	68	0.35	<0.27	<0.27	27 J	43 J
MLSE 17 (5)	URS, 2005	<0.89 UJ	5.7	120 J	0.7	<0.89	150	15	18 J	11 J	<0.08	<3.6	140	2.8	<0.89	<0.89	110 J	45 J
MLSE 17 (6)	URS, 2005	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-

TABLE 2
METALS RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**3**	**19**	**3,100**	**7,200**	**1.1**	**140**	**50**	**114**	**82**	**0.62**	**522**	**110**	**1.6**	**1**	**3.7**	**90**	**230**
MLSE 18 (1)	URS, 2005	<0.28 UJ	**0.54**	**23 J**	**0.12**	<0.28	**29**	**2.5**	**1.5 J**	**11 J**	**0.024 J**	<1.1	**12**	<0.28	<0.28	<0.28	**16 J**	**12 J**
MLSE 18 (2)	URS, 2005	<0.27 UJ	**2.4**	**61 J**	**0.31**	<0.27	**59**	**11**	**8.2 J**	**2.4 J**	<0.023	<1.1	**33**	**0.52**	<0.27	<0.27	**46 J**	**24 J**
MLSE 18 (5)	URS, 2005	<0.27	**2.5**	**52 J**	**0.27**	<0.27	**53**	**12**	**6.5 J**	**2.3 J**	**0.019 J**	<1.1	**28**	**0.4**	<0.27	<0.27	**40 J**	**20 J**
MLSE 19 (1.5)	URS, 2005	<0.26	**2.1**	**54**	**0.29**	<0.26	**70**	**7.5**	**7.9**	**2.9**	<0.022	<1	**27**	**1.4**	<0.26	<0.26	**53**	**30**
MLSE 19 (2.5)	URS, 2005	<0.22 UJ	**2**	**55**	**0.32**	<0.22	**63**	**7.7**	**7.7**	**2.5**	<0.024	<0.9	**28**	**1.2**	<0.22	<0.22	**52**	**23**
MLSE 19 (5)	URS, 2005	<0.24	**5.2**	**72**	**0.48**	<0.24	**88**	**13**	**12**	**3.8**	<0.024	<0.96	**54**	**2**	<0.24	<0.24	**75**	**28**
MLSE 20 (1)	URS, 2005	<0.32	**1.3**	**93**	**0.35**	<0.32	**120**	**10**	**14**	**28**	<0.025	<1.3	**140**	**1.9**	<0.32	<0.32	**53**	**43**
MLSE 20 (2)	URS, 2005	<0.58 UJ	**2.7**	**99**	**0.42**	<0.58	**140**	**12**	**13**	**10**	<0.058	<2.3	**90**	**2.3**	<0.58	<0.58	**77**	**47**
MLSE 20 (5)	URS, 2005	<0.24 UJ	**1.8**	**53**	**0.26**	<0.24	**60**	**12**	**7.5**	**2.4**	<0.027	<0.97	**32**	**1.1**	<0.24	<0.24	**48**	**22**
MLSE 21 (1)	URS, 2005	**2.6 J**	**11**	**230**	**0.85**	**2.7**	**280**	**29**	**140**	**1,200**	**0.96**	<7.3	**210**	**5.9**	<1.8	<1.8	**190**	**960**
MLSE 21 (2)	URS, 2005	<0.48	**3.7**	**45**	**0.23**	<0.48	**120**	**9.9**	**24**	**130**	**0.14**	<1.9	**95**	**1.4**	<0.48	<0.48	**65**	**160**
MLSE 21 (5)	URS, 2005	<1.4 UJ	**52**	**94**	<0.55	<1.4	**110**	**32**	**13**	**3.2**	<0.13	<5.5	**110**	**12**	<1.4	<1.4	**90**	**57**
MLSE 21 (6)	URS, 2005	-	**27**	-	-	-	-	-	-	-	-	-	-	**4.9**	-	-	-	-
MLSE 21 (7)	URS, 2005	<0.23	**12**	**27**	**0.1**	<0.23	**26**	**6.1**	**1.2**	**0.72**	<0.02	<0.91	**21**	**0.25**	<0.23	<0.23	**23**	**10**
MLSE 21 (8)	URS, 2005	-	**4.8**	-	-	-	-	-	-	-	-	-	-	<1.3	-	-	-	-
MLSE 22 (1)	URS, 2005	<0.22 UJ	**0.4**	**13**	<0.12 UJ	<0.22	**42**	**4.8**	**1.7**	**0.96**	<0.023	<0.9	**19**	**0.74**	<0.22	<0.22	**38**	**15**
MLSE 22 (2)	URS, 2005	<0.29 UJ	**0.57**	**16**	**0.13**	<0.29	**50**	4.9	**2.2**	**1.1**	<0.023	<1.1	**20**	**0.73**	<0.29	<0.29	**41**	**16**
MLSE 22 (5)	URS, 2005	<0.23 UJ	**1.1**	**11**	**0.18**	<0.23	**33**	**4.3**	**2.7**	**1.4**	<0.024	<0.94	**21**	**0.4**	<0.23	<0.23	**24**	**15**
MLSE 23 (1)	URS, 2005	<0.25 UJ	**0.83**	**21**	<0.18 UJ	<0.25	**53**	**5.2**	**2.6**	**2.5**	<0.022	<0.99	**21**	<0.25	<0.25	<0.25	**37**	**20**
MLSE 23 (2)	URS, 2005	<0.25 UJ	**0.8**	**18**	<0.2 UJ	<0.25	**41**	**4.9**	**2.5**	**1.5**	<0.021	<1	**23**	<0.25	<0.25	<0.25	**29**	**17**
MLSE 23 (5)	URS, 2005	<0.27 UJ	**1.5**	**15**	**0.26**	<0.27	**62 J**	**6.1**	**3.4**	**1.7**	<0.02	<1.1	**25**	<0.27	<0.27	<0.27	**52**	**22**
MLSE 24 (1)	URS, 2005	<0.39 UJ	**2.4**	**34**	**0.22**	<0.39	**48 J**	**4.2**	**12**	**82**	**0.05**	<1.6	**29**	<0.39	<0.39	<0.39	**36**	**50**
MLSE 24 (2.5)	URS, 2005	<0.31 UJ	**2.2**	**47**	**0.27**	<0.31	**63 J**	**7.2**	**7.9**	**22**	**0.046**	<1.3	**53**	<0.31	<0.31	<0.31	**39**	**42**
MLSE 24 (5)	URS, 2005	<1.2 UJ	**16**	**79**	**0.47**	<1.2	**94 J**	**29**	**15**	**2.8**	<0.1	<4.6	**110**	**2.2**	<1.2	<1.2	**69**	**63**
MLSE 25 (1)	URS, 2005	<5.2 UJ	**0.74**	**25 J**	<0.43	<0.43	**29 J**	**4**	**6.4**	**36 J**	<0.048	<2.2 UJ	**16 J**	<0.43	<0.43	<0.43	**19 J**	**34 J**
MLSE 26 (1)	URS, 2005	<14	**4.4**	**110 J**	<1.1	<1.1	**66 J**	**9.4**	**32**	**91 J**	<0.097	<5.7	**84 J**	<1.1	<1.1	<1.1	**62 J**	**100 J**
MLSE 26 (2)	URS, 2005	<7.4	**5.9**	**86 J**	<0.61	<0.61	**91 J**	**8.2**	**22**	**71 J**	**0.088**	<3.1	**74 J**	<0.61	<0.61	<0.61	**71 J**	**88 J**
MLSE 27 (1)	URS, 2005	<0.28 UJ	**1.2**	**20**	<0.15 UJ	<0.28	**51 J**	**4.3**	**3.1**	**22**	**0.02**	<1.1	**25**	<0.28	<0.28	<0.28	**27**	**32**
MLSE 27 (2)	URS, 2005	<0.9 UJ	**7.1**	**160**	**0.79**	<0.9	**230 J**	**23**	**23**	**57**	**0.18**	<3.6	**260**	<0.9	<0.9	<0.9	**120**	**99**
MLSE 27 (5)	URS, 2005	<0.78 UJ	**15**	**60**	**0.39**	<0.78	**110 J**	**31**	**9.2**	**5.6**	<0.064	<3.1	**93**	**0.81**	<0.78	<0.78	**94**	**64**
MLSE 27 (6)	URS, 2005	<0.26 UJ	**4**	**15**	<0.16 UJ	<0.26	**44 J**	**7.1**	**2.1**	**0.99**	<0.023	<1	**23**	<0.26	<0.26	<0.26	**37**	**18**
MLSE 28 (1)	URS, 2005	<0.42 UJ	**3.2**	**56**	**0.26**	<0.42	**76 J**	**11**	**21**	**140**	**0.13**	<1.7	**66**	<0.42	<0.42	<0.42	**46**	**150**
MLSE 28 (2)	URS, 2005	<0.43 UJ	**3.6**	**61**	**0.31**	<0.43	**94 J**	**10**	**11**	**35**	**0.056**	<1.7	**78**	<0.43	<0.43	<0.43	**54**	**57**
MLSE 28 (5)	URS, 2005	<1.5 UJ	**25**	**100**	<0.62	<1.5	**150 J**	**44**	**18**	**4**	<0.12	<6.2	**180**	**2.9**	<1.5	<1.5	**100**	**83**
MLSE 28 (6)	URS, 2005	<0.39 UJ	**5.8**	**26**	<0.15 UJ	<0.39	**36 J**	**9.8**	**4.6**	**1.4**	<0.02	<1.5	**40**	<0.39	<0.39	<0.39	**26**	**21**
MLSE 29 (1)	URS, 2005	-	-	-	-	**2**	-	-	-	**660**	-	-	-	-	-	-	-	-
MLSE 29 (2)	URS, 2005	-	-	-	-	**1.6**	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 29 (4)	URS, 2005	<0.93 UJ	**11**	**280**	**0.97**	**1**	**250 J**	**32**	**66 J**	**240**	<0.19 UJ	<3.7	**320**	<0.93	<0.93	<0.93	<130 UJ	**260**
MLSE 29 (5)	URS, 2005	-	-	-	-	<1.7				**7.8**	-	-	-	-	-	-	-	-
MLSE 29 (6)	URS, 2005	-	-	-	-	<1.5	-	-	-	**2.3**	-	-	-	-	-	-	-	-
MLSE 30 (1)	URS, 2005	-	-	-	-	**1.8**	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 30 (2)	URS, 2005	-	-	-	-	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 30 (4)	URS, 2005	<1 UJ	**8**	**64**	<0.55	<1	**130 J**	**22**	**45 J**	<3	<0.12	<5.5	**130**	<1.4	<1.4	<1.4	**80**	**180**

TABLE 2
METALS RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**3**	**19**	**3,100**	**7,200**	**1.1**	**140**	**50**	**114**	**82**	**0.62**	**522**	**110**	**1.6**	**1**	**3.7**	**90**	**230**
MLSE 30 (5)	URS, 2005	-	-	-	-	<2.1	-	-	-	**20**	-	-	-	-	-	-	-	-
MLSE 30 (6)	URS, 2005	-	-	-	-	<1.7	-	-	-	**16**	-	-	-	-	-	-	-	-
MLSE 31 (1)	URS, 2005	-	-	-	-	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 31 (2) MS/MSD	URS, 2005	-	-	-	-	**0.74**	-	-	-	**120**	-	-	-	-	-	-	-	-
MLSE 31 (4)	URS, 2005	<13	**7.2**	**170**	**0.61**	<1	<150 UJ	**20**	**42 J**	**100**	<0.3 UJ	<4.2	**180**	<1.6	<1	<1	<90 UJ	**190**
MLSE 31 (5)	URS, 2005	-	-	-	-	<2	-	-	-	**2.1**	-	-	-	-	-	-	-	-
MLSE 31 (6)	URS, 2005	-	-	-	-	<1.3	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 32 (1)	URS, 2005	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 32 (2) MS/MSD	URS, 2005	-	-	-	-	<0.23	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 32 (4)	URS, 2005	<2.8	**2.5**	**36**	**0.19**	<0.24	<56 UJ	**6.7**	**5.2**	**2.9**	<0.024 UJ	<0.95	**28**	<0.24	<0.24	<0.24	**46**	**18**
MLSE 32 (5)	URS, 2005	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 32 (6)	URS, 2005	-	-	-	-	<1	-	-	-	-	-		-	-	-	-	-	-
MLSE 33 (1)	URS, 2005	-	-	-	-	<0.27	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 33 (2)	URS, 2005	-	-	-	-	<1.7	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 33 (5)	URS, 2005	-	-	-	-	<1.3	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 33 (6)	URS, 2005	-	-	-	-	<0.23	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 37 (1)	URS, 2005	<3.6 UJ	**1.4**	**25**	<0.12 UJ	<0.3	**40 J**	**5.9**	**4.8 J**	**17**	<0.023	<1.2	**45**	<0.3	<0.3	<0.3	**17**	**27**
MLSE 37 (2)	URS, 2005	<8	**6.3**	**160**	**0.61**	<0.67	**170 J**	**22**	**24 J**	**59**	**0.17**	<2.7	**210**	<0.67	<0.67	<0.67	**94**	**75**
MLSE 37 (5)	URS, 2005	<3.2 UJ	**3.7**	**31**	<0.2 UJ	<0.26	**50J**	**9.3**	**5.1J**	**1.9**	<0.019	<1.1	**46**	<0.26	<0.26	<0.26	**33**	**19**
MLSE 38 (1)	URS, 2005	<3.3 UJ	**2**	**32**	**0.2**	<0.28	**71 J**	**7.6**	**5.7 J**	**16**	<0.025	<1.1	**32**	<0.28	<0.28	<0.28	**42**	**72**
MLSE 38 (2)	URS, 2005	<3.2 UJ	**2.4**	**39**	**0.25**	<0.27	**96 J**	**10**	**7.3 J**	**2.7**	**0.01 J**	**0.1 J**	**39**	<0.27	<0.27	<0.27	**48**	**44**
MLSE 38 (5)	URS, 2005	<3.1 UJ	**3.8**	**48**	**0.33**	<0.026	**81 J**	**13**	**5.9 J**	**2.9**	<0.021	<1	**73**	<0.26	<0.26	<0.26	**62**	**28**
MLSE 39 (1)	URS, 2005	-	-	-	-	**1.2**	-	-	-	**280**	-	-	-	-	-	-	-	-
MLSE 39 (2)	URS, 2005	-	-	-	-	<1.3	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 39 (4)	URS, 2005	-	-	-	-	-	-	-	-	**92**	-	-	-	-	-	-	-	-
MLSE 39 (5)	URS, 2005	-	-	-	-	<0.69	-	-	-	**50**	-	-	-	-	-	-	-	-
MLSE 39 (6)	URS, 2005	-	-	-	-	<1.6	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 40 (1)	URS, 2005	-	-	-	-	<0.24	-	-	-	**17**	-	-	-	-	-	-	-	-
MLSE 40 (2)	URS, 2005	-	-	-	-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-
MLSE 40 (4)	URS, 2005	-	-	-	-	-	-	-	-	**13**	-	-	-	-	-	-	-	-
MLSE 40 (5)	URS, 2005	-	-	-	-	<0.79	-	-	-	**54**	-	-	-	-	-	-	-	-
MLSE 40 (6)	URS, 2005	-	-	-	-	<0.54	-	-	-	-	-	-	-	-	-	-	-	-
DUP 100404-1 (1) [MLSE 31 (1)][a]	URS, 2005	-	-	-	-	<1.5	-	-	-	-	-	-	-	-	-	-	-	-
DUP 280904-1(1.5) [MLSE 19 (1.5)][a]	URS, 2005	<0.28	**1.8**	**51**	**0.27**	<0.28	**67**	**7.5**	**7.6**	**3.1**	<0.024	<1.1	**27**	**1**	<0.28	<0.28	**51**	**25**
DUP092904-1(2.5) [MLSE 24 (2.5)][a]	URS, 2005	<0.36 UJ	**2.6**	**43**	**0.28**	<0.36	**60 J**	**8.5**	**10**	**32**	**0.11**	<1.4	**62**	<0.36	<0.36	<0.36	**41**	**61**
DUP093004-1(1) [MLSE 27 (1)][a]	URS, 2005	<0.27	**1.4**	**25**	<0.17 UJ	<0.27	**47 J**	**5**	**3.5**	**24**	<0.019	<1.1	**31**	<0.27	<0.27	<0.27	**34**	**35**
DUP093004-2(1) [MLSE 38 (1)][a]	URS, 2005	<3.3	**1.5**	**25**	<0.14 UJ	<0.27	**49 J**	**5.4**	**4.3 J**	**23**	<0.025	<1.1	**23**	<0.27	<0.27	<0.27	**32**	**68**

TABLE 2
METALS RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**3**	**19**	**3,100**	**7,200**	**1.1**	**140**	**50**	**114**	**82**	**0.62**	**522**	**110**	**1.6**	**1**	**3.7**	**90**	**230**
DUP093004-3(2) [MLSE 38 (2)][a]	URS, 2005	<3.2 UJ	**2.9**	**46**	**0.29**	<0.26	**97 J**	**13**	**8.6 J**	**3.3**	<0.022	<1.1	**48**	<0.26	<0.26	<0.26	**58**	**61**
DUP100104-1(1) [MLSE 30 (1)][a]	URS, 2005	-	**-**	-	-	**2.1**	-	-	-	-	-	-	-	-	-	-	-	-
DUP100504-1(1) [MLSE 33 (1)][a]	URS, 2005	-	**-**	-	-	<0.29	-	-	-	-	-	-	-	-	-	-	-	-
DUP100504-2(1) [MLSE 32 (1)][a]	URS, 2005	-	**-**	-	-	**0.38**	-	-	-	-	-	-	-	-	-	-	-	-

Legend:
Results in milligrams per kilogram (mg/kg) . Results for URS, 2001 and URS, 2005 are reported in dry weight.

J	Estimated Concentration
U	Non-Detect
UJ	Estimated Reporting Limit
ND	Non-Detect (see source report for reporting limits)
<2.50	Non-Detect at a Reporting Limit of 2.50 mg/kg
-	Not Analyzed
NE	Not Established
[ ][a]	Indicates parent sample

Notes:

1. Cleanup levels are based on ecological freshwater sediment criteria and backgrounds metals concentrations for the Colma formation. Of the chemicals detected in the lake sediments, special-status sediment criteria are only available for selenium and thallium (see Table 7-3 from Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water by EKI dated October 2002).
2. Concentrations detected above the Reporting Limit are boldfaced.
3. Concentrations detected above the applicable Cleanup Level are boldfaced and highlighted.

TABLE 3
STLC AND TCLP ANALYTICAL RESULTS
PRESIDIO - MOUNTAIN LAKE

Source: URS, 2005

Analyte		Regulatory Limit	MLSE 29 (4.1)	MLSE 30 (4.1)	MLSE 31 (4.1)	MLSE 32 (4.1)	MLSE 33 (4.1)	MLSE 39 (4.1)	MLSE 40 (4.1)	DUP100604-1 (4.1)
Antimony	STLC	15	< 3	< 3	< 3	**0.85 J**	**0.28 J**	**0.46 J**	< 3	<0.43
Arsenic	STLC	5.0	< 0.25	0.19 J	< 0.25	**0.23 J**	**0.13 J**	< 0.25	< 0.25	< 0.25
	TCLP	5.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06
Barium	STLC	100	**2.4**	**0.89**	**2.1**	**2.7**	**1.1**	**3.8**	**2**	**3.4**
	TCLP	100	**0.63**	<0.28	**0.7**	<0.85	**0.34**	**1.2**	**0.78**	**0.73**
Beryllium	STLC	0.75	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	<0.032	< 0.1	<0.046
Cadmium	STLC	1.0	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	TCLP	1.0	**0.0083 J**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chromium	STLC	5.0	**0.61**	**0.46 J**	**0.63**	**0.51**	**0.53**	**1.1**	**0.76**	**1.2**
	TCLP	5.0	TRUE	<0.0098	<0.015	<0.027	< 0.1	<0.036	<0.019	< 0.1
Cobalt	STLC	80	**0.13 J**	**0.079 J**	**0.15 J**	**0.34 J**	**0.18 J**	**0.56 J**	**0.28 J**	**0.42**
Copper	STLC	25	**0.16 J**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Lead	STLC	5.0	**6.2**	**0.091 J**	**3.3**	< 0.15	< 0.15	**0.77**	**0.95**	**0.38**
	TCLP	5.0	**0.73**	<0.013	**0.37**	< 0.03	< 0.03	**0.053**	**0.045**	< 0.03
Mercury	STLC	0.2	< 0.001	**0.00027 J**	<0.0011	< 0.001 UJ	<0.00034	<0.00059	<0.0011	**0.00024**
	TCLP	0.2	< 0.001	< 0.001	< 0.001	< 0.001 U	< 0.001	< 0.001	< 0.001	< 0.001
Molybdenum	STLC	350	< 1	< 1	< 1	**0.16 J**	< 1	< 1	< 1	< 0.001
Nickel	STLC	20	**0.83 J**	**0.76 J**	**1.1**	**0.78 J**	**0.8 J**	**2**	**6.4**	**2.5**
Selenium	STLC	1.0	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	**0.18 J**	< 0.25	< 0.25
	TCLP	1.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Silver	STLC	5.0	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	TCLP	5.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Thallium	STLC	7.0	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Vanadium	STLC	24	**0.86**	**0.93**	**1**	**0.79**	**0.93**	**1.5**	**0.81**	**1.7**
Zinc	STLC	250	**5.3**	<0.58	**4**	<0.33	<0.44	**4.4**	**1.3**	<1.4

Legend:
Results in milligrams per liter (mg/L)

J	Concentration is estimated
U	Non-Detect
UJ	Estimated Reporting Limit
<0.25	Non-Detect at a Reporting Limit of 0.25 mg/L

Notes:
1 Concentrations detected above the Method Detection limit are boldfaced.
2 Concentrations detected above the applicable Regulatory Limit are boldfaced and highlighted.
3 TCLP results are presented only for analytes that have a TCLP regulatory standard.

TABLE 4
PESTICIDES RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	alpha-Chlordane	beta-BHC	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC (Lindane)	gamma-Chlordane	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
Freshwater Sediment Cleanup Level (µg/kg)	**Source**	**16**	**16**	**32**	**5**	**8**	**10**	**13**	**7.5**	**32**	**5.4**	**5.4**	**5.4**	**100**	**100**	**100**	**3**	**10**	**8.3**	**8.3**	**19**	**NE**
MLSD01	D&M, 1997	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3**	ND	ND	ND	ND	ND
MLSD02	D&M, 1997	ND	ND	ND	**3**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND
MLSD03	D&M, 1997	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND
MLSD04	D&M, 1997	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND
ML-1 (9.7-0.3)comp	EKI, 1998	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ML-2 (19.5-2)comp	EKI, 1998	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ML-3 (19.4-5)comp	EKI, 1998	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ML-4 (19.5-5)comp	EKI, 1998	ND	ND	ND	ND	ND	ND	ND	**4.7**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ML-5 (14.7-0.3)comp	EKI, 1998	ND	ND	ND	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MLSD 1 (0.1)	URS, 2001	<16	<16	<16	<1.33	**5.4 J**	<1.38	<4.06	**8.0 J**	<16	<1.67	<16	<16	<16	<16	<16	<1.11	<1.41	<2.32	<1.72	<16	<780
MLSD 1 (0.25)	URS, 2001	<13	<13	<13	<1.07	**4.4 J**	<1.12	<13	**6.6 J**	<13	<1.35	<13	<13	<13	<13	**9.4 J**	**4.8 J**	<1.14	<1.88	<1.39	<13	<630
MLSE 1 (0.5)	URS, 2001	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	**3.8J**	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	**4.0 J**	<0.37	<5.3	<5.3	<5.3	<5.3	<260
MLSE 1 (2)	URS, 2001	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	**2.4 J**	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	**3.5 J**	<0.33	<4.7	<4.7	<4.7	<4.7	<240
MLSE 4 (0.5)	URS, 2001	<5.59	<4.05	<5.41	<4.18	<4.65	<4.35	<12.8	**25 J**	<4.18	<5.27	<49	<49	<49	<49	<49	<3.49	<4.45	<7.32	<5.41	<27.71	<2500
MLSE 4 (2)	URS, 2001	<15	**13 J**	<15	<15	**4.7 J**	**6.2 J**	<3.78	**8.3 J**	<15	<1.55	<15	<15	<15	<15	<15	**4.1 J**	**4.6 J**	**3.1 J**	**4.5 J**	<15	<730
MLSE5 (0.5)	URS, 2001	**14 J**	<2.02	<2.70	<2.08	<2.32	<2.17	**14 J**	**5.9 J**	<25	<2.63	<25	<25	<25	<25	**18 J**	**9.9 J**	<2.22	<3.65	<2.70	<13.81	<1200
MLSE5 (2)	URS, 2001	<4.60	<3.34	<4.54	<3.44	**10 J**	<3.58	**12 J**	**8.1 J**	<3.44	<4.33	<41	<41	<41	<41	**28 J**	**6.1 J**	<3.66	<6.02	<4.45	<22.80	<2000
MLSE10(0.5)	URS, 2001	<12	<12	<12	<12	**3.5 J**	<1.09	**5.9 J**	**3.8 J**	<12	<1.32	<12	<12	<12	**42**	**9.1 J**	**4.2 J**	<1.12	**1.4 J**	<1.36	<12	<620
MLSE10(2)	URS, 2001	<6.9	<6.9	<6.9	<6.9	**1.7 J**	**1.6 J**	<6.9	<6.9	<6.9	<0.74	<6.9	<6.9	<6.9	<6.9	<6.9	**3.5 J**	<6.9	<6.9	**3.0 J**	<6.9	<350
MLSE15 (0.5)	URS, 2001	<2.16	**9.6 J**	<19	<19	**6.1 J**	<1.68	<4.94	**11 J**	<19	<2.03	<19	<19	<19	<19	<19	**5.3 J**	<1.72	**4.0 J**	<2.09	<19	<950
MLSE15 (2)	URS, 2001	**1.4 J**	**0.84 J**	**0.19 J**	**0.40 J**	**0.68 J**	**0.74 J**	**2.3 J**	**1.4 J**	**0.89 J**	**0.19 J**	**1.2 J**	**1.3 J**	<2.5	<2.5	**1.9 J**	**1.1 J**	<2.5	<2.5	**1.0 J**	<2.5	<130
DUP012401-1 [MLSD-1 (0.25)][a]	URS, 2001	<13	<13	<13	<13	**4.2 J**	<1.10	<13	<1.08	<13	<1.34	<13	<13	<13	<13	<13	<0.89	<1.13	<1.86	<1.37	<13	<630
DUP012401-7 [MLSE-1 (0.5)][a]	URS, 2001	<14	<14	<14	<14	<1.29	<1.21	<3.56	**6.9 J**	<14	<1.46	<14	<14	<14	<14	<14	<0.97	<1.24	<2.03	<1.50	<14	<690
MLSE 16(1)	URS, 2005	<17 UJ	<17 UJ	<17 UJ	<8.6 UJ	<8.6 UJ	<8.6 UJ	<8.6 UJ	<8.6 UJ	<17	<8.6	<17 UJ	<17 UJ	<17 UJ	<17 UJ	-	<8.6 UJ	<8.6 UJ	<8.6 UJ	<8.6 UJ	<86 UJ	<300 UJ
MLSE 16(2)	URS, 2005	<22	<22	<22	<11	<11	<11	<11	<11	<22	<11	<22	<22	<22	<22	-	<11	<11	<11	<11	<110	<400
MLSE 16(5)	URS, 2005	<18	<18	<18	<9	<9	<9	<9	<9	<18	<9	<18	<18	<18	<18	-	<9	<9	<9	<9	<90	<320
MLSE 17(1)	URS, 2005	<8.9 UJ	<8.9 UJ	<8.9 UJ	<4.6 UJ	<4.6 UJ	<4.6 UJ	<4.6 UJ	<4.6 UJ	<8.9 UJ	<4.6 UJ	<8.9 UJ	<8.9 UJ	<8.9 UJ	<8.9 UJ	-	<4.6 UJ	**10 J**	<4.6 UJ	<4.6 UJ	<46 UJ	<160 UJ
MLSE 17(2)	URS, 2005	<4.1	<4.1	<4.1	<2.1	<2.1	<2.1	<2.1	<2.1	<4.1	<2.1	<4.1	<4.1	<4.1	<4.1	-	<2.1	<2.1	<2.1	<2.1	<21	<74
MLSE 17(5)	URS, 2005	<14	<14	<14	<7.1	<7.1	<7.1	<7.1	<7.1	<14	<7.1	<14	<14	<14	<14	-	<7.1	<7.1	<7.1	<7.1	<71	<250
MLSE 18(1)	URS, 2005	<4.3	<4.3	<4.3	<2.2	<2.2	<2.2	<2.2	<2.2	<4.3	<2.2	<4.3	<4.3	<4.3	<4.3	-	<2.2	<2.2	<2.2	<2.2	<22	<78
MLSE 18(2)	URS, 2005	<4.2	<4.2	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<4.2	<2.2	<4.2	<4.2	<4.2	<4.2	-	<2.2	<2.2	<2.2	<2.2	<22	<76
MLSE 18(5)	URS, 2005	<3.8	<3.8	<3.8	<2	<2	<2	<2	<2	<3.8	<2	<3.8	<3.8	<3.8	<3.8	-	<2	<2	<2	<2	<20	<69
MLSE 19 (1.5)	URS, 2005	<8.1	<8.1	<8.1	<4.1	<4.1	<4.1	<4.1	<4.1	<8.1	<4.1	<8.1	<8.1	<8.1	<8.1	-	<4.1	<4.1	<4.1	<4.1	<41	<150
MLSE 19 (2.5)	URS, 2005	<8.3	<8.3	<8.3	<4.3	<4.3	<4.3	<4.3	<4.3	<8.3	<4.3	<8.3	<8.3	<8.3	<8.3	-	<4.3	<4.3	<4.3	<4.3	<43	<150
MLSE 19 (5)	URS, 2005	<4	<4	<4	<2.1	<2.1	<2.1	<2.1	<2.1	<4	<2.1	<4	<4	<4	<4	-	<2.1	<2.1	<2.1	<2.1	<21	<73
MLSE 20 (1)	URS, 2005	<4.5	<4.5	<4.5	<2.3	<2.3	<2.3	<2.3	<2.3	<4.5	<2.3	<4.5	<4.5	<4.5	<4.5	-	<2.3	<2.3	<2.3	<2.3	<23	<83

TABLE 4
PESTICIDES RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	alpha-Chlordane	beta-BHC	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC (Lindane)	gamma-Chlordane	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
Freshwater Sediment Cleanup Level (µg/kg)	**Source**	**16**	**16**	**32**	**5**	**8**	**10**	**13**	**7.5**	**32**	**5.4**	**5.4**	**5.4**	**100**	**100**	**100**	**3**	**10**	**8.3**	**8.3**	**19**	**NE**
MLSE 20 (2)	URS, 2005	<8.1	<8.1	<8.1	<4.2	<4.2	<4.2	<4.2	<4.2	<8.1	<4.2	<8.1	<8.1	<8.1	<8.1	-	<4.2	<4.2	<4.2	<4.2	<42	<150
MLSE 20(5)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<71
MLSE 21 (1)	URS, 2005	<59	<59	<59	<31	<31	<31	<31	<31	<59	<31	<59	<59	<59	<59	-	<31	**32**	<31	<31	<310	<1100
MLSE 21 (2)	URS, 2005	<32	<32	<32	<17	<17	<17	<17	<17	<32	<17	<32	<32	<32	<32	-	<17	<17	<17	<17	<170	<580
MLSE 21 (5)	URS, 2005	<35	<35	<35	<18	<18	<18	<18	<18	<35	<18	<35	<35	<35	<35	-	<18	<18	<18	<18	<180	<630
MLSE 22 (1)	URS, 2005	<4	<4	<4	<2	<2	<2	<2	<2	<4	<2	<4	<4	<4	<4	-	<2	<2	<2	<2	<20	<72
MLSE 22 (2)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<71
MLSE 22(5)	URS, 2005	<4	<4	<4	<2	<2	<2	<2	<2	<4	<2	<4	<2	<4	<4	-	<2	<2	<2	<2	<20	<72
MLSE 23(1)	URS, 2005	<3.8	<3.8	<3.8	<2	<2	<2	<2	<2	<3.8	<2	<3.8	<3.8	<3.8	<3.8	-	<2	<2	<2	<2	<20	<70
MLSE 23(2)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<70
MLSE 23(5)	URS, 2005	<3.8	<3.8	<3.8	<2	<2	<2	<2	<2	<3.8	<2	<3.8	<3.8	<3.8	<3.8	-	<2	<2	<2	<2	<20	<70
MLSE 24(1)	URS, 2005	<5.8	<5.8	<5.8	<3	<3	<3	<3	<3	<5.8	<3	<5.8	<5.8	<5.8	<5.8	-	<3	<3	<3	<3	<30	<110
MLSE 24(2.5)	URS, 2005	<4.4	<4.4	<4.4	<2.2	<2.2	<2.2	<2.2	<2.2	<4.4	<2.2	<4.4	<4.4	<4.4	<4.4	-	<2.2	<2.2	<2.2	<2.2	<22	<79
MLSE 24(5)	URS, 2005	<33	<33	<33	<17	<17	<17	<17	<17	<33	<17	<33	<33	<33	<33	-	<17	<17	<17	<17	<170	<610
MLSE 25 (1)	URS, 2005	<6.6	<6.6	<6.6 UJ	<3.4 UJ	<3.4 UJ	<3.4	<3.4 UJ	<3.4 UJ	<6.6 UJ	<3.4 UJ	<6.6	<6.6	<6.6 UJ	<6.6	-	<3.4 UJ	<3.4	<3.4 UJ	<3.4 UJ	<34	<120
MLSE 26 (1)	URS, 2005	<15 UJ	<15 UJ	<15 UJ	<7.7 UJ	<7.7 UJ	**91 J**	<7.7 UJ	<7.7 UJ	<15 UJ	<7.7 UJ	<15 UJ	<15 UJ	<15 UJ	<15 UJ	-	<7.7 UJ	**16 J**	<7.7 UJ	<7.7 UJ	<77 UJ	<270 UJ
MLSE 26 (2)	URS, 2005	<44	<44	<44 UJ	<23 UJ	<23	<23	<23	<23	<44 UJ	<23	<44	<44	<44 UJ	<44	-	<23 UJ	<23	<23 UJ	<23	<230	<800
MLSE 27 (1)	URS, 2005	<3.8	<3.8	<3.8	<2	<2	<2	<2	<2	<3.8	<2	<3.8	<3.8	<3.8	<3.8	-	<2	<2	<2	<2	<20 UJ	<70
MLSE 27 (2)	URS, 2005	<12	<12	<12	<6.3	<6.3	<6.3	<6.3	<6.3	<12	<6.3	<12	<12	<12	<12	-	<6.3	<6.3	<6.3	<6.3	<63	<220
MLSE 27 (5)	URS, 2005	<12	<12	<12	<6	<6	<6	<6	<6	<12	<6	<12	<12	<12	<12	-	<6	<6	<6	<6	<60 UJ	<210
MLSE 27 (6)	URS, 2005	<4	<4	<4	<2	<2	<2	<2	<2	<4	<2	<4	<4	<4	<4	-	<2	<2	<2	<2	<20 UJ	<72
MLSE 28 (1)	URS, 2005	<6.2	<6.2	<6.2	<3.2	<3.2	<3.2	<3.2	<3.2	<6.2	<3.2	<6.2	<6.2	<6.2	<6.2	-	<3.2	<3.2	<3.2	<3.2	<32 UJ	<110
MLSE 28 (2)	URS, 2005	<6.6	<6.6	<6.6	<3.4	<3.4	<3.4	<3.4	<3.4	<6.6	<3.4	<6.6	<6.6	<6.6	<6.6	-	<3.4	<3.4	<3.4	<3.4	<34 UJ	<120
MLSE 28 (5)	URS, 2005	<22	<22	<22	<11	<11	<11	<11	<11	<22	<11	<22	<22	<22	<22	-	<11	<11	<11	<11	<110 UJ	<400
MLSE 28 (6)	URS, 2005	<5.5	<5.5	<5.5	<2.9	<2.9	<2.9	<2.9	<2.9	<5.5	<2.9	<5.5	<5.5	<5.5	<5.5	-	<2.9	<2.9	<2.9	<2.9	<29 UJ	<100
MLSE 29 (1)	URS, 2005	<19	<19	<19	<9.9	<9.9	<9.9	<9.9	<9.9	<19	<9.9	<19	<19	<19	<19	-	<9.9	<9.9	<9.9	<9.9	<99 UJ	<350
MLSE 29 (2)	URS, 2005	<16	<16	<16	<8	<8	<8	<8	<8	<16	<8	<16	<16	<16	<16	-	<8	<8	<8	<8	<80 UJ	<280
MLSE 29 (5)	URS, 2005	<26	<26	<26	<13	<13	<13	<13	<13	>26	>13	<26	<26	<26	<26	-	<13	<13	<13	<13	<130	<460
MLSE 29 (6)	URS, 2005	<22 UJ	<22 UJ	<22 UJ	<11 UJ	<11 UJ	<11 UJ	<11 UJ	<11 UJ	<22 UJ	<11 UJ	<22 UJ	<22 UJ	<22 UJ	<22 UJ	-	<11 UJ	<11 UJ	<11 UJ	<11 UJ	<110 UJ	<400 UJ
MLSE 30(1)	URS, 2005	<18	<18	<18	<9.4	<9.4	<9.4	<9.4	<9.4	<18	<9.4	<18	<18	<18	<18	-	<9.4	<9.4	<9.4	<9.4	<94	<330
MLSE 30(2)	URS, 2005	<15	<15	<15	<7.7	<7.7	<7.7	<7.7	<7.7	<15	<7.7	<15	<15	<15	<15	-	<7.7	<7.7	<7.7	<7.7	<77	<270
MLSE 30(5)	URS, 2005	<28	<28	<28	<14	<14	<14	<14	<14	<28	<14	<28	<28	<28	<28	-	<14	<14	<14	<14	<140	<510
MLSE 30(6)	URS, 2005	<24	<24	<24	<12	<12	<12	<12	<12	<24	<12	<24	<24	<24	<24	-	<12	<12	<12	<12	<120	<430
MLSE 31 (1)	URS, 2005	<18 UJ	<18 UJ	<18 UJ	<9.3	<9.3	<9.3 UJ	<9.3	<9.3	<18 UJ	<9.3	<18 UJ	<18 UJ	<18 UJ	<18 UJ	-	<9.3	<9.3 UJ	<9.3	<9.3	<93 UJ	<330 UJ
MLSE 31 (2)	URS, 2005	<3.2	<3.2	<3.2	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<3.2	<3.2	<3.2	<3.2	-	<1.7	<1.7	<1.7	<1.7	<17	<59
MLSE 31 (5)	URS, 2005	<28 UJ	<28 UJ	<28 UJ	<14 UJ	<14 UJ	<14 UJ	<14 UJ	<14 UJ	<28 UJ	<14 UJ	<28 UJ	<28 UJ	<28 UJ	<28 UJ	-	<14 UJ	<14 UJ	<14 UJ	<14 UJ	<140 UJ	<500 UJ
MLSE 31 (6)	URS, 2005	<47 UJ	<47 UJ	<47 UJ	<24 UJ	<24 UJ	<24 UJ	<24 UJ	<24 UJ	<47 UJ	<24 UJ	<47 UJ	<47 UJ	<47 UJ	<47 UJ	-	<24 UJ	<24 UJ	<24 UJ	<24 UJ	<240 UJ	<860 UJ
MLSE 32 (1)	URS, 2005	<4.6	<4.6	<4.6	<2.3	<2.3	<2.3	<2.3	<2.3	<4.6	<2.3	<4.6	<4.6	<4.6	<4.6	-	<2.3	<2.3	<2.3	<2.3	<23	<83

TABLE 4
PESTICIDES RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	alpha-Chlordane	beta-BHC	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC (Lindane)	gamma-Chlordane	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
Freshwater Sediment Cleanup Level (µg/kg)	**Source**	**16**	**16**	**32**	**5**	**8**	**10**	**13**	**7.5**	**32**	**5.4**	**5.4**	**5.4**	**100**	**100**	**100**	**3**	**10**	**8.3**	**8.3**	**19**	**NE**
MLSE 32 (2)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<71
MLSE 32 (5)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<71
MLSE 32 (6)	URS, 2005	<17	<17	<17	<8.5	<8.5	<8.5	<8.5	<8.5	<17	<8.5	<17	<17	<17	<17	-	<8.5	<8.5	<8.5	<8.5	<85	<300
MLSE 33 (1)	URS, 2005	**6**	<4.4	<4.4	<2.2	<2.2	<2.2	<2.2	<2.2	<4.4	<2.2	<4.4	<4.4	<4.4	<4.4	-	<2.2	<2.2	<2.2	<2.2	<22	<79
MLSE 33 (2)	URS, 2005	<23	<23	<23	<12	<12	<12	<12	<12	<23	<12	<23	<23	<23	<23	-	<12	<12	<12	<12	<120	<430
MLSE 33 (5)	URS, 2005	<16	<16	<16	<8	<8	<8	<8	<8	<16	<8	<16	<16	<16	<16	-	<8	<8	<8	<8	<80	<280
MLSE 33 (6)	URS, 2005	<4.5	<4.5	<4.5	<2.3	<2.3	<2.3	<2.3	<2.3	<4.5	<2.3	<4.5	<4.5	<4.5	<4.5	-	<2.3	<2.3	<2.3	<2.3	<23	<81
MLSE 37 (1)	URS, 2005	<4.1	<4.1	<4.1	<2.1	<2.1	**2.7 J**	<2.1	<2.1	<4.1	<2.1	<4.1	<4.1	<4.1	<4.1	-	<2.1	<2.1	<2.1	<2.1	<21 UJ	<75
MLSE 37 (2)	URS, 2005	<9.5	<9.5	<9.5	<4.9	<4.9	<4.9	<4.9	<4.9	<9.5	<4.9	<9.5	<9.5	<9.5	<9.5	-	<4.9	<4.9	<4.9	<4.9	<49 UJ	<170
MLSE 37 (5)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<72
MLSE 38 (1)	URS, 2005	<8.2	<8.2	<8.2	<4.2	<4.2	<4.2	<4.2	<4.2	<8.2	<4.2	<8.2	<8.2	<8.2	<8.2	-	<4.2	<4.2	<4.2	<4.2	<42	<150
MLSE 38 (2)	URS, 2005	<4	<4	<4	<2.1	<2.1	<2.1	<2.1	<2.1	<4	<2.1	<4	<4	<4	<4	-	<2.1	<2.1	<2.1	<2.1	<21	<73
MLSE 38 (5)	URS, 2005	<4	<4	<4	<2.1	<2.1	<2.1	<2.1	<2.1	<4	<2.1	<4	<4	<4	<4	-	<2.1	<2.1	<2.1	<2.1	<21	<73
MLSE 39 (1)	URS, 2005	**34**	<14	<14	<7.1	<7.1	<7.1	<7.1	<7.1	<14	<7.1	<14	<14	<14	<14	-	<7.1	<7.1	<7.1	<7.1	<71	<250
MLSE 39 (2)	URS, 2005	<16	<16	<16	<8.1	<8.1	<8.1	<8.1	<8.1	<16	<8.1	<16	<16	<16	<16	-	<8.1	**13**	<8.1	<8.1	<81	<290
MLSE 39 (5)	URS, 2005	<11	<11	<11	<5.5	<5.5	<5.5	<5.5	<5.5	<11	<5.5	<11	<11	<11	<11	-	<5.5	<5.5	<5.5	<5.5	<55	<190
MLSE 39 (6)	URS, 2005	<23	<23	<23	<12	<12	<12	<12	<12	<23	<12	<23	<23	<23	<23	-	<12	<12	<12	<12	<120	<420
MLSE 40 (1)	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20	<71
MLSE 40 (2)	URS, 2005	<3.8	<3.8	<3.8	<2	<2	<2	<2	<2	<3.8	<2	<3.8	<3.8	<3.8	<3.8	-	<2	<2	<2	<2	<20	<69
MLSE 40 (5)	URS, 2005	<9.9	<9.9	<9.9	<5.1	<5.1	<5.1	<5.1	<5.1	<9.9	<5.1	<9.9	<9.9	<9.9	<9.9	-	<5.1	<5.1	<5.1	<5.1	<51	<180
MLSE 40 (6)	URS, 2005	<7.8	<7.8	<7.8	<4	<4	<4	<4	<4	<7.8	<4	<7.8	<7.8	<7.8	<7.8	-	<4	<4	<4	<4	<40	<140
DUP 100404-1 (1) [MLSE 31 (1)][a]	URS, 2005	<18 UJ	<18 UJ	<18 UJ	<9.4 UJ	<9.4 UJ	<9.4 UJ	<9.4 UJ	<9.4 UJ	<18 UJ	<9.4 UJ	<18 UJ	<18 UJ	<18 UJ	<18 UJ	-	<9.4 UJ	<9.4 UJ	<9.4 UJ	<9.4 UJ	<94 UJ	<330 UJ
DUP 280904-1(1.5) [MLSE 19 (1.5)][a]	URS, 2005	<8.1	<8.1	<8.1	<4.2	<4.2	<4.2	<4.2	<4.2	<8.1	<4.2	<8.1	<8.1	<8.1	<8.1	-	<4.2	<4.2	<4.2	<4.2	<42	<150
DUP092904-1(2.5) [MLSE 24(2.5)][a]	URS, 2005	<4.9	<4.9	<4.9	<2.5	<2.5	<2.5	<2.5	<2.5	<4.9	<2.5	<4.9	<4.9	<4.9	<4.9	-	<2.5	<2.5	<2.5	<2.5	<25	<89
DUP093004-1(1) [MLSE 27 (1)][a]	URS, 2005	<3.9	<3.9	<3.9	<2	<2	<2	<2	<2	<3.9	<2	<3.9	<3.9	<3.9	<3.9	-	<2	<2	<2	<2	<20 UJ	<72
DUP093004-2(1) [MLSE 38 (1)][a]	URS, 2005	<4.2	<4.2	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<4.2	<2.2	<4.2	<4.2	<4.2	<4.2	-	<2.2	<2.2	<2.2	<2.2	<22 UJ	<76
DUP093004-3(2) [MLSE 38 (2)][a]	URS, 2005	<4.1	<4.1	<4.1	<2.1	<2.1	<2.1	<2.1	<2.1	<4.1	<2.1	<4.1	<4.1	<4.1	<4.1	-	<2.1	<2.1	<2.1	<2.1	<21 UJ	<75
DUP100104-1(1) [MLSE 30 (1)][a]	URS, 2005	<18	<18	<18	<9.5	<9.5	<9.5	<9.5	<9.5	<18	<9.5	<18	<18	<18	<18	-	<9.5	<9.5	<9.5	<9.5	<95	<330
DUP100504-1(1) [MLSE 33 (1)][a]	URS, 2005	<4.2	<4.2	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<4.2	<2.2	<4.2	<4.2	<4.2	<4.2	-	<2.2	<2.2	<2.2	<2.2	<22	<77
DUP100504-2(1) [MLSE 32 (1)][a]	URS, 2005	**5.2**	<4.6	**4.7**	<2.4	<2.4	<2.4	<2.4	<2.4	<4.6	<2.4	<4.6	<4.6	<4.6	<4.6	-	<2.4	<2.4	<2.4	<2.4	<24	<84

TABLE 4
PESTICIDES RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Number		4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	alpha-Chlordane	beta-BHC	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC (Lindane)	gamma-Chlordane	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
Freshwater Sediment Cleanup Level (µg/kg)	**Source**	**16**	**16**	**32**	**5**	**8**	**10**	**13**	**7.5**	**32**	**5.4**	**5.4**	**5.4**	**100**	**100**	**100**	**3**	**10**	**8.3**	**8.3**	**19**	**NE**

Legend:
Results in milligrams per kilogram (mg/kg) . Results for URS, 2001 and URS, 2005 are reported in dry weight.

J	Estimated Concentration
U	Non-Detect
UJ	Estimated Reporting Limit
ND	Non-Detect (see source report for reporting limits)
<2.50	Non-Detect at a Reporting Limit of 2.50 µg/kg
-	Not Analyzed
NE	Not Established
[ ] [a]	Indicates parent sample

Notes:

1	Cleanup levels are based on ecological freshwater sediment criteria.
2	Concentrations detected above the Reporting Limit are boldfaced.
3	Concentrations detected above the applicable Cleanup Level are boldfaced and highlighted.

TABLE 5
TPH, BTEX, AND MTBE RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Name		Motor Oil	Diesel	Gasoline	Benzene	Toluene	Ethyl benzene	Xylene(s)	MTBE
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**144**	**144**	**140**	**0.79**	**3**	**15**	**5.7**	**NE**
MLSD01	D&M, 1997	-	-	-	ND	ND	ND	ND	-
MLSD02	D&M, 1997	-	-	-	ND	ND	ND	ND	-
MLSD03	D&M, 1997	-	-	-	ND	ND	ND	ND	-
MLSD04	D&M, 1997	-	-	-	ND	ND	ND	ND	-
ML-1 (9.7-0.3)comp	EKI, 1998	-	**48** (2)	<1.0 (1)	ND	ND	ND	<0.0050	ND
ML-2 (19.5-2)comp	EKI, 1998	-	**30** (2)	<1.0 (1)	ND	ND	ND	<0.0050	ND
ML-3 (19.4-5)comp	EKI, 1998	-	**39** (2)	<1.0 (1)	ND	ND	ND	<0.0050	ND
ML-4 (19.5-5)comp	EKI, 1998	-	**41** (2)	<1.0 (1)	ND	ND	ND	**0.01**	ND
ML-5 (14.7-0.3)comp	EKI, 1998	-	**19** (2)	<1.0 (1)	ND	ND	ND	<0.0050	ND
MLSD 1 (0.1)	URS, 2001	**460**	**66 J**	<3.9 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
MLSD 1 (0.25)	URS, 2001	**130**	**18 J**	<1.3	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063
MLSD 2 (0.1)	URS, 2001	**130**	**16 J**	<2.0 UJ	<0.0099 UJ	<0.0099 UJ	<0.0099 UJ	<0.0099 UJ	<0.0099 UJ
MLSD 3 (0.5)	URS, 2001	**440**	**72 J**	<1.4	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068
MLSE 1 (0.5)	URS, 2001	<66	**2.3 J**	<1.3	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066
MLSE 1 (1)	URS, 2001	<64	**14 J**	<1.3	-	-	-	-	-
MLSE 1 (2)	URS, 2001	<59	**8.2 J**	<1.2	-	-	-	-	-
MLSE2 (0.5)	URS, 2001	**470**	**96 J**	<7.2	<0.036	**0.015J**	**0.0061J**	<0.036	**0.0065J**
MLSE2 (1)	URS, 2001	<250	**52 J**	<5.0 UJ	-	-	-	-	-
MLSE2 (2)	URS, 2001	<190	**21 J**	<3.9 UJ	-	-	-	-	-
MLSE3 (0.5)	URS, 2001	<220	**31 J**	<4.4	<0.022	<0.022	<0.022	<0.022	<0.022
MLSE3 (1)	URS, 2001	<180	**6.9 J**	<3.6 UJ	-	-	-	-	-
MLSE3 (2)	URS, 2001	<170	**5.4 J**	<3.5 UJ	-	-	-	-	-
MLSE 4 (0.5)	URS, 2001	**320**	**45 J**	<1.2	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062
MLSE 4 (1)	URS, 2001	**1400**	**150 J**	<1.7	-	-	-	-	-
MLSE 4 (2)	URS, 2001	**1500**	**160 J**	<1.5	-	-	-	-	-
MLSE 4 (3)	URS, 2001	**200 J**	**49 J**	-	-	-	-	-	-
MLSE 4 (5)	URS, 2001	**200 J**	**62 J**	-	-	-	-	-	-
MLSE5 (0.5)	URS, 2001	<120	**59 J**	<2.5	<0.012	<0.012	<0.012	<0.012	<0.012
MLSE5 (1)	URS, 2001	<70	**12 J**	<1.4 UJ	-	-	-	-	-
MLSE5 (2)	URS, 2001	<100	**3.0 J**	<2.1 UJ	-	-	-	-	-
MLSE6 (0.5)	URS, 2001	<290	**42 J**	<5.8	<0.029	<0.029	<0.029	<0.029	<0.029
MLSE6 (1)	URS, 2001	<220	**34 J**	<4.4 UJ	-	-	-	-	-
MLSE6 (2)	URS, 2001	<200	**12 J**	<4.0 UJ	-	-	-	-	-
MLSE7 (0.5)	URS, 2001	**110**	**20 J**	<1.8	<0.0092	<0.0092	<0.0092	<0.0092	<0.0092
MLSE7 (1)	URS, 2001	<97	**5.8 J**	<1.9 UJ	-	-	-	-	-
MLSE7 (2)	URS, 2001	<170	<3.4	<3.4 UJ	-	-	-	-	-
MLSE 8 (0.5)	URS, 2001	<180	<3.6	<3.6	<0.018	<0.018	<0.018	<0.018	<0.018
MLSE 8 (1)	URS, 2001	<290	<5.9	<5.9	-	-	-	-	-
MLSE 8 (2)	URS, 2001	<370	<7.3	<7.3	-	-	-	-	-
MLSE 9 (0.5)	URS, 2001	<230	<4.7	<4.7	<0.023	<0.023	<0.023	<0.023	<0.023
MLSE 9 (1)	URS, 2001	<230	<4.5	<4.5	-	-	-	-	-
MLSE 9 (2)	URS, 2001	<180	**3.8 J**	<3.6	-	-	-	-	-
MLSE10(0.5)	URS, 2001	**96**	**15 J**	<1.2	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062
MLSE10(1)	URS, 2001	**1500**	**200 J**	<1.8 UJ	-	-	-	-	-
MLSE10(2)	URS, 2001	<170	<3.5	<3.5 UJ	-	-	-	-	-
MLSE11(0.5)	URS, 2001	<60	<1.2	<1.2	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
MLSE11(1)	URS, 2001	<59	<1.2	<1.2 UJ	-	-	-	-	-
MLSE11(2)	URS, 2001	<58	<1.2	<1.2 UJ	-	-	-	-	-
MLSE 12 (0.5)	URS, 2001	<150	<2.9	<2.9	<0.015	<0.015	<0.015	<0.015	<0.015

TABLE 5
TPH, BTEX, AND MTBE RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Name		Motor Oil	Diesel	Gasoline	Benzene	Toluene	Ethyl benzene	Xylene(s)	MTBE
Freshwater Sediment Cleanup Level (mg/kg)	**Source**	**144**	**144**	**140**	**0.79**	**3**	**15**	**5.7**	**NE**
MLSE 12 (1)	URS, 2001	<130	<2.5	<2.5	-	-	-	-	-
MLSE 12 (2)	URS, 2001	<110	<2.3	**24**	-	-	-	-	-
MLSE13(0.5)	URS, 2001	<160	**11 J**	<3.2	<0.016	<0.016	<0.016	<0.016	<0.016
MLSE13(1)	URS, 2001	<230	**7.3 J**	<4.5 UJ	-	-	-	-	-
MLSE13(2)	URS, 2001	<210	<4.2	<4.2 UJ	-	-	-	-	-
MLSE14 (0.5)	URS, 2001	<310	**52 J**	<6.3	<0.031	<0.031	<0.031	<0.031	<0.031
MLSE14 (1)	URS, 2001	<230	**32 J**	<4.6 UJ	-	-	-	-	-
MLSE14 (2)	URS, 2001	**180**	**70 J**	<3.2 UJ	-	-	-	-	-
MLSE 14 (3)	URS, 2001	<200 UJ	**13 J**	-	-	-	-	-	-
MLSE 14 (5)	URS, 2001	<270 UJ	**15 J**	-	-	-	-	-	-
MLSE15 (0.5)	URS, 2001	<95	**7.0 J**	<1.9	<0.0095	<0.0095	<0.0095	<0.0095	<0.0095
MLSE15 (1)	URS, 2001	<79	**3.6J**	<1.6 UJ	-	-	-	-	-
MLSE15 (2)	URS, 2001	<63	<1.3	<1.3 UJ	-	-	-	-	-
DUP012401-1 [MLSD-1 (0.25)]a	URS, 2001	**200**	**18 J**	<1.3	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063
DUP012401-6 [MLSE-4 (1)]a	URS, 2001	**1300**	**200 J**	<1.5	-	-	-	-	-
DUP012401-7 [MLSE-1 (0.5)]a	URS, 2001	<69	**13 J**	<1.4	<0.0069	<0.0069	<0.0069	<0.0069	<0.0069
DUP012401-8 [MLSE-1 (2)]a	URS, 2001	<100	**10 J**	<2.1	-	-	-	-	-

Legend:

Results in milligrams per kilogram (mg/kg) . Results for URS, 2001 and URS, 2005 are reported in dry weight.

J	Estimated Concentration
U	Non-Detect
UJ	Estimated Reporting Limit
ND	Non-Detect (see Source Report for reporting limits).
<2.50	Non-Detect at a Reporting Limit of 2.50 mg/kg
-	Not Analyzed
NE	Not Established
[ ] [a]	Indicates parent sample

Notes:

1. TPPH = Total Purgeable Petroleum Hydrocarbons as Gasoline analyzed using EPA Method 8015M.
2. TEPH = Total Extractable Petroleum Hydrocarbons analyzed as Diesel using EPA Method 8015M. Chromatogram pattern does not match diesel range. Samples are unidentified hydrocarbons, C9 – C24 range.
3. Cleanup levels are based on ecological freshwater sediment criteria.
4. Concentrations detected above the method detection limit are boldfaced.
5. Concentrations detected above the applicable Cleanup Level are boldfaced and highlighted.

TABLE 6
TOTAL CYANIDE AND NITRATE RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Location (Depth)	Source	Cyanide (mg/kg)	Nitrate (NO3) (mg/kg)
ML-1 (9.7-0.3) comp	EKI, 1998	**-**	<1.0
ML-2 (19.5-2) comp	EKI, 1998	**-**	<1.0
ML-3 (19.4-5) comp	EKI, 1998	**-**	**6.5**
ML-4 (19.5-5) comp	EKI, 1998	**-**	<1.0
ML-5 (14.7-0.3) comp	EKI, 1998	**-**	<1.0
MLSD 1(0.25)	URS, 2001	**80J**	-
MLSD 1(0.1)	URS, 2001	**80**	-
MLSD 2(0.1)	URS, 2001	**7.1**	-
MLSD 3(0.5)	URS, 2001	<0.25	-
MLSE 1(0.5)	URS, 2001	<0.25 UJ	<1.0
MLSE 1(1.0)	URS, 2001	-	<1.0
MLSE 2(0.5)	URS, 2001	**12**	<1.0
MLSE 2(1.0)	URS, 2001	-	<1.0
MLSE 3(0.5)	URS, 2001	<0.25	-
MLSE 4(0.5)	URS, 2001	**13**	-
MLSE 4 (2)	URS, 2001	**0.8**	-
MLSE 4 (4)	URS, 2001	**0.4**	-
MLSE 5(0.5)	URS, 2001	**1.4**	-
MLSE 6(0.5)	URS, 2001	**4.7**	-
MLSE 6 (2)	URS, 2001	<0.25	-
MLSE 6 (4)	URS, 2001	<0.25	-
MLSE 7(0.5)	URS, 2001	**0.69**	<1.0
MLSE 7(1.0)	URS, 2001	-	<1.0
MLSE 8(0.5)	URS, 2001	**1.6**	-
MLSE 9 (0.5)	URS, 2001	<0.25	-
MLSE 10 (0.5)	URS, 2001	<0.25	-
MLSE 11 (0.5)	URS, 2001	<0.25	-
MLSE 12 (0.5)	URS, 2001	**2.2**	<1.0
MLSE 12 (1.0)	URS, 2001	NA	<1.0
MLSE 13 (0.5)	URS, 2001	<0.25	<1.0
MLSE 13 (1.0)	URS, 2001	-	<1.0
MLSE 14 (0.5)	URS, 2001	**3.1**	-
MLSE 14 (2)	URS, 2001	<0.25	-
MLSE 14 (4)	URS, 2001	<0.25	-

TABLE 6
TOTAL CYANIDE AND NITRATE RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Location (Depth)	Source	Cyanide (mg/kg)	Nitrate (NO3) (mg/kg)
MLSE 15(0.5)	URS, 2001	<0.25	-
DUP012401-1 [MLSD-1 (0.25)][a]	URS, 2001	**2.5J**	-
DUP012401-7 [MLSE-1 (0.5)][a]	URS, 2001	**3.9 J**	<1.0
MLSE 16 (1)	URS, 2005	<5	-
MLSE 16 (2)	URS, 2005	<6.7	-
MLSE 16 (5)	URS, 2005	<5.3	-
MLSE 17 (1)	URS, 2005	<2.7	-
MLSE 17 (2)	URS, 2005	<1.2	-
MLSE 17 (5)	URS, 2005	<4.2	-
MLSE 18 (1)	URS, 2005	<1.3	-
MLSE 18 (2)	URS, 2005	<1.3	-
MLSE 18 (5)	URS, 2005	<1.1	-
MLSE 19 (1.5)	URS, 2005	<1.2	-
MLSE 19 (2.5)	URS, 2005	<1.3	-
MLSE 19 (5)	URS, 2005	<1.2	-
MLSE 20 (1)	URS, 2005	<1.4	-
MLSE 20 (2)	URS, 2005	<2.5	-
MLSE 20 (5)	URS, 2005	<1.2	-
MLSE 21 (1)	URS, 2005	<9.1	-
MLSE 21 (2)	URS, 2005	<1.9	-
MLSE 21 (5)	URS, 2005	<5.3	-
MLSE 22 (1)	URS, 2005	<1.2	-
MLSE 22 (2)	URS, 2005	<1.2	-
MLSE 22 (5)	URS, 2005	<1.2	-
MLSE 23 (1)	URS, 2005	<1.2	-
MLSE 23 (2)	URS, 2005	<1.2	-
MLSE 23 (5)	URS, 2005	<1.2	-
MLSE 24 (1)	URS, 2005	<1.8	-
MLSE 24 (2.5)	URS, 2005	<1.3	-
MLSE 24 (5)	URS, 2005	<5	-
MLSE 25 (1)	URS, 2005	<2	-
MLSE 26 (1)	URS, 2005	<4.5	-
MLSE 26 (2)	URS, 2005	<2.7	-
MLSE 27 (1)	URS, 2005	<1.2	-

TABLE 6
TOTAL CYANIDE AND NITRATE RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Location (Depth)	Source	Cyanide (mg/kg)	Nitrate (NO3) (mg/kg)
MLSE 27 (2)	URS, 2005	<3.7	-
MLSE 27 (5)	URS, 2005	<3.6	-
MLSE 27 (6)	URS, 2005	<1.2	-
MLSE 28 (1)	URS, 2005	<1.9	-
MLSE 28 (2)	URS, 2005	<2	-
MLSE 28 (5)	URS, 2005	<6.7	-
MLSE 28 (6)	URS, 2005	<1.7	-
MLSE 29 (1)	URS, 2005	<5.9	-
MLSE 29 (2)	URS, 2005	<4.8	-
MLSE 29 (4)	URS, 2005	<3.8	-
MLSE 29 (5)	URS, 2005	<7.7	-
MLSE 29 (6)	URS, 2005	<6.7	-
MLSE 30 (1)	URS, 2005	<5.6	-
MLSE 30 (2)	URS, 2005	<4.5	-
MLSE 30 (4)	URS, 2005	<6.7	-
MLSE 30 (5)	URS, 2005	<8.3	-
MLSE 30 (6)	URS, 2005	<7.1	-
MLSE 31 (1)	URS, 2005	<5.6	-
MLSE 31 (2)	URS, 2005	<4.8	-
MLSE 31 (4)	URS, 2005	<4	-
MLSE 31 (5)	URS, 2005	<8.3	-
MLSE 31 (6)	URS, 2005	<7.1	-
MLSE 32 (1)	URS, 2005	<1.4	-
MLSE 32 (2)	URS, 2005	<1.2	-
MLSE 32 (4)	URS, 2005	<1.2	-
MLSE 32 (5)	URS, 2005	<1.2	-
MLSE 32 (6)	URS, 2005	<5	-
MLSE 33 (1)	URS, 2005	<1.3	-
MLSE 33 (2)	URS, 2005	<7.1	-
MLSE 33 (4)	URS, 2005	<5.6	-
MLSE 33 (5)	URS, 2005	<4.8	-
MLSE 33 (6)	URS, 2005	<1.4	-
MLSE 37 (1)	URS, 2005	<1.3	-
MLSE 37 (2)	URS, 2005	<2.9	-

TABLE 6
TOTAL CYANIDE AND NITRATE RESULTS
PRESIDIO - MOUNTAIN LAKE

Sample Location (Depth)	Source	Cyanide (mg/kg)	Nitrate (NO3) (mg/kg)
MLSE 37 (5)	URS, 2005	<1.2	-
MLSE 38 (1)	URS, 2005	<1.2	-
MLSE 38 (2)	URS, 2005	<1.2	-
MLSE 38 (5)	URS, 2005	<1.2	-
MLSE 39 (1)	URS, 2005	<4.2	-
MLSE 39 (2)	URS, 2005	<4.8	-
MLSE 39 (5)	URS, 2005	<3.2	-
MLSE 39 (6)	URS, 2005	<7.1	-
MLSE 40 (1)	URS, 2005	<1.2	-
MLSE 40 (2)	URS, 2005	<1.1	-
MLSE 40 (5)	URS, 2005	<3	-
MLSE 40 (6)	URS, 2005	<2.4	-
DUP 280904-1(1.5) [MLSE 19 (1.5)][a]	URS, 2005	<1.2	-
DUP 290904-1(2.5) [MLSE 24 (2.5)][a]	URS, 2005	<1.5	-
DUP 093004-1(1) [MLSE 27 (1)]a	URS, 2005	<1.2	-
DUP 093004-2 (1) [MLSE 38 (1)][a]	URS, 2005	<1.3	-
DUP 093004-3 (2) [MLSE 38 (2)][a]	URS, 2005	<1.3	-
DUP 100104-1(1) [MLSE 30 (1)][a]	URS, 2005	<5.6	-
DUP 100404-1 (1) [MLSE 31 (1)][a]	URS, 2005	<5.6	-
DUP 100504-1(1) [MLSE 33 (1)][a]	URS, 2005	<1.3	-
DUP 100504-2 (1) [MLSE 32 (1)][a]	URS, 2005	<1.4	-

Legend:

Results in milligrams per kilogram (mg/kg) . Results for URS, 2001 and URS, 2005 are reported in dry weight.

J	Estimated Concentration
U	Non-Detect
UJ	Estimated Reporting Limit
<2.50	Non-Detect at a Reporting Limit of 2.50 mg/kg
-	Not Analyzed
[ ][a]	Indicates parent sample

Notes:

1	Concentrations detected above the method detection limit are boldfaced.
2	Cleanup Levels have not been established for cyanide and nitrate.

TABLE 9
ELUTRIATE RESULTS
PRESIDIO - MOUNTAIN LAKE

Source: URS, 2005

Sample Location (Depth)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SFPUC Permit	NE	4,000	NE	NE	500	5,000	NE	4,000	1,500	50	NE	2,000	NE	600	NE	NE	7,000
AWQC	NE	150	NE	NE	0.25	Cr III 74 Cr VI 11	NE	9	2.5	0.77	NE	52	5	Max = 3.2	NE	NE	120
MLSE 29 (4.1)	0.98 J	2.7 J	120	<2	<1	<1	1.4 J	0.51 J	0.13 J	<0.11	1.5 J	6.7 J	<5	<5	<5	<1.1	12 J
MLSE 30 (4.1)	0.45 J	2.1 J	98	<2	<1	<0.87	0.77 J	1.5 J	0.19 J	<0.2	1.7 J	4.2 J	<5	<5	<5	<1.1	13 J
MLSE 31 (4.1)	0.55 J	2.3 J	110	<2	<1	<1.1	1.1 J	2.1 J	0.52 J	<0.11	1.2 J	6.2 J	<5	<5	<5	<1.4	<18
MLSE 32 (4.1)	0.64 J	3.2 J	130	<2	<1	<1	1.2 J	1.4 J	0.14 J	<0.11	1.1 J	3.7 J	<5	<5	<5	<2.9	<8.6
MLSE 33 (4.1)	0.39 J	1.9 J	62	<2	<1	<1.2	0.74 J	0.78 J	0.12 J	<0.2	1.4 J	4.6 J	<5	<5	<5	<2.8	<9.2
MLSE 39 (4.1)	0.51 J	2.9 J	110	<2	<1	<1.2	1.3 J	0.7 J	0.16 J	<0.15	1.4 J	5.5 J	<5	<5	<5	<0.93	<10
MLSE 40 (4.1)	0.83 J	1.8 J	120	<2	<1	<0.92	0.95 J	1.6 J	0.21 J	0.063 J	1.5 J	8.2 J	<5	<5	<5	<3.4	17 J
DUP100604-1 (4.1)[a]	1.3	2.4 J	120	<2	<1	<2.1	3.2 J	3.4 J	0.58 J	<0.12	1.8 J	9.4 J	<5	<5	<5	<2.1	34 J

Legend:

Results in microgram (µg/L) per liter

J	Estimated Concentration
U	Non-Detect
UJ	Estimated Reporting Limit
-	Not Analyzed
[ ][a]	Parent Sample MLSE 39 (4.1)
NE	Not Established

Notes:

1 AWQC = EPA National Recommended Ambient Water Quality Criteria for Freshwater Aquatic Life Protection

2 SFPUC Permit = San Francisco Public Utilities Commission Industrial User Class II Wastewater Permit, No. 05-0246 (All Metals Permit levels are for Total Metals, µg/L).

Table 1: Summary of Sediment Sample Analytical Results - Metals

			Analytical Method:	EPA 6010B																
			Analyte:	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Residential Preliminary Remediation Goal[a]																				
Serpentinite				29	5.4[b]	5,000	140	1.9[b]	1,700[b]	4,000	--	400	20	360	4,500[b]	360	360	5.7	650	22,000
Colma				29	6.2[b]	5,000	140	1.7	1,200	4,000	--	400	20	360	1,400	360	360	5.7	650	22,000
Beach Sand				29	5.9[b]	5,000	140	1.7	1,200	4,000	--	400	20	360	1,400	360	360	5.7	650	22,000
Freshwater Sediment Cleanup Level[a]																				
Serpentinite				3.0[c]	19	3,100	7,200	1.9[b]	1,700[b]	170[b]	114	82	0.62	522	4,500[b]	1.6	1.7[b]	3.7	74[b]	230
Colma				3.0[c]	19	3,100	7,200	1.1	140[b]	50	114	82	0.62	522	110[b]	1.6	1.0[b]	3.7	90[b]	230
Beach Sand				3.0[c]	19	3,100	7,200	1.7[b]	120[b]	50	114	82	0.62	522	70[b]	1.6	1.0[b]	3.7	92[b]	230
Boring	Sample Name	Sample Date	Sample depth (feet below sediment surface)																	
MLSE 100	MLSE 100(0.5)	12/02/11	0.5	<0.65[d][e]	1.2	28	<0.13	<0.32	64	5.7	3	7.8	<0.024	<0.32	27	<0.65	<0.32	<0.65	40	26
MLSE 100 (Dup)	DUP 111202(0.5	12/02/11	0.5	<0.6	0.98	27	<0.12	<0.3	60	5.7	3.1	8.8	<0.024	<0.3	28	<0.6	0.32	<0.6	42	27
MLSE 100	MLSE 100(1.5)	12/02/11	1.5	<0.63	1.2	29	<0.13	<0.32	58	4.7	2.7	2.4	<0.024	<0.32	24	<0.63	<0.32	<0.63	33	21
MLSE 101	MLSE 101(0.5)	12/02/11	0.5	<0.6	0.95	21	<0.12	<0.3	62	5.6	3.1	9.1	<0.024	<0.3	29	<0.6	<0.3	<0.6	43	25
MLSE 101	MLSE 101(1)	12/02/11	1	<0.59	0.97	24	<0.12	<0.29	55	4.6	3.6	13	<0.023	<0.29	23	<0.59	<0.29	<0.59	35	31
MLSE 102	MLSE 102(0.5)	12/02/11	1.5	<0.61	0.99	22	<0.12	<0.3	59	5	5.1	26	<0.024	<0.3	28	<0.61	<0.3	<0.61	42	30
MLSE 102	MLSE 102(1)	12/02/11	1	<0.63	0.93	23	<0.13	<0.32	61	5.7	4.9	23	<0.024	<0.32	29	<0.63	<0.32	<0.63	44	30
MLSE 103	MLSE 103(0.5)	12/02/11	0.5	<0.63	1.3	31	<0.13	<0.32	62	6.1	3.6	9.6	<0.024	<0.32	41	<0.63	<0.32	<0.63	38	27
MLSE 103	MLSE 103(2)	12/02/11	2	<0.6	0.92	25	<0.12	<0.3	73	6.6	4	1.9	<0.024	<0.3	32	<0.6	<0.3	<0.6	44	23
MLSE 103	MLSE 103(4)	12/02/11	4	<0.66	1.1	20	<0.13	<0.33	63	6.8	4.5	1.3	<0.025	<0.33	31	<0.66	<0.33	<0.66	52	20
MLSE 104	MLSE 104(0.5)	12/02/11	0.5	<0.6	1.1	20	<0.12	<0.3	66	5.9	3.3	5.6	<0.024	<0.3	37	<0.6	<0.3	<0.6	53	29
MLSE 104	MLSE 104(2)	12/02/11	2	<0.6	0.91	20	0.12	<0.3	46	6.2	4	1.8	<0.024	<0.3	31	<0.6	<0.3	<0.6	49	18
MLSE 104	MLSE 104(4)	12/02/11	4	<0.58	0.94	18	<0.12	<0.29	50	5.7	3.6	1.6	<0.023	<0.29	27	<0.58	<0.29	<0.58	43	17
MLSE 105	MLSE 105(0.5)	12/02/11	0.5	<0.6	1.2	23	<0.12	<0.3	55	5.5	3.3	6.8	<0.024	<0.3	26	<0.6	<0.3	<0.6	53	24
MLSE 105	MLSE 105(2)	12/02/11	2	<0.59	1.5	25	<0.12	<0.29	76	7.7	5.6	3.8	<0.024	<0.29	36	<0.59	0.36	<0.59	72	28
MLSE 105	MLSE 105(4)	12/02/11	4	<0.58	1.2	23	0.12	<0.29	80	7.3	5.1	1.5	<0.023	<0.29	33	<0.58	0.32	<0.58	68	23

Notes:

mg/kg = milligrams per kilogram

(a) Residential soil preliminary remediation goals (PRGs) and freshwater sediment cleanup levels from *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water (EKI 2002).*

(b) EKI (2002) notes that "Cleanup level for this compound and this lithology is based on the background level in soil."

(c) EKI (2002) notes that "Cleanup level for this compound and this lithology is based on the background level in soil. Background level for this compound and this lithology is derived from the typical detection limit."

(d) <0.65 = Not detected above reporting limit

(e) All sample results are reported in dry weight.

Table 2: Summary of Sediment Sample Analytical Results - Organic Compounds

				Petroleum Compounds			Pesticides[a]								Moisture Content
			Analyte:	Gasoline Range Organics [C7-C12]	Diesel Range Organics [C10-C28]	Motor Oil Range Organics [C24-C36]	Alpha-BHC	Beta-BHC	Gamma-BHC (Lindane)	Delta-BHC	4,4'-DDE	4,4'-DDD	Alpha-Chlordane	Gamma-Chlordane	Percent Moisture
			Units:	mg/kg	mg/kg	mg/kg	ug/kg[c]	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	%
Residential Preliminary Remediation Goal[b]															
			Serpentinite	1,030	1,380	1,900	180	320	440	180	1,400	2,000	370	370	n/a
			Colma	1,030	1,380	1,900	180	320	440	180	1,400	2,000	370	370	n/a
			Beach Sand	1,030	1,380	1,900	180	320	440	180	1,400	2,000	370	370	n/a
Freshwater Sediment Cleanup Level[b]															
			Serpentinite	140	144	144	8	13	3	7.5	16	16	10	10	n/a
			Colma	140	144	144	8	13	3	7.5	16	16	10	10	n/a
			Beach Sand	140	144	144	8	13	3	7.5	16	16	10	10	n/a
Boring	Sample Name	Sample Date	Sample depth (feet below sediment surface)												
MLSE 100	MLSE 100(0.5)	12/02/11	0.5	<1.3[c][d]	5.7	19	<2	<2	<2	<2	<3.9	<3.9	<2	<2	17
MLSE 100 (Dup)	DUP 111202(0.5)	12/02/11	0.5	<1.3	4.5	21	<2	<2	<2	<2	<3.9	<3.9	<2	<2	16
MLSE 100	MLSE 100(1.5)	12/02/11	1.5	<1.1	2 Y[e]	11	<2	<2	<2	<2	<3.9	<3.9	<2	<2	16
MLSE 101	MLSE 101(0.5)	12/02/11	0.5	<1.2	3.2 Y	14	<2.1	<2.1	<2.1	<2.1	<4	<4	<2.1	<2.1	17
MLSE 101	MLSE 101(1)	12/02/11	1	<1.1	1.3 Y	9	<2	<2	<2	<2	<3.9	<3.9	<2	<2	14
MLSE 102	MLSE 102(0.5)	12/02/11	1.5	<1.3	3.1 Y	25	<2	<2	<2	<2	<3.9	<3.9	<2	<2	15
MLSE 102	MLSE 102(1)	12/02/11	1	<1.2	3.5 Y	23	<2.1	<2.1	<2.1	<2.1	<4	<4	<2.1	<2.1	17
MLSE 103	MLSE 103(0.5)	12/02/11	0.5	<1.2	6.5 Y	21	<2	<2	<2	<2	<3.9	<3.9	<2	<2	16
MLSE 103	MLSE 103(2)	12/02/11	2	<1.2	<1.2	<6	<2	<2	<2	<2	<3.9	<3.9	<2	<2	16
MLSE 103	MLSE 103(4)	12/02/11	4	<1.2	<1.3	<6.4	<2.2	<2.2	<2.2	<2.2	<4.2	<4.2	<2.2	<2.2	21
MLSE 104	MLSE 104(0.5)	12/02/11	0.5	<1.2	4 Y	19	<2	<2	<2	<2	<4	<4	<2	<2	16
MLSE 104	MLSE 104(2)	12/02/11	2	<1.2	<1.2	<5.9	<2	<2	<2	<2	<3.9	<3.9	<2	<2	16
MLSE 104	MLSE 104(4)	12/02/11	4	<1.1	<1.2	<5.8	<2	<2	<2	<2	<3.8	<3.8	<2	<2	14
MLSE 105	MLSE 105(0.5)	12/02/11	0.5	<1.2	5.7 Y	35	<2.1	<2.1	<2.1	<2.1	<4	<4	<2.1	<2.1	17
MLSE 105	MLSE 105(2)	12/02/11	2	<1.3	1.5 Y	6.4	<2	<2	<2	<2	<3.8	<3.8	<2	<2	15
MLSE 105	MLSE 105(4)	12/02/11	4	<1.2	<1.2	<5.8	<2	<2	<2	<2	<3.8	<3.8	<2	<2	14

Notes:

mg/kg = milligrams per kilogram

ug/kg = micrograms per kilogram

(a) Results for pesticides shown for potential chemicals of concern (URS 2011) only. Laboratory report includes other organochlorine pesticides; none were detected above the respective reporting limits.

(b) Residential soil preliminary remediation goals (PRGs) and freshwater sediment cleanup levels from *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water (EKI 2002).*

(c) < 1.3 = Not detected above reporting limit

(d) All sample results are reported in dry weight.

(e) Y = Laboratory reports: "Sample exhibits chromatographic pattern which does not resemble standard"

Appendix B

Administrative Record List

Table B-1: Administrative Record List

Mountain Lake Remedial Action Plan

Date	Author	Recipient	Title of Document
March-2012	Kennedy/Jenks	Trust	Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California
March-2012	Bay Area Air Quality Management District (BAAQMD)	Public	Air Quality Standards and Attainment Status
February-2012	Geosytec Consultants	Trust	Remedial Investigation Summary Report, Barnard Avenue Protected Range (BAPR), Presidio of San Francisco, California
January-2012	California Historical Resources Information System (CHRIS)	Department of Toxic Substances Control (DTSC)	Record Search Results for the Proposed Mountain Lake Project/Remedial Action Plan
January-2012	Presidio Trust (Trust) Archeology Lab	Trust Remediation	Archeological Management Assessment, Mountain Lake Remediation
January-2012	Caltrans	Trust	Letter addressing dry excavation at Mountain Lake
January-2012	Kennedy/Jenks	Trust	Letter Report - Sediment Sampling at Mountain Lake
December-2011	Native American Heritage Commission (NAHC)	DTSC	Proposed San Francisco Mountain Lake Project, San Francisco County
October-2011	URS Corporation	Trust	Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco, California
August-2011	MACTEC, Inc.	Trust	Draft Revised Remedial Investigation Report, Baker Beach Disturbed Area 1A, Presidio of San Francisco, California
July-2011	City and County of San Francisco Planning Department	Public	Draft Environmental Impact Report: The 34th America's Cup and James R Herman Cruise Terminal and Northeast Wharf Plaza
July-2011	MACTEC, Inc.	Trust	Field Sampling Plan, Data Gaps Investigation, Baker Beach Disturbed Area 2, Presidio of San Francisco, California
2011	U.S. Office of Management and Budget	Federal Agencies	Circular No. A94 ,Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs
November-2010	Trust	Public	Final Supplemental Environmental Impact Statement, Presidio Trust Management Plan, Main Post Update
May-2011	BAAQMD	Public	California Environmental Quality Act, Air Quality Guidelines
May-2010	USEPA	Public	ProUCL Version 4.1 User Guide (Draft). Office of Research and Development. EPA/600/R-07/041

Table B-1: Administrative Record List

Mountain Lake Remedial Action Plan

Date	Author	Recipient	Title of Document
May-2010	Blankinship & Assoc.	Trust	Summary of Stormwater Sampling and Analysis 1996-2010, Presidio Golf Course, San Francisco, California
December-2009	Department of Toxic Substances Control (DTSC)	Public	Interim Advisory for Green Remediation
July-2009	DTSC	State of California Department of Transportation (Caltrans)	Variance V09HQSCD006 (regarding lead-contaminated soil)
March-2009	Climate Action Team (CAT)	Public	Draft Biennial Report
February-2009	Erler & Kalinowski, Inc. (EKI)	Trust	Final Remedial Action Plan for Landfills 8 and 10, PHSH Fill Site, and Four Small Arms Firing Ranges, Presidio of San Francisco, California
2009	V. Magar et al.	Public	Technical Guide: Monitored Natural Recovery at Contaminated Sediment Sites, Environmental Security Technology Certification Program (ESTCP), Project ER-0622
December-2008	California Air Resources Board (CARB)	Public	Climate Change Scoping Plan, Framework for Change
September-2008	U.S. Army Corps of Engineers (USACE)	Public	Technical Guidelines for Environmental Dredging of Contaminated Sediments
September-2008	Federal Highway Administration (FHWA) and San Francisco County Transportation Authority (FSCTA)	Public	Final Environmental Impact Statement/Report and Section 4(f) Evaluation, South Access to the Golden Gate Bridge: Doyle Drive
January-2008	San Francisco Bay Conservation and Development Commission (BCDC)	Public	San Francisco Bay Plan
November-2007	CARB	Public	California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit
June-2007	Association of State and Territorial Solid Waste Management Officials (ASTSWMO)	Public	Guide to the Assessment and Remediation of State-Managed Sediment Sites. Sediments Focus Group

Table B-1: Administrative Record List

Mountain Lake Remedial Action Plan

Date	Author	Recipient	Title of Document
May-2007	Intergovernmental Panel on Climate Change (IPCC)	Public	Climate Change 2007: Synthesis Report, the Fourth IPCC Assessment Report
September-2006	C. Feierabend	Trust	Mountain Lake East Arm Cultural Landscape Assessment, Final Report, Presidio of San Francisco, California
March-2006	Climate Action Team (CAT)	Public	Climate Action Team Report to Governor Schwarzenegger and the Legislature
March-2006	USACE	Trust	Chemical Warfare Investigation Work Plan
April-2005	Arnold Palmer Golf Management, Inc. and Presidio Trust (Trust)	Internal	Presidio Golf Course Integrated Pest Management Program
2005	USEPA	Public	Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, OSWER Publication 9355.0-85
November-2003	Curtis & Tompkins, Ltd.	Treadwell & Rollo, Inc.	Letter regarding cadmium interferences in data reported for the Presidio Firing Ranges. Letter from Steven Stanley, C&T Project Manager to Dorinda Shipman, Treadwell & Rollo.
July-2003	NPS and Trust	Public	Presidio Trails and Bikeways Master Plan and Environmental Assessment
April-2003	NPS & URS Corporation	Public	Presidio Wetland Resources: U.S. Army Corps of Engineers Potential Jurisdictional Wetlands and U.S. Fish and Wildlife Service Wetland Habitat on the Presidio of San Francisco
March-2003	Severn Trent Laboratories	EKI	Letter regarding cadmium interferences in data reported for the Landfill E project. Letter from Tod Granicher, STL Project Manager, to Michelle King, Erler & Kalinowski
March-2003	EKI	Trust	Presidio Trust Revised Feasibility Study, Main Installation Sites, Presidio of San Francisco, California
2003	RWQCB	Public	Water Board Order No. R2-2003- 0080 (Rescinding Order No. 96-070), San Francisco Bay Region
October-2002	EKI	Trust	Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water, Presidio of San Francisco, California
May-2002	Trust	Public	Presidio Trust Management Plan (PTMP), Land Use Policies for Area B of the Presidio of San Francisco, California
May-2002	Trust	Public	Presidio Trust Management Plan (PTMP), Final Environmental Impact Statement

Table B-1: Administrative Record List

Mountain Lake Remedial Action Plan

Date	Author	Recipient	Title of Document
March-2002	Trust, NPS, Advisory Council on Historic Preservation (ACHP), and the State Historic Preservation Office (SHPO)	--	Programmatic Agreement Among the Presidio Trust, National Park Service, the Advisory Council on Historic Preservation, and the California State Historic Preservation Officer Regarding the Presidio Trust Implementation Plan and Various Operation and Maintenance Activities for Area "B" of the Presidio of San Francisco, Golden Gate National Recreation Area
October-2001	DTSC	Public	Information Advisory – Clean Imported Fill Material
August-2001	USACE	Public	Subaqueous Cap Design: Selection of Bioturbation Profiles, Depths, and Rates, DOER Technical Notes Collection. ERDC TN-DOER-C21
July-2001	CARB	Public	Resolution 01-28
July-2001	URS Corporation	Trust	Mountain Lake Sediment Investigation, Final Report
June-2001	USEPA	Trust	Comprehensive Five-Year Review Guidance. EPA 540-R-01-007
June-2001	Trust	Public	Community Relations Plan, Presidio of San Francisco, California
December-2001	Trust and NPS	Public	Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco
April-2001	Tetra Tech, Inc.	Trust	Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan, Revision 1
2001	L. Reidy	UC Berkeley	Evidence of Environmental Change Over the Last 20 Years at Mountain Lake, in the Northern San Francisco Peninsula
October-2000	Trust, NPS, and Golden Gate National Parks Assoc. (GGNPA)	Public	Mountain Lake Enhancement Plan and Environmental Assessment
September-2000	Trust	Public	Renewing Mountain Lake, A Summary of the Mountain Lake Enhancement Plan
July-2000	USEPA	Public	A Guide to Developing and Documenting Cost Estimates During the Feasibility Study
June-2000	E. Buisson and L. Castellini	Trust	Mountain Lake Wetlands Delineation, Presidio of San Francisco, California
August-1999	DTSC	Trust & NPS	Consent Agreement Between the California Department of Toxic Substances Control, the Presidio Trust, and the U.S. Department of the Interior, National Park Service for the Remediation of Hazardous Substances at the Presidio of San Francisco
May-1999	U.S. Army, Trust, and NPS	Public	Memorandum of Agreement Regarding Environmental Remediation at the Presidio of San Francisco

Table B-1: Administrative Record List

Mountain Lake Remedial Action Plan

Date	Author	Recipient	Title of Document
November-1998	EKI	Trust	Report of Sediment Sampling at Mountain Lake, The Presidio Trust, San Francisco, California
June-1998	USACE	Public	Guidance for Subaqueous Dredged Material Capping, Dredging Operations and Environmental Research Program Technical Report DOER-1
August-1997	USEPA	Public	Rules of Thumb for Superfund Remedy Selection. EPA 540/R-97/013
August-1997	USEPA	Public	Clarification of the Role of Applicable or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA, OSWER Directive No. 9200.4-23
May-1997	Dames & Moore, Inc.	Army	Final Feasibility Study Report, Presidio Main Installation, Presidio of San Francisco
January-1997	Dames & Moore, Inc.	Army	Final Remedial Investigation Report, Presidio Main Installation, Presidio of San Francisco
December-1995	DTSC	Public	Guidance Document No. EO -95 -007 -PP, Remedial Action Plan (RAP) Policy
1995	City and County of San Francisco	Public	Transportation: An Element of the General Plan of the city and County of San Francisco
1994	USEPA	Public	ARCS Remediation Guidance Document, EPA 905-B94-003
1993	NPS	Public	National Historic Landmark District Update, Presidio of San Francisco, San Francisco, California
May-1992	USEPA	Public	Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Solid Waste and Emergency Response. Publication 9285.7-081.
February-1992	USEPA	USEPA	Permit and Permit “Equivalency” Processes for CERCLA On-Site Response Actions. OSWER Directive 9355.7-03.
June-1991	USACE	Public	Dredging Research technical Notes - design requirements for capping, US Army Engineer Waterways Experiment Station, DRP-5-03
April-1991	USEPA	Public	Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. OSWER Directive No. 9355.0-30

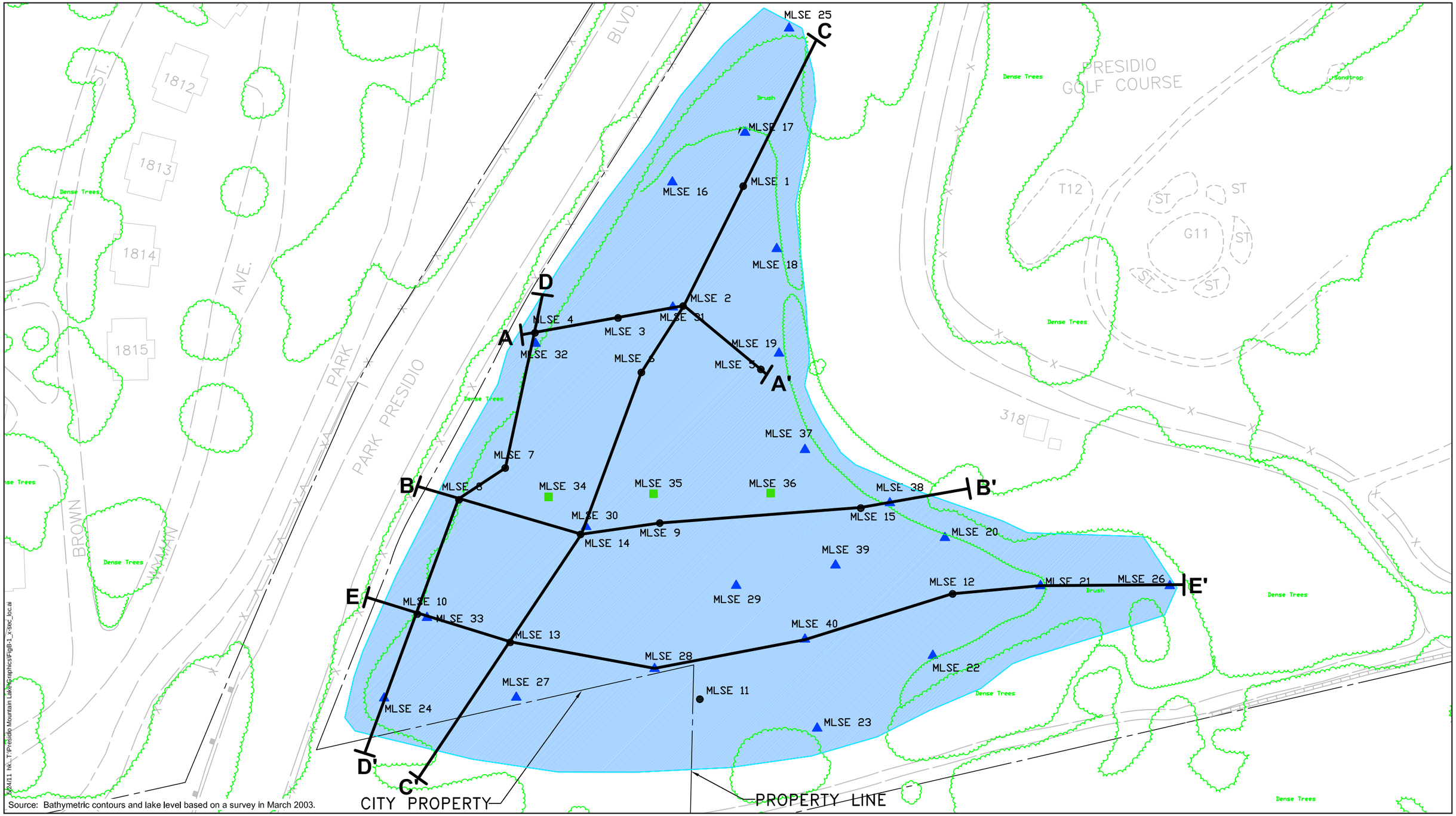
Table B-1: Administrative Record List

Mountain Lake Remedial Action Plan

Date	Author	Recipient	Title of Document
1990	Ringden J. and M. Sitton, Environmental Photographic Interpretation Center, Environmental Monitoring Systems, USEPA	Public	Installation Assessment Army Base Closure Program, Presidio Military Reservation, San Francisco, CA
December-1991	USEPA	Public	Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part B. EPA/540/R-92/003
December-1989	USEPA	Public	Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part A. EPA/540/1-89/002
1988	USEPA	Public	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA
1974	J. Schlocker	Public	Geology of the San Francisco North Quadrangle, CA

Appendix C

Mountain Lake Cross Sections
(Reproduced from URS 2011)



Source: Bathymetric contours and lake level based on a survey in March 2003.

LEGEND:

- FENCING
- MOUNTAIN LAKE
- MLSE 1 — 2001 SEDIMENT SAMPLING LOCATION
- MLSE 17 — 2004 CHEMICAL/PHYSICAL SAMPLING LOCATION
- MLSE 34 — 2004 ARCHAEOLOGICAL SAMPLING LOCATION
- BSS — BELOW SEDIMENT SURFACE

NOTE: SURVEY DATUM NGVD29/NAD88

0 40 80 160

Scale in Feet

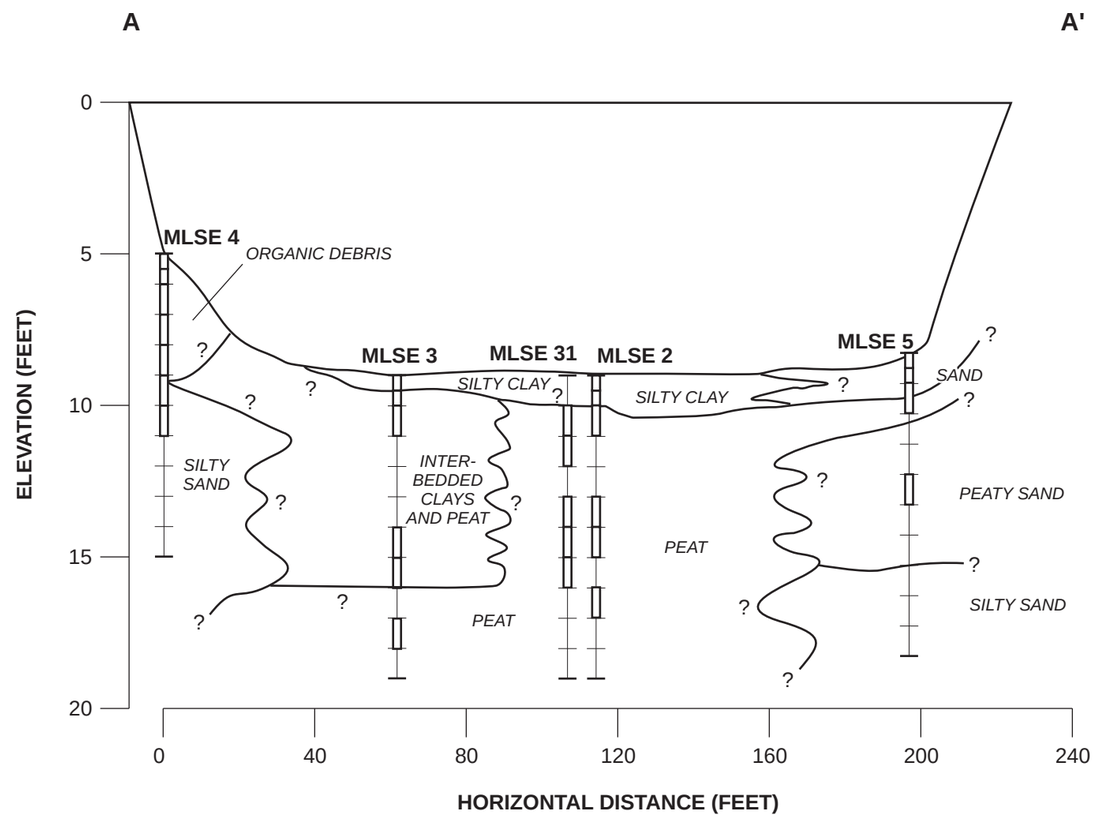
CROSS-SECTION LOCATIONS

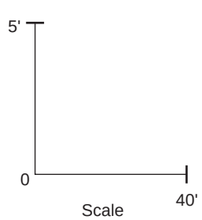
RI Summary & Risk Evaluation
Mountain Lake - Presidio Trust
San Francisco, California

June 2011
28067661

URS

FIGURE B-1





5/24/11 Nk...T:\Presidio Mountain Lake\Graphics\FigB-2_x-sec_aa.ai

LEGEND

[ ] Sample analyzed for chemical suite

CROSS-SECTION PROFILE A-A'

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28067661

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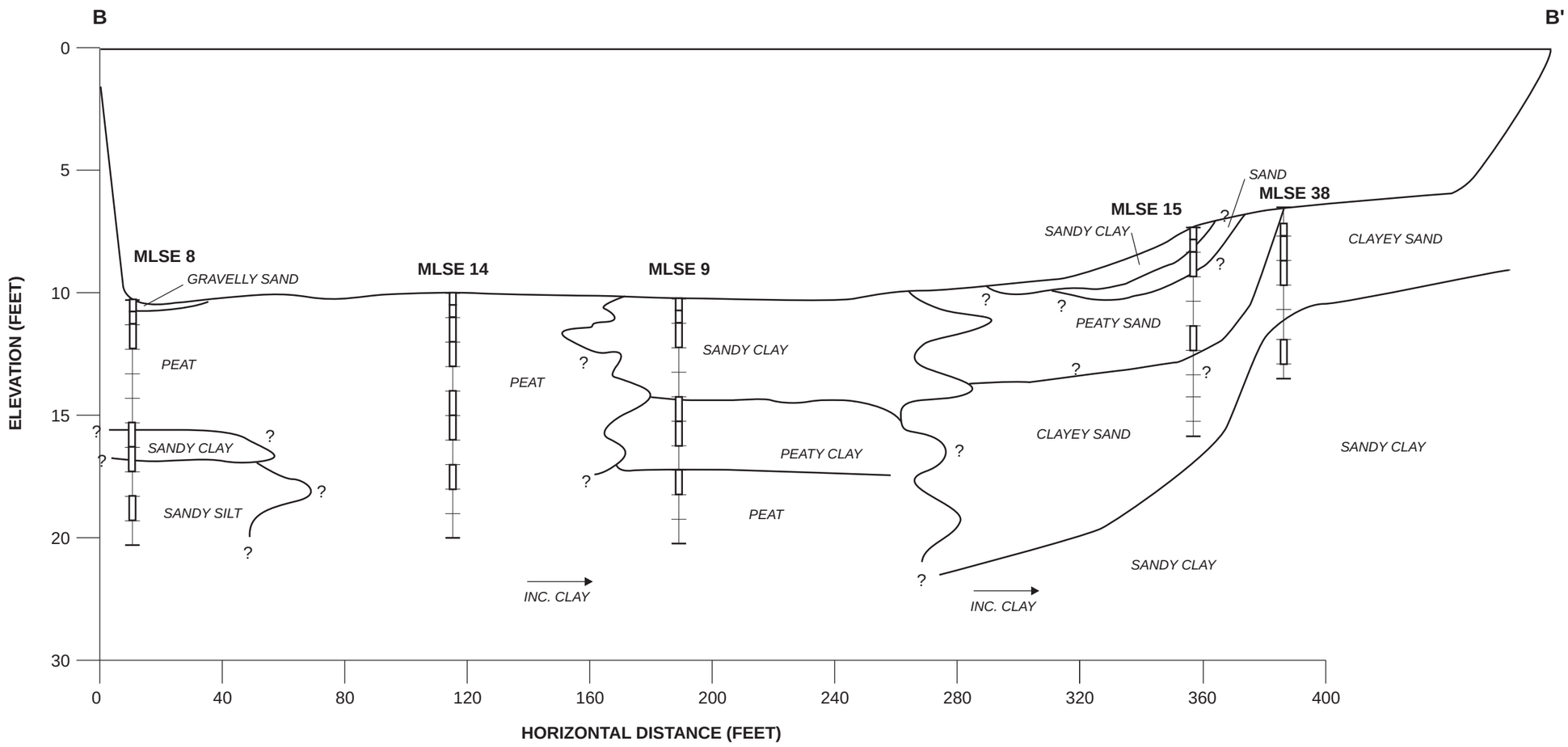
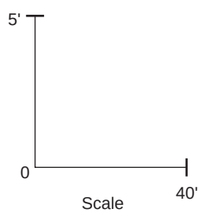
FIGURE B-2





5/24/11 N:...T:\Presidio Mountain Lake\Graphics\FigB-3_x-sec_BB.ai

LEGEND

[] Sample analyzed for chemical suite

CROSS-SECTION PROFILE B-B'

RI Summary & Risk Evaluation
Mountain Lake - Presidio Trust
San Francisco, California

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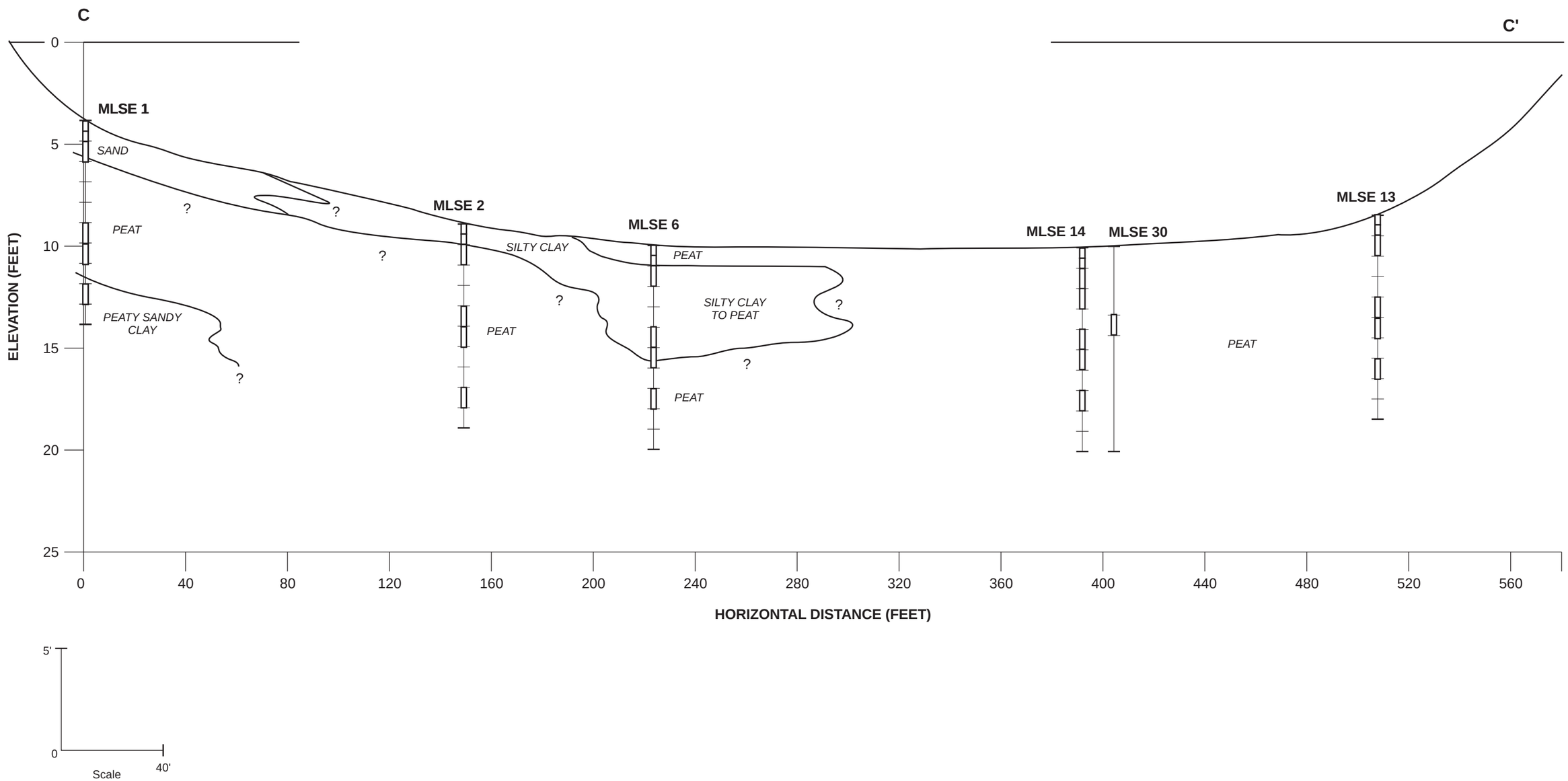
FIGURE B-3



5/24/11 INk...T:\Presidio Mountain Lake\Graphics\FigB-4_x-sec_cc.ai

LEGEND

[] Sample analyzed for chemical suite

CROSS-SECTION PROFILE C-C'

RI Summary & Risk Evaluation
Mountain Lake - Presidio Trust
San Francisco, California

June 2011
28067661

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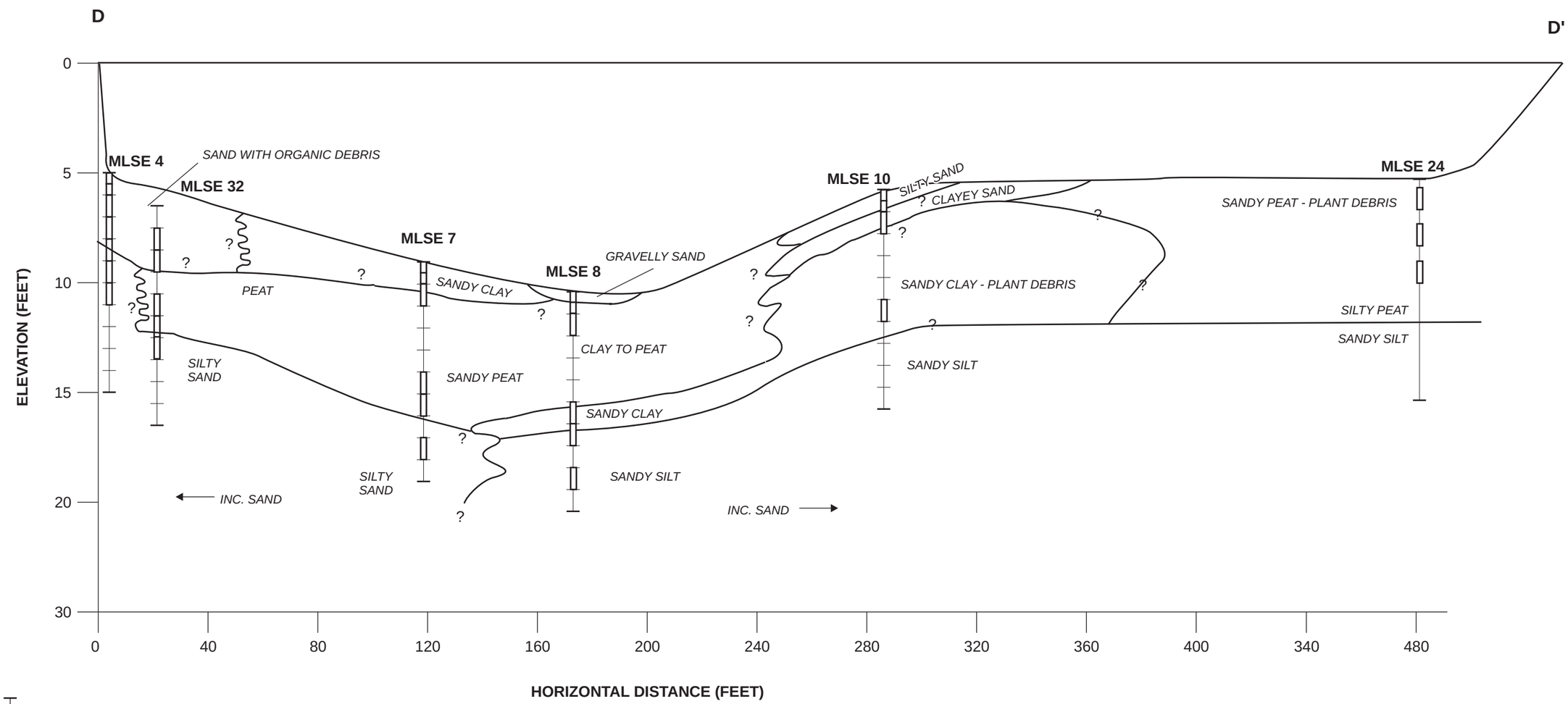
FIGURE B-4



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LEGEND

[ ] Sample analyzed for chemical suite

CROSS-SECTION PROFILE D-D'

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28067661

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Mountain Lake - Presidio Trust
San Francisco, California

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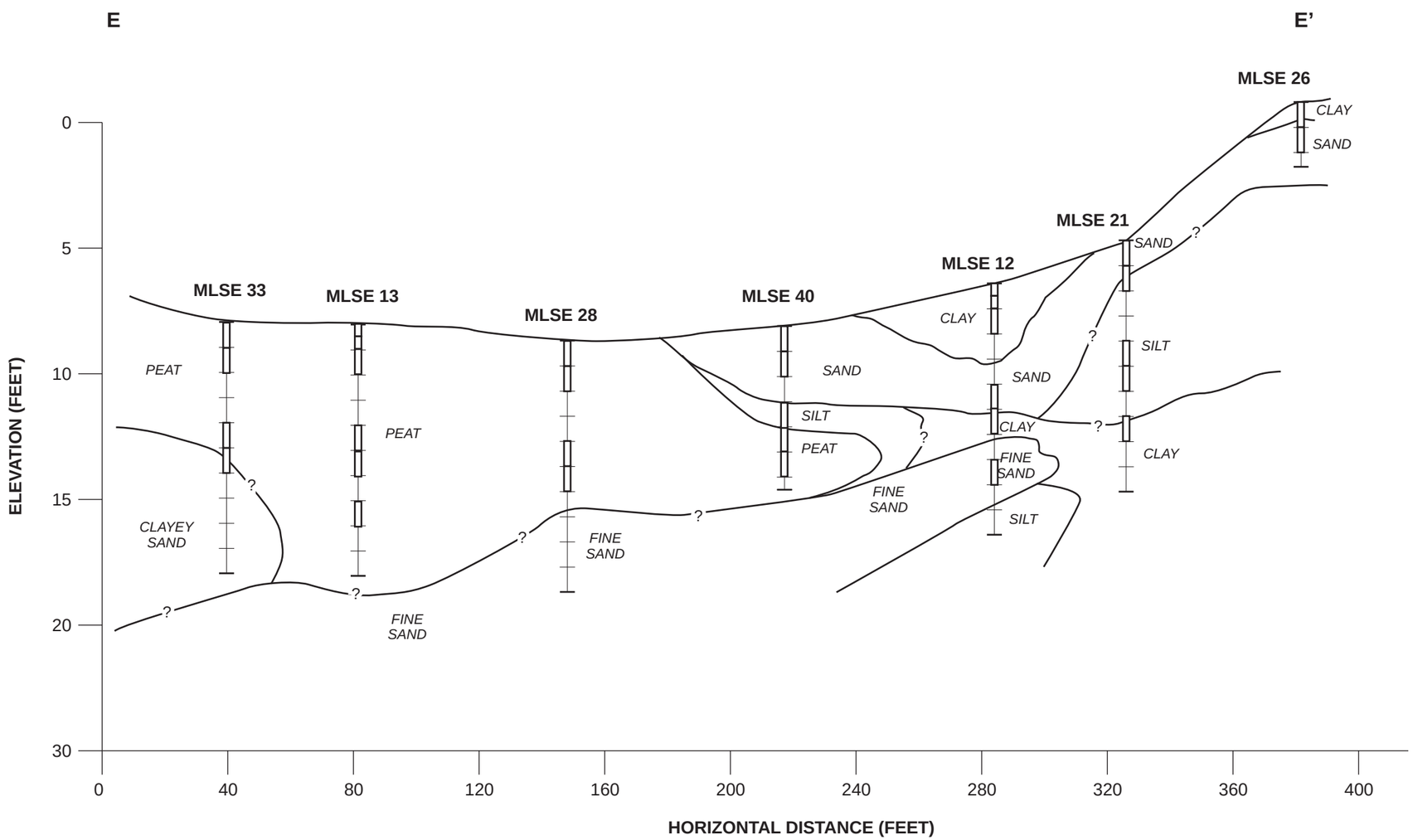
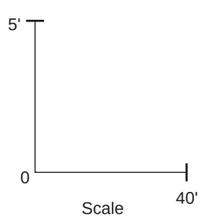
FIGURE B-5





5/24/11 I:\k...T:\Presidio Mountain Lake\Graphics\FigB-6_x-sec_ee.ai

LEGEND

[] Sample analyzed for chemical suite

CROSS-SECTION PROFILE E-E'

June 2011
28067661

RI Summary & Risk Evaluation
Mountain Lake - Presidio Trust
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URS

FIGURE B-6

Appendix D

95 Percent UCL Calculations

Appendix D: Calculation of 95 Percent Upper Confidence Limit on the Arithmetic Mean

This appendix presents the methods used to calculate the 95 percent upper confidence limit on the arithmetic mean (95 percent UCL) concentrations of the potential chemicals of concern (PCOCs) in Mountain Lake sediment in support of the Risk Evaluation in Section 3.5 of the Feasibility Study/Remedial Action Plan (FS/RAP). The 95 percent UCLs were calculated using ProUCL Version 4.1.00, which is the current version of the ProUCL statistical software available from the United States Environmental Protection Agency (USEPA). The ProUCL software is available for download from: http://www.epa.gov/osp/hstl/tsc/software.htm.

D.1 Introduction

PCOCs in Mountain Lake sediment were identified in the *Remedial Investigation Summary and Risk Evaluation* (RI Summary; URS 2011). The PCOCs are the chemicals with a maximum detected concentration greater than the respective freshwater sediment criteria from the *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water* (EKI 2002). The PCOCs identified in the RI Summary are arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc, 4,4-DDD, alpha-BHC, beta-BHC, gamma-BHC (lindane), delta-BHC, alpha chlordane, gamma chlordane, and total petroleum hydrocarbons as diesel (TPHd) and motor oil (TPHmo).

While the use of the maximum detected concentration is appropriate for screening purposes, it is likely an overestimate of the concentration to which exposure would occur over time. Per USEPA guidance (1992), the 95 percent UCL of the arithmetic mean should be used to evaluate potential exposures to chemicals in environmental media. Therefore, the 95 percent UCL concentrations were calculated for the PCOCs.

D.2 Data Used in Calculations

The analytical data that were used to calculate the 95 percent UCLs were obtained from Tables 2, 4, and 5 of the RI Summary (URS 2011; data tables are reproduced in Appendix A of this FS/RAP). The samples collected from the storm drain inlet are not representative of sediment concentrations in Mountain Lake and were excluded from the data set used in the calculations. The sediment core samples collected in 1998 represent data composited over multiple depths, including depths below the exposure interval for ecological receptors, and were also excluded from the data set used in the calculations (EKI 1998). Sediment samples collected from Mountain Lake beach area in December 2011 were also not included because this subset of samples was collected to assess human health risk and concentrations of PCOCs were found not to pose unacceptable risk to human health or the environment (Kennedy/Jenks 2012). All other sediment data in the tables were included in the data set used in the 95 percent UCL calculations.

Prior to calculating the 95 percent UCLs, the following criteria were used to determine the representative concentration for duplicate samples:

- If both samples were detected values, the two values were averaged, and the result was considered a detected value in the calculations.

- If one sample was a detected value and the other sample was a non-detect, the detected value was used in the calculations.
- If both samples were non-detects, the lower detection limit was used as a non-detect in the calculations.

D.2.1 Cadmium Data

The concentrations of cadmium in the 2001 sampling event may be elevated due to analytical interference. These samples were analyzed for cadmium by Severn Trent Laboratories (STL) in Pleasanton, California. STL also analyzed cadmium in samples collected at Landfill E within the Presidio in 2002 with elevated cadmium concentrations. STL reviewed the cadmium data in those samples and concluded that the cadmium results reported could be elevated by as much as 1 to 2 milligrams per kilogram (mg/kg) as a result of iron interference (STL 2003). Curtis & Tompkins laboratory also had similar iron interference problems in cadmium analyses on samples collected from Presidio firing ranges (C&T 2003). In Mountain Lake sediment samples collected in close proximity to each other, the cadmium concentrations in samples collected in 2005 are consistently lower than in samples collected in 2001. For example, the cadmium concentration in MLSE2(1) is 4.1 mg/kg and the concentration in MLSE31(1) is 1.4 mg/kg. Similarly, the cadmium concentration in MLSE14(1) is 4.2 mg/kg and the concentration in MLSE30(1) is 1.8 mg/kg.

Due to the potential for analytical interference and uncertainty in the data quality, the cadmium data collected in 2001 were excluded from the data set used to calculate the 95 percent UCLs.

D.3 Baseline Condition 95 Percent UCLs

To calculate the baseline condition 95 percent UCLs, all sediment data collected between 0 and 3 feet below sediment surface (bss), which represents the exposure interval for ecological receptors, were included in the data set. The data used in the baseline condition 95 percent UCL calculations, including the representative concentrations for duplicate samples, are presented in Table D-1.

The 95 percent UCLs were calculated in accordance with the ProUCL User Guide (USEPA 2010). The summary statistics, including the 95 percent UCL concentrations, are presented in Table D-2. The 95 percent UCL concentrations that are higher than the freshwater sediment cleanup levels for Mountain Lake, which are based on ecological freshwater sediment criteria, and background metals concentrations for the Colma formation (EKI 2002), are highlighted. These PCOCs are lead, nickel, and total petroleum hydrocarbons as motor oil (TPHmo).

The ProUCL output files are included as attachments.

D.4 Post-Remediation 95 Percent UCLs

Post-remediation 95 percent UCLs were also calculated assuming sediment removal in the remedial action area defined in Section 3.6.3 of the main text. To calculate the post-remediation 95 percent UCLs, all sediment data below the remedial action area to a depth of 3.5 feet were included in the calculation. This data would represent the upper 3 feet of sediment that is considered bioavailable to ecological receptors following sediment removal. Data in the upper 3.5 feet of sediment after removal were included in the post-remediation data set because data do not exist at some locations for shallower depths and the inclusion of data to 3.5 feet provides a

more robust data set. The data used in the post-remediation 95 percent UCL calculations, including the representative concentrations for duplicate samples, are presented in Table D-3.

The summary statistics, including the 95 percent UCL concentrations, are presented in Table D-4. The 95 percent UCL concentrations that are higher than the freshwater sediment cleanup levels for Mountain Lake or background concentrations for Colma Formation are highlighted. Nickel has a 95 percent UCL concentration that is slightly above the cleanup level for Colma Formation but well below the cleanup level for the Serpentine Formation. All other PCOCs have 95 percent UCLs below freshwater sediment cleanup levels or background metal concentrations.

The ProUCL output files are included as attachments.

D.5 References

Curtis & Tompkins, Ltd (C&T). 2003. Letter regarding cadmium interferences in data reported for the Presidio Firing Ranges. Letter from Steven Stanley, C&T Project Manager to Dorinda Shipman, Treadwell & Rollo. November 2003.

EKI. 2002. Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water, Presidio of San Francisco. October 2002. Revised 16 May 2006.

Erler & Kalinowski, Inc. (EKI). 1998. Report of Sediment Sampling at Mountain Lake. The Presidio Trust, San Francisco, California. November 1998.

Kennedy/Jenks Consultants. 2012. Letter Report – Sediment Sampling at Mountain Lake, The Presidio Trust, San Francisco, California. 11 January 2012.

Severn Trent Laboratories (STL). 2003. Letter regarding cadmium interferences in data reported for the Landfill E project. Letter from Tod Granicher, STL Project Manager, to Michelle King, Erler & Kalinowski. March 2003.

URS Corporation. 2011. Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco. Prepared for the Presidio Trust. October 2011.

USEPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Solid Waste and Emergency Response. Publication 9285.7-081. May 1992.

USEPA. 2010. ProUCL Version 4.1 User Guide (Draft). Office of Research and Development. EPA/600/R-07/041. May 2010.

Table D-1: Data Used in 95 Percent Upper Confidence Limit Calculations for Baseline Conditions[a]

Source[b]	Sample Number[c]	As[d] mg/kg[e]	Cd[f] mg/kg	Cr[g] mg/kg	Cu[h] mg/kg	Pb[i] mg/kg	Hg[j] mg/kg	Ni[k] mg/kg	Se[l] mg/kg	V[n] mg/kg	Zn[m] mg/kg	4,4'-DDD[o] µg/kg[p]	alpha-BHC[q] µg/kg	beta-BHC µg/kg	delta-BHC µg/kg	gamma-BHC (Lindane) µg/kg	alpha-Chlordane µg/kg	gamma-Chlordane µg/kg	Motor Oil mg/kg	Diesel mg/kg
D&M[f], 1997	MLSD01	<2.50[s]	-[t]	51.2	4.71	19.2	<0.050	20.7	-	50.1	36.7	ND[u]	ND	ND	ND	3	ND	ND	-	-
	MLSD02	<2.50	-	73.9	6.09	25.3	0.069	21.6	-	44.8	24.1	ND	ND	ND	ND	<1	ND	ND	-	-
	MLSD03	<2.50	-	50.1	5.16	34.4	<0.050	19.1	-	36	21.5	ND	ND	ND	ND	<1	ND	ND	-	-
	MLSD04	<2.50	-	74.3	6.85	<7.44	<0.050	21.3	-	66.3	21.2	ND	ND	ND	ND	<1	ND	ND	-	-
URS[v], 2001	AVG MLSE1(0.5)[w]	<1.3	(x)	45	9.05	20.5	<0.066	54.5	<0.53	24.5	52	<5.3	<1.29	<3.56	5.35	<0.37	<1.21	<1.24	<66	7.65
	MLSE1(1)	<1.3	(x)	37	6.8	15	<0.064	50	<0.51	18	41	-	-	-	-	-	-	-	<64	14
	MLSE1(2)	-	-	-	-	-	-	-	-	-	-	<4.7	<4.7	<4.7	2.4	<0.33	<4.7	<4.7	-	-
	AVG MLSE1(2)	<1.2	(x)	56.5	10.6	11.6	<0.059	56	<0.47	32	41	-	-	-	-	-	-	-	<59	9.1
	MLSE2(0.5)	<7.2	(x)	150	130	1200	0.73	170	<2.9	81	670	-	-	-	-	-	-	-	470	96
	MLSE2(1)	<5.0	(x)	120	87	1000	0.55	150	<2.0	70	530	-	-	-	-	-	-	-	<250	52
	MLSE2(2)	<3.9	(x)	110	47	290	0.28	140	<1.5	68	220	-	-	-	-	-	-	-	<190	21
	MLSE3(0.5)	<4.4	(x)	92	67	630	0.39	120	<1.8	68	320	-	-	-	-	-	-	-	<220	31
	MLSE3(1)	<3.6	(x)	130	44	140	0.24	160	<1.4	82	150	-	-	-	-	-	-	-	<180	6.9
	MLSE3(2)	<3.5	(x)	150	38	65	0.2	200	<1.4	90	97	-	-	-	-	-	-	-	<170	5.4
	MLSE4(0.5)	<1.2	(x)	27	22	100	<0.062	30	<0.49	14	190	<5.59	<4.65	<12.8	25	<3.49	<4.35	<4.45	320	45
	AVG MLSE4(1)	<1.5	(x)	32	60	1465	0.12	28.5	<0.59	19	185	-	-	-	-	-	-	-	1350	175
	MLSE4(2)	<1.5	(x)	180	31	1200	0.12	24	<0.58	18	99	<15	4.7	<3.78	8.3	4.1	6.2	4.6	1500	160
	MLSE4(3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	49
	MLSE5(0.5)	<2.5	(x)	44	17	100	0.078	38	<0.99	25	74	14	<2.32	14	5.9	9.9	<2.17	<2.22	<120	59
	MLSE5(1)	<1.4	(x)	28	7	39	<0.070	21	<0.56	13	34	-	-	-	-	-	-	-	<70	12
	MLSE5(2)	<2.0	(x)	64	12	17	<0.10	48	<0.81	38	32	<4.60	10	12	8.1	6.1	<3.58	<3.66	<100	3
	MLSE6(0.5)	<5.8	(x)	150	120	1000	0.72	150	<2.3	86	530	-	-	-	-	-	-	-	<290	42
	MLSE6(1)	2.1	(x)	130	68	590	0.73	140	<1.8	81	320	-	-	-	-	-	-	-	<220	34
	MLSE6(2)	<4.0	(x)	130	48	180	0.28	160	<1.6	79	190	-	-	-	-	-	-	-	<200	12
	MLSE7(0.5)	<1.8	(x)	35	17	150	0.097	46	<0.73	23	92	-	-	-	-	-	-	-	110	20
	MLSE7(1)	<1.9	(x)	59	9.6	36	<0.097	55	<0.78	32	43	-	-	-	-	-	-	-	<97	5.8
	MLSE7(2)	<3.4	(x)	140	23	12	0.074	140	<1.4	97	48	-	-	-	-	-	-	-	<170	<3.4
	MLSE8(0.5)	<3.6	(x)	150	26	7	0.091	120	<1.4	97	45	-	-	-	-	-	-	-	<180	<3.6
	AVG MLSE8(1)	<5.9	(x)	106.5	30	6	0.095	120	<2.3	84	52	-	-	-	-	-	-	-	-	-
	AVG MLSE8(2)	<7.0	(x)	96.5	30.5	6.1	0.053	120	<2.8	72.5	55	-	-	-	-	-	-	-	-	-
	MLSE8(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<290	<5.9
	MLSE8(2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<370	<7.3
	MLSE9(0.5)	<4.7	(x)	170	88	510	0.52	190	<1.9	97	360	-	-	-	-	-	-	-	<230	<4.7
	MLSE9(1)	<4.5	(x)	160	75	290	0.44	190	<1.8	90	270	-	-	-	-	-	-	-	<230	<4.5
	MLSE9(2)	<3.6	(x)	180	46	94	0.4	230	<1.5	97	190	-	-	-	-	-	-	-	<180	3.8
	MLSE10(0.5)	<1.2	(x)	30	13	23	<0.062	31	<0.50	22	32	<12	3.5	5.9	3.8	4.2	<1.09	<1.12	96	15
	MLSE10(1)	13	(x)	36	64	690	0.23	35	<0.72	25	200	-	-	-	-	-	-	-	1500	200
	MLSE10(2)	<3.5	(x)	110	21	27	0.1	98	<1.4	82	45	<6.9	1.7	<6.9	<6.9	3.5	1.6	<6.9	<170	<3.5
	MLSE11(0.5)	<1.2	(x)	35	5.4	8.6	<0.060	24	<0.48	26	20	-	-	-	-	-	-	-	<60	<1.2
	MLSE11(1)	<1.2	(x)	39	5.2	6.9	<0.059	23	<0.47	27	17	-	-	-	-	-	-	-	<59	<1.2
	MLSE11(2)	<1.2	(x)	25	5.8	3.6	<0.058	21	<0.46	19	16	-	-	-	-	-	-	-	<58	<1.2
	MLSE12(0.5)	<2.9	(x)	180	37	44	0.16	290	<1.2	78	69	-	-	-	-	-	-	-	<150	<2.9
	MLSE12(1)	<2.5	(x)	110	21	60	0.11	130	<1.0	59	160	-	-	-	-	-	-	-	<130	<2.5
	MLSE12(2)	<2.3	(x)	160	19	25	0.061	230	<0.92	71	48	-	-	-	-	-	-	-	<110	<2.3
	MLSE13(0.5)	<3.2	(x)	97	75	370	0.16	120	<1.3	52	340	-	-	-	-	-	-	-	<160	11
	MLSE13(1)	<4.5	(x)	170	42	18	0.09	180	<1.8	130	59	-	-	-	-	-	-	-	<230	7.3
	MLSE13(2)	<4.2	(x)	160	33	28	0.12	140	<1.7	120	66	-	-	-	-	-	-	-	<210	<4.2
	MLSE14(0.5)	<6.3	(x)	140	120	880	0.74	150	<2.5	75	520	-	-	-	-	-	-	-	<310	52
	MLSE14(1)	2.6	(x)	140	100	810	0.47	150	<1.8	79	480	-	-	-	-	-	-	-	<230	32
	MLSE14(2)	<3.2	(x)	120	44	92	0.3	170	<1.3	74	180	-	-	-	-	-	-	-	180	70
	MLSE14(3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200	13

Table D-1: Data Used in 95 Percent Upper Confidence Limit Calculations for Baseline Conditions[a]

Source[b]	Sample Number[c]	As[d] mg/kg[e]	Cd[f] mg/kg	Cr[g] mg/kg	Cu[h] mg/kg	Pb[i] mg/kg	Hg[j] mg/kg	Ni[k] mg/kg	Se[l] mg/kg	V[n] mg/kg	Zn[m] mg/kg	4,4'-DDD[o] µg/kg[p]	alpha-BHC[q] µg/kg	beta-BHC µg/kg	delta-BHC µg/kg	gamma-BHC (Lindane) µg/kg	alpha-Chlordane µg/kg	gamma-Chlordane µg/kg	Motor Oil mg/kg	Diesel mg/kg
URS, 2001 (cont'd)	MLSE15(0.5)	<1.9	(x)	60	9.9	27	0.11	35	<0.76	36	30	<2.16	6.1	<4.94	11	5.3	<1.68	<1.72	<95	7
	MLSE15(1)	1.3	(x)	47	6.9	32	<0.079	47	<0.63	33	27	-	-	-	-	-	-	-	<79	3.6
	MLSE15(2)	<1.3	(x)	32	2.7	3.7	<0.063	13	<0.50	19	11	1.4	0.68	2.3	1.4	1.1	0.74	<2.5	<63	<1.3
URS, 2005	MLSE16(1)	4.7	<1.1	57	13	120	0.53	52	1.4	37	70	<17	<8.6	<8.6	<8.6	<8.6	<8.6	<8.6	-	-
	MLSE16(2)	11	<1.5	89	12	7.5	<0.12	77	3.6	68	45	<22	<11	<11	<11	<11	<11	<11	-	-
	MLSE17(1)	4.7	0.8	57	24	440	0.13	62	0.83	33	210	<8.9	<4.6	<4.6	<4.6	<4.6	<4.6	10	-	-
	MLSE17(2)	2.5	<0.27	55	5.5	9.3	<0.022	68	0.35	27	43	<4.1	<2.1	<2.1	<2.1	<2.1	<2.1	<2.1	-	-
	MLSE18(1)	0.54	<0.28	29	1.5	11	0.024	12	<0.28	16	12	<4.3	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	MLSE18(2)	2.4	<0.27	59	8.2	2.4	<0.023	33	0.52	46	24	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	AVG MLSE19(1.5)	1.95	<0.26	68.5	7.75	3	<0.022	27	1.2	52	27.5	<8.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	-	-
	MLSE19(2.5)	2	<0.22	63	7.7	2.5	<0.024	28	1.2	52	23	<8.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	-	-
	MLSE20(1)	1.3	<0.32	120	14	28	<0.025	140	1.9	53	43	<4.5	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	-	-
	MLSE20(2)	2.7	<0.58	140	13	10	<0.058	90	2.3	77	47	<8.1	<4.2	<4.2	<4.2	<4.2	<4.2	<4.2	-	-
	MLSE21(1)	11	2.7	280	140	1200	0.96	210	5.9	190	960	<59	<31	<31	<31	<31	<31	32	-	-
	MLSE21(2)	3.7	<0.48	120	24	130	0.14	95	1.4	65	160	<32	<17	<17	<17	<17	<17	<17	-	-
	MLSE22(1)	0.4	<0.22	42	1.7	0.96	<0.023	19	0.74	38	15	<4	<2	<2	<2	<2	<2	<2	-	-
	MLSE22(2)	0.57	<0.29	50	2.2	1.1	<0.023	20	0.73	41	16	<3.9	<2	<2	<2	<2	<2	<2	-	-
	MLSE23(1)	0.83	<0.25	53	2.6	2.5	<0.022	21	<0.25	37	20	<3.8	<2	<2	<2	<2	<2	<2	-	-
	MLSE23(2)	0.8	<0.25	41	2.5	1.5	<0.021	23	<0.25	29	17	<3.9	<2	<2	<2	<2	<2	<2	-	-
	MLSE24(1)	2.4	<0.39	48	12	82	0.05	29	<0.39	36	50	<5.8	<3	<3	<3	<3	<3	<3	-	-
	AVG MLSE24(2.5)	2.4	<0.31	61.5	8.95	27	0.078	57.5	<0.31	40	51.5	<4.4	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	MLSE25(1)	0.74	<0.43	29	6.4	36	<0.048	16	<0.43	19	34	<6.6	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	-	-
	MLSE26(1)	4.4	<1.1	66	32	91	<0.097	84	<1.1	62	100	<15	<7.7	<7.7	<7.7	<7.7	91	16	-	-
	MLSE26(2)	5.9	<0.61	91	22	71	0.088	74	<0.61	71	88	<44	<23	<23	<23	<23	<23	<23	-	-
	AVG MLSE27(1)	1.3	<0.27	49	3.3	23	0.02	28	<0.27	30.5	33.5	<3.8	<2	<2	<2	<2	<2	<2	-	-
	MLSE27(2)	7.1	<0.9	230	23	57	0.18	260	<0.9	120	99	<12	<6.3	<6.3	<6.3	<6.3	<6.3	<6.3	-	-
	MLSE28(1)	3.2	<0.42	76	21	140	0.13	66	<0.42	46	150	<6.2	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	-	-
	MLSE28(2)	3.6	<0.43	94	11	35	0.056	78	<0.43	54	57	<6.6	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	-	-
	MLSE29(1)	-	2	-	-	660	-	-	-	-	-	<19	<9.9	<9.9	<9.9	<9.9	<9.9	<9.9	-	-
	MLSE29(2)	-	1.6	-	-	-	-	-	-	-	-	<16	<8	<8	<8	<8	<8	<8	-	-
	AVG MLSE30(1)	-	1.95	-	-	-	-	-	-	-	-	<18	<9.4	<9.4	<9.4	<9.4	<9.4	<9.4	-	-
	MLSE30(2)	-	1.3	-	-	-	-	-	-	-	-	<15	<7.7	<7.7	<7.7	<7.7	<7.7	<7.7	-	-
	AVG MLSE31(1)	-	1.4	-	-	-	-	-	-	-	-	<18	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	-	-
	MLSE31(2)MS/MSD	-	0.74	-	-	120	-	-	-	-	-	<3.2	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	-	-
	AVG MLSE32(1)	-	0.38	-	-	-	-	-	-	-	-	5.2	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	-	-
	MLSE32(2)MS/MSD	-	<0.23	-	-	-	-	-	-	-	-	<3.9	<2	<2	<2	<2	<2	<2	-	-
	AVG MLSE33(1)	-	<0.27	-	-	-	-	-	-	-	-	6	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	MLSE33(2)	-	<1.7	-	-	-	-	-	-	-	-	<23	<12	<12	<12	<12	<12	<12	-	-
	MLSE37(1)	1.4	<0.3	40	4.8	17	<0.023	45	<0.3	17	27	<4.1	<2.1	<2.1	<2.1	<2.1	2.7	<2.1	-	-
	MLSE37(2)	6.3	<0.67	170	24	59	0.17	210	<0.67	94	75	<9.5	<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	-	-
	AVG MLSE38(1)	1.75	<0.27	60	5	19.5	<0.025	27.5	<0.27	37	70	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	AVG MLSE38(2)	2.65	<0.26	96.5	7.95	3	0.01	43.5	<0.26	53	52.5	<4	<2.1	<2.1	<2.1	<2.1	<2.1	<2.1	-	-
	MLSE39(1)	-	1.2	-	-	280	-	-	-	-	-	34	<7.1	<7.1	<7.1	<7.1	<7.1	<7.1	-	-
	MLSE39(2)	-	<1.3	-	-	-	-	-	-	-	-	<16	<8.1	<8.1	<8.1	<8.1	<8.1	13	-	-
	MLSE40(1)	-	<0.24	-	-	17	-	-	-	-	-	<3.9	<2	<2	<2	<2	<2	<2	-	-
	MLSE40(2)	-	<0.25	-	-	-	-	-	-	-	-	<3.8	<2	<2	<2	<2	<2	<2	-	-

Table D-1: Data Used in 95 Percent Upper Confidence Limit Calculations for Baseline Conditions[a]

Notes:

(a) Data are from Tables 2, 4, and 5 of the RI Summary (URS 2011). Samples collected from 0 to 3 feet below sediment surface are included in the baseline conditions data set.
(b) Source of data as referenced in the RI Summary (URS 2011).
(c) The sample number. The parenthetical indicates sample depth.
(d) As = arsenic
(e) mg/kg = milligrams per kilogram
(f) Cd = cadmium
(g) Cr = chromium
(h) Cu = copper
(i) Pb = lead
(j) Hg = mercury
(k) Ni = nickel
(l) Se = selenium
(m) Zn = zinc
(n) V = vanadium
(o) DDD = dichlorodiphenyldichloroethane
(p) µg/kg = micrograms per kilogram
(q) BHC = Benzene hexachloride
(r) D&M = Dames and Moore.
(s) < = No detection above the stated laboratory detection limit.
(t) "-"= No data provided.
(u) ND = Non-detect with no stated detection limit. Results were not used in the 95 percent upper confidence limit calculations.
(v) URS = URS Corporation.
(w) AVG = Average of duplicate samples: if both values detect than it is an average of the results, if it there is one detect and one non-detect it is the value of the detect, and if they are both non-detects then it is the lower of the two non-detects.
(x) Due to potential analytical interference, cadmium data from the 2001 sampling event were not included in the calculations.

Table D-2: Statistical Evaluation of Baseline Sediment Samples (0 to 3 feet below surface) from Mountain Lake[a]

				Summary Statistics[b]		Detected Values[b]		Goodness-of-Fit Test	Upper Confidence Limit (UCL)		
Analyte	Unit	No. of Samples	Detection Rate	Arithmetic Mean[c]	Standard Deviation	Minimum Detected	Maximum Detected	Distribution	Method of UCL Calculation[d]	Assessed 95% UCL[e]	Cleanup Level[f]
Arsenic	mg/kg	78	42%	3.43	3.15	0.40	13	Gamma	95% KM (t) UCL	2.6	19
Cadmium[g]	mg/kg	43	23%	1.41	0.69	0.38	3	Normal	95% KM (t) UCL	0.8	1.1
Chromium	mg/kg	78	100%	91.6	54.3	25	280	- [i]	95% Chebyshev (Mean, Sd) UCL	118	140
Copper	mg/kg	78	100%	29.2	32.5	1.5	140	Lognormal	Use 95% H-UCL	42	114
Lead	mg/kg	82	99%	199	343	0.96	1465	Lognormal	97.5% KM (Chebyshev) UCL	432	82
Mercury	mg/kg	78	60%	0.245	0.235	0.010	0.96	Lognormal	95% KM (Chebyshev) UCL	0.26	0.62
Nickel	mg/kg	78	100%	88.7	69.6	12	290	-	95% Chebyshev (Mean, Sd) UCL	123	110
Selenium	mg/kg	74	18%	1.70	1.53	0.35	6	Gamma	95% KM (t) UCL	0.80	1.6
Vanadium	mg/kg	78	100%	55.9	32.4	13	190	Gamma	95% Approximate Gamma UCL	62	90
Zinc	mg/kg	78	100%	127.9	170	11	960	-	95% Chebyshev (Mean, Sd) UCL	212	230
4.4'-DDD	mg/kg	54	11%	0.013	0.012	0.001	0.034	Normal	95% KM (t) UCL	0.0044	0.016
Alpha-BHC	mg/kg	54	13%	0.0050	0.0033	0.00068	0.010	Normal	95% KM (t) UCL	0.0022	0.0080
Alpha-Chlordane	mg/kg	54	11%	0.019	0.036	0.00074	0.091	Gamma	95% KM (t) UCL	0.0061	0.010
Beta-BHC	mg/kg	54	9%	0.0094	0.0051	0.0023	0.014	Normal	95% KM (t) UCL	0.0037	0.013
Delta-BHC	mg/kg	54	19%	0.0079	0.0067	0.0014	0.025	Gamma	95% KM (t) UCL	0.0038	0.0075
Gamma-BHC(Lindane)	mg/kg	58	16%	0.0045	0.0025	0.0011	0.010	Normal	95% KM (t) UCL	0.0023	0.0030
Gamma-Chlordane	mg/kg	54	11%	0.014	0.009	0.0046	0.032	Normal	95% KM (t) UCL	0.0068	0.010
Motor Oil	mg/kg	48	21%	587	607	96	1500	Gamma	95% KM (t) UCL	286	144
Diesel	mg/kg	48	69%	43.0	53.2	3	200	Lognormal	95% KM (Chebyshev) UCL	61	144

Notes:

a) Values calculated using ProUCL Version 4.1.00 (http://www.epa.gov/osp/hstl/tsc/software.htm)
b) Summary statistics and detected values were determined following data reduction
c) Arithmetic mean is calculated only for detects
d) Method is the statistic recommended by ProUCL based on the dataset for the given chemical
e) Nondetects are included in the 95% UCL in accordance with the ProUCL methods
f) Freshwater Sediment Cleanup Level from the Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water (EKI 2002)
g) Due to potential analytical interference in the 2001 dataset, only 2005 data were evaluated for cadmium
h) Highlighted cells are 95% UCLs that exceed the cleanup level
i) Data do not follow a discernible distribution

Abbreviations:

mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
95% UCL - 95 percent upper confidence limit

Table D-3: Data Used in Post-Remediation 95 Percent Upper Confidence Limit Calculations[a]

Source[b]	Sample Number[c]	As[d] mg/kg[e]	Cd[f] mg/kg	Cr[g] mg/kg	Cu[h] mg/kg	Pb[i] mg/kg	Hg[j] mg/kg	Ni[k] mg/kg	Se[l] mg/kg	V[n] mg/kg	Zn[m] mg/kg	4,4'-DDD[o] µg/kg[p]	alpha-BHC[q] µg/kg	beta-BHC µg/kg	delta-BHC µg/kg	gamma-BHC (Lindane) µg/kg	alpha-Chlordane µg/kg	gamma-Chlordane µg/kg	Motor Oil mg/kg	Diesel mg/kg
D&M[f], 1997	MLSD01	<2.50[s]	-[t]	51.2	4.71	19.2	<0.050	20.7	-	50.1	36.7	ND[u]	ND	ND	ND	3	ND	ND	-	-
	MLSD02	<2.50	-	73.9	6.09	25.3	0.069	21.6	-	44.8	24.1	ND	ND	ND	ND	<1	ND	ND	-	-
	MLSD04	<2.50	-	74.3	6.85	<7.44	<0.050	21.3	-	66.3	21.2	ND	ND	ND	ND	<1	ND	ND	-	-
URS[v], 2001	MLSE1(6)	<3.9	(w)	140	31	32	<0.20	150	<1.6	100	74	-	-	-	-	-	-	-	-	-
	MLSE2(8)	<6.5	(w)	110	18	<6.5	<0.32	120	<2.6	78	55	-	-	-	-	-	-	-	-	-
	MLSE3(7)	<6.9	(w)	190	32	7.4	<0.35	210	<2.8	140	100	-	-	-	-	-	-	-	-	-
	MLSE3(9)	<6.2	(w)	110	19	<6.2	<0.31	120	<2.5	76	61	-	-	-	-	-	-	-	-	-
	MLSE5(5)	<1.5	(w)	50	10	2.9	<0.076	20	<0.61	39	23	-	-	-	-	-	-	-	-	-
	MLSE6(8)	<3.5	(w)	190	28	36	<0.17	200	<1.4	110	68	-	-	-	-	-	-	-	-	-
	MLSE7(6)	<6.1	(w)	93	17	3.3	<0.30	96	<2.4	73	48	-	-	-	-	-	-	-	-	-
	MLSE8(6)	2.1	(w)	160	30	11	0.094	81	<1.5	120	79	-	-	-	-	-	-	-	-	-
	MLSE9(5)	<3.4	(w)	200	40	67	0.2	280	<1.4	93	110	-	-	-	-	-	-	-	-	-
	MLSE9(6)	<7.0	(w)	100	23	30	<0.35	120	<2.8	76	75	-	-	-	-	-	-	-	-	-
	MLSE10(6)	<1.4	(w)	50	11	3	<0.069	27	<0.55	36	24	-	-	-	-	-	-	-	-	-
	MLSE11(0.5)	<1.2	(w)	35	5.4	8.6	<0.060	24	<0.48	26	20	-	-	-	-	-	-	-	<60	<1.2
	MLSE11(1)	<1.2	(w)	39	5.2	6.9	<0.059	23	<0.47	27	17	-	-	-	-	-	-	-	<59	<1.2
	MLSE11(2)	<1.2	(w)	25	5.8	3.6	<0.058	21	<0.46	19	16	-	-	-	-	-	-	-	<58	<1.2
	MLSE12(5)	<5.1	(w)	120	21	7.9	<0.26	110	<2.0	84	62	-	-	-	-	-	-	-	-	-
	MLSE12(6)	<4.6	(w)	87	17	11	<0.23	120	<1.8	64	72	-	-	-	-	-	-	-	-	-
	MLSE13(5)	<8.0	(w)	93	42	19	0.058	110	<3.2	67	72	-	-	-	-	-	-	-	-	-
	MLSE13(6)	<7.0	(w)	96	19	<7.0	<0.35	110	<2.8	70	60	-	-	-	-	-	-	-	-	-
	MLSE14(5)	<5.3	(w)	130	30	14	0.1	110	<2.1	90	50	-	-	-	-	-	-	-	<270	15
	MLSE14(6)	<8.4	(w)	88	19	<8.4	<0.42	110	<3.4	61	62	-	-	-	-	-	-	-	-	-
	MLSE15(0.5)	<1.9	(w)	60	9.9	27	0.11	35	<0.76	36	30	<2.16	6.1	<4.94	11	5.3	<1.68	<1.72	<95	7
	MLSE15(1)	1.3	(w)	47	6.9	32	<0.079	47	<0.63	33	27	-	-	-	-	-	-	-	<79	3.6
	MLSE15(2)	<1.3	(w)	32	2.7	3.7	<0.063	13	<0.50	19	11	1.4	0.68	2.3	1.4	1.1	0.74	<2.5	<63	<1.3
URS, 2005	MLSE16(5)	20	<1.3	98	15	2.6	<0.11	110	4.9	63	64	<18	<9	<9	<9	<9	<9	<9	-	-
	MLSE16(6)	20	-	-	-	-	-	-	5.6	-	-	-	-	-	-	-	-	-	-	-
	MLSE17(5)	5.7	<0.89	150	18	11	<0.08	140	2.8	110	45	<14	<7.1	<7.1	<7.1	<7.1	<7.1	<7.1	-	-
	MLSE17(6)	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MLSE18(1)	0.54	<0.28	29	1.5	11	0.024	12	<0.28	16	12	<4.3	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	MLSE18(2)	2.4	<0.27	59	8.2	2.4	<0.023	33	0.52	46	24	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	AVG MLSE19(1.5)[x]	1.95	<0.26	68.5	7.75	3	<0.022	27	1.2	52	27.5	<8.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	-	-
	MLSE19(2.5)	2	<0.22	63	7.7	2.5	<0.024	28	1.2	52	23	<8.3	<4.3	<4.3	<4.3	<4.3	<4.3	<4.3	-	-
	MLSE20(1)	1.3	<0.32	120	14	28	<0.025	140	1.9	53	43	<4.5	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	-	-
	MLSE20(2)	2.7	<0.58	140	13	10	<0.058	90	2.3	77	47	<8.1	<4.2	<4.2	<4.2	<4.2	<4.2	<4.2	-	-
	MLSE21(6)	27	-	-	-	-	-	-	4.9	-	-	-	-	-	-	-	-	-	-	-
	MLSE21(7)	12	<0.23	26	1.2	0.72	<0.02	21	0.25	23	10	-	-	-	-	-	-	-	-	-
	MLSE21(8)	4.8	-	-	-	-	-	-	<1.3	-	-	-	-	-	-	-	-	-	-	-
	MLSE22(1)	0.4	<0.22	42	1.7	0.96	<0.023	19	0.74	38	15	<4	<2	<2	<2	<2	<2	<2	-	-
	MLSE22(2)	0.57	<0.29	50	2.2	1.1	<0.023	20	0.73	41	16	<3.9	<2	<2	<2	<2	<2	<2	-	-
	MLSE23(1)	0.83	<0.25	53	2.6	2.5	<0.022	21	<0.25	37	20	<3.8	<2	<2	<2	<2	<2	<2	-	-
	MLSE23(2)	0.8	<0.25	41	2.5	1.5	<0.021	23	<0.25	29	17	<3.9	<2	<2	<2	<2	<2	<2	-	-
	MLSE24(1)	2.4	<0.39	48	12	82	0.05	29	<0.39	36	50	<5.8	<3	<3	<3	<3	<3	<3	-	-
	AVG MLSE24(2.5)	2.4	<0.31	61.5	8.95	27	0.078	57.5	<0.31	40	51.5	<4.4	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	MLSE25(1)	0.74	<0.43	29	6.4	36	<0.048	16	<0.43	19	34	<6.6	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	-	-
	AVG MLSE27(1)	1.3	<0.27	49	3.3	23	0.02	28	<0.27	30.5	33.5	<3.8	<2	<2	<2	<2	<2	<2	-	-
	MLSE27(2)	7.1	<0.9	230	23	57	0.18	260	<0.9	120	99	<12	<6.3	<6.3	<6.3	<6.3	<6.3	<6.3	-	-
	MLSE28(5)	25	<1.5	150	18	4	<0.12	180	2.9	100	83	<22	<11	<11	<11	<11	<11	<11	-	-
	MLSE28(6)	5.8	<0.39	36	4.6	1.4	<0.02	40	<0.39	26	21	<5.5	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	-	-
	MLSE29(5)	-	<1.7	-	-	7.8	-	-	-	-	-	<26	<13	<13	<13	<13	<13	<13	-	-

Table D-3: Data Used in Post-Remediation 95 Percent Upper Confidence Limit Calculations[a]

Source[b]	Sample Number[c]	As[d] mg/kg[e]	Cd[f] mg/kg	Cr[g] mg/kg	Cu[h] mg/kg	Pb[i] mg/kg	Hg[j] mg/kg	Ni[k] mg/kg	Se[l] mg/kg	V[n] mg/kg	Zn[m] mg/kg	4,4'-DDD[o] µg/kg[p]	alpha-BHC[q] µg/kg	beta-BHC µg/kg	delta-BHC µg/kg	gamma-BHC (Lindane) µg/kg	alpha-Chlordane µg/kg	gamma-Chlordane µg/kg	Motor Oil mg/kg	Diesel mg/kg
URS, 2005 (cont'd)	MLSE29(6)	-	<1.5	-	-	2.3	-	-	-	-	-	<22	<11	<11	<11	<11	<11	<11	-	-
	MLSE30(4)	8	<1	130	45	<3	<0.12	130	<1.4	80	180	-	-	-	-	-	-	-	-	-
	MLSE30(5)	-	<2.1	-	-	20	-	-	-	-	-	<28	<14	<14	<14	<14	<14	<14	-	-
	MLSE30(6)	-	<1.7	-	-	16	-	-	-	-	-	<24	<12	<12	<12	<12	<12	<12	-	-
	MLSE33(5)	-	<1.3	-	-	-	-	-	-	-	-	<16	<8	<8	<8	<8	<8	<8	-	-
	MLSE33(6)	-	<0.23	-	-	-	-	-	-	-	-	<4.5	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	-	-
	MLSE37(5)	3.7	<0.26	50	5.1	1.9	<0.019	46	<0.26	33	19	<3.9	<2	<2	<2	<2	<2	<2	-	-
	AVG MLSE38(1)	1.75	<0.27	60	5	19.5	<0.025	27.5	<0.27	37	70	<4.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	-	-
	AVG MLSE38(2)	2.65	<0.26	96.5	7.95	3	0.01	43.5	<0.26	53	52.5	<4	<2.1	<2.1	<2.1	<2.1	<2.1	<2.1	-	-
	MLSE39(5)	-	<0.69	-	-	50	-	-	-	-	-	<11	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	-	-
	MLSE39(6)	-	<1.6	-	-	-	-	-	-	-	-	<23	<12	<12	<12	<12	<12	<12	-	-
	MLSE40(5)	-	<0.79	-	-	54	-	-	-	-	-	<9.9	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	-	-
	MLSE40(6)	-	<0.54	-	-	-	-	-	-	-	-	<7.8	<4	<4	<4	<4	<4	<4	-	-

Notes:

(a) Data are from Tables 2, 4, and 5 of the RI Summary (URS 2011).
(b) Source of data as referenced in the RI Summary (URS 2011).
(c) The sample number. The parenthetical indicates sample depth.
(d) As = arsenic
(e) mg/kg = milligrams per kilogram
(f) Cd = cadmium
(g) Cr = chromium
(h) Cu = copper
(i) Pb = lead
(j) Hg = mercury
(k) Ni = nickel
(l) Se = selenium
(m) Zn = zinc
(n) V = vanadium
(o) DDD = dichlorodiphenyldichloroethane
(p) µg/kg = micrograms per kilogram
(q) BHC = Benzene hexachloride
(r) D&M = Dames and Moore.
(s) < = No detection above the stated laboratory detection limit.
(t) "-"= No data provided.
(u) ND = Non-detect with no stated detection limit. Results were not used in the 95 percent upper confidence limit calculations.
(v) URS = URS Corporation.
(w) Due to potential analytical interference, cadmium data from the 2001 sampling event were not included in the calculations.
(x) AVG = Conditional average of two values: if both values detect than it is a simple average, if it there is one detect and one non-detect it is the value of the detect, and if they are both non-detects than it is the lower of the two non-detects.

Table D-4: Statistical Evaluation of Post-Remediation Sediment Samples (0 to 3.5 feet below post-remediation surface) from Mountain Lake[a]

				Summary Statistics[b]		Detected Values[b]		Goodness-of-Fit Test	Upper Confidence Limit (UCL)		
Analyte	Unit	No. of Samples	Detection Rate	Arithmetic Mean[c]	Standard Deviation	Minimum Detected	Maximum Detected	Distribution	Method of UCL Calculation[d]	Assessed 95% UCL[e]	Cleanup Level[f]
Arsenic	mg/kg	53	55%	5.77	7.57	0.40	27	Lognormal	95% KM (Chebyshev) UCL	7.4	19
Cadmium[g]	mg/kg	34	0%	-	-	-	-	-	-	-	1.1
Chromium	mg/kg	50	100%	86.5	50.8	25	230	Gamma	95% Approximate Gamma UCL	99	140
Copper	mg/kg	50	100%	13.9	11.3	1.2	45	Gamma	95% Approximate Gamma UCL	17	114
Lead	mg/kg	57	89%	17	19	0.72	82	Lognormal	95% KM (Chebyshev) UCL	26	82
Mercury	mg/kg	50	24%	0.083	0.060	0.010	0.20	Normal	95% KM (t) UCL	0.05	0.62
Nickel	mg/kg	50	100%	77.2	67.2	12	280	-[h]	95% Chebyshev (Mean, Sd) UCL	119	110
Selenium	mg/kg	50	26%	2.30	1.82	0.25	6	Normal	95% KM (t) UCL	1.17	1.6
Vanadium	mg/kg	50	100%	58.2	30.8	16	140	Gamma	95% Approximate Gamma UCL	66	90
Zinc	mg/kg	50	100%	47.1	32	10	180	Gamma	95% Approximate Gamma UCL	55	230
4.4'-DDD[j]	mg/kg	37	3%	-	-	0.001	0.001	-	-	-	0.016
Alpha-BHC[j]	mg/kg	37	5%	-	-	0.00068	0.006	-	-	-	0.0080
Alpha-Chlordane[j]	mg/kg	37	3%	-	-	0.00074	0.001	-	-	-	0.010
Beta-BHC[j]	mg/kg	37	3%	-	-	0.0023	0.002	-	-	-	0.013
Delta-BHC[j]	mg/kg	37	5%	-	-	0.0014	0.011	-	-	-	0.0075
Gamma-BHC(Lindane)[j]	mg/kg	37	8%	-	-	0.0011	0.005	-	-	-	0.0030
Gamma-Chlordane	mg/kg	37	0%	-	-	-	-	-	-	-	0.010
Motor Oil	mg/kg	8	0%	-	-	-	-	-	-	-	144
Diesel	mg/kg	8	50%	9.7	5.3	4	15	Normal	95% KM (t) UCL	10	144

Notes:

a) Values calculated using ProUCL Version 4.1.00 (http://www.epa.gov/osp/hstl/tsc/software.htm)
b) Summary statistics and detected values were determined following data reduction
c) Arithmetic mean is calculated only for detects
d) Method is the statistic recommended by ProUCL based on the dataset for the given chemical
e) Nondetects are included in the 95% UCL in accordance with the ProUCL methods
f) Freshwater Sediment Cleanup Level from the Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water (EKI 2002)
g) Due to potential analytical interference in the 2001 dataset, only 2005 data were evaluated for cadmium
h) Data do not follow a discernible distribution
i) Highlighted cells are 95% UCLs that exceed the cleanup level
j) Too few detects (less than four) to calculate statistics.

Abbreviations:

mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
95% UCL - 95 percent upper confidence limit

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects - Baseline Metals								
2			User Selected Options									
3			From File	Tbl 2 rev3.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Arsenic											
10												
11						General Statistics						
12						Number of Valid Data	78			Number of Detected Data		33
13						Number of Distinct Detected Data	29			Number of Non-Detect Data		45
14										Percent Non-Detects		57.69%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	0.4			Minimum Detected		-0.916
18						Maximum Detected	13			Maximum Detected		2.565
19						Mean of Detected	3.431			Mean of Detected		0.87
20						SD of Detected	3.149			SD of Detected		0.883
21						Minimum Non-Detect	1.2			Minimum Non-Detect		0.182
22						Maximum Non-Detect	7.2			Maximum Non-Detect		1.974
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		75
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		3
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		96.15%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.79			Shapiro Wilk Test Statistic		0.976
31						5% Shapiro Wilk Critical Value	0.931			5% Shapiro Wilk Critical Value		0.931
32				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	2.338			Mean		0.532
37						SD	2.324			SD		0.764
38						95% DL/2 (t) UCL	2.776			95% H-Stat (DL/2) UCL		2.723
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41				MLE method failed to converge properly						Mean in Log Scale		0.324
42										SD in Log Scale		0.8
43										Mean in Original Scale		2.027
44										SD in Original Scale		2.38
45										95% t UCL		2.476
46										95% Percentile Bootstrap UCL		2.478
47										95% BCA Bootstrap UCL		2.597
48										95% H-UCL		2.301
49												
50				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		

	A	B	C	D	E	F	G	H	I	J	K	L
51					k star (bias corrected)	1.405	Data appear Gamma Distributed at 5% Significance Level					
52					Theta Star	2.442						
53					nu star	92.73						
54												
55					A-D Test Statistic	0.457	Nonparametric Statistics					
56					5% A-D Critical Value	0.765					Kaplan-Meier (KM) Method	
57					K-S Test Statistic	0.765					Mean	2.085
58					5% K-S Critical Value	0.156					SD	2.4
59	Data appear Gamma Distributed at 5% Significance Level										SE of Mean	0.288
60											95% KM (t) UCL	2.565
61	Assuming Gamma Distribution										95% KM (z) UCL	2.56
62				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	2.563
63					Minimum	0.000001					95% KM (bootstrap t) UCL	2.712
64					Maximum	13					95% KM (BCA) UCL	2.574
65					Mean	2.095					95% KM (Percentile Bootstrap) UCL	2.575
66					Median	1.595					95% KM (Chebyshev) UCL	3.342
67					SD	2.45					97.5% KM (Chebyshev) UCL	3.886
68					k star	0.3					99% KM (Chebyshev) UCL	4.955
69					Theta star	6.983						
70					Nu star	46.8	Potential UCLs to Use					
71					AppChi2	32.1					95% KM (t) UCL	2.565
72					95% Gamma Approximate UCL (Use when n >= 40)	3.054						
73					95% Adjusted Gamma UCL (Use when n < 40)	3.076						
74	Note: DL/2 is not a recommended method.											
75												
76	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
77	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
78	For additional insight, the user may want to consult a statistician.											
79												
80												
81	Cadmium											
82												
83	General Statistics											
84					Number of Valid Data	43					Number of Detected Data	10
85					Number of Distinct Detected Data	10					Number of Non-Detect Data	33
86											Percent Non-Detects	76.74%
87												
88	Raw Statistics						Log-transformed Statistics					
89					Minimum Detected	0.38					Minimum Detected	-0.968
90					Maximum Detected	2.7					Maximum Detected	0.993
91					Mean of Detected	1.407					Mean of Detected	0.211
92					SD of Detected	0.689					SD of Detected	0.575
93					Minimum Non-Detect	0.22					Minimum Non-Detect	-1.514
94					Maximum Non-Detect	1.7					Maximum Non-Detect	0.531
95												
96	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	40
97	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	3
98	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	93.02%
99												
100	UCL Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
101	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
102					Shapiro Wilk Test Statistic	0.978					Shapiro Wilk Test Statistic	0.949
103					5% Shapiro Wilk Critical Value	0.842					5% Shapiro Wilk Critical Value	0.842
104	**Data appear Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
105												
106	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
107					DL/2 Substitution Method						DL/2 Substitution Method	
108					Mean	0.521					Mean	-1.174
109					SD	0.613					SD	0.977
110					95% DL/2 (t) UCL	0.678					95% H-Stat (DL/2) UCL	0.708
111												
112					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
113					Mean	0.0706					Mean in Log Scale	-1.182
114					SD	1.107					SD in Log Scale	0.875
115					95% MLE (t) UCL	0.355					Mean in Original Scale	0.49
116					95% MLE (Tiku) UCL	1.652					SD in Original Scale	0.605
117											95% t UCL	0.645
118											95% Percentile Bootstrap UCL	0.647
119											95% BCA Bootstrap UCL	0.675
120											95% H UCL	0.608
121												
122	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
123					k star (bias corrected)	2.868	**Data appear Normal at 5% Significance Level**					
124					Theta Star	0.491						
125					nu star	57.36						
126												
127					A-D Test Statistic	0.191	**Nonparametric Statistics**					
128					5% A-D Critical Value	0.729					Kaplan-Meier (KM) Method	
129					K-S Test Statistic	0.729					Mean	0.627
130					5% K-S Critical Value	0.268					SD	0.538
131	**Data appear Gamma Distributed at 5% Significance Level**										SE of Mean	0.0874
132											95% KM (t) UCL	0.774
133	**Assuming Gamma Distribution**										95% KM (z) UCL	0.771
134					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.843
135					Minimum	0.000001					95% KM (bootstrap t) UCL	0.789
136					Maximum	2.7					95% KM (BCA) UCL	1.309
137					Mean	0.327					95% KM (Percentile Bootstrap) UCL	1.095
138					Median	0.000001					95% KM (Chebyshev) UCL	1.008
139					SD	0.681					97.5% KM (Chebyshev) UCL	1.173
140					k star	0.0969					99% KM (Chebyshev) UCL	1.496
141					Theta star	3.377						
142					Nu star	8.332	**Potential UCLs to Use**					
143					AppChi2	2.929					95% KM (t) UCL	0.774
144					95% Gamma Approximate UCL (Use when n >= 40)	0.931					95% KM (Percentile Bootstrap) UCL	1.095
145					95% Adjusted Gamma UCL (Use when n < 40)	0.967						
146	**Note: DL/2 is not a recommended method.**											
147												
148	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
149	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
150	**For additional insight, the user may want to consult a statistician.**											

	A	B	C	D	E	F	G	H	I	J	K	L
151												
152												
153	**Chromium**											
154												
155						**General Statistics**						
156						Number of Valid Observations	78				Number of Distinct Observations	52
157												
158						**Raw Statistics**					**Log-transformed Statistics**	
159						Minimum	25				Minimum of Log Data	3.219
160						Maximum	280				Maximum of Log Data	5.635
161						Mean	91.63				Mean of log Data	4.341
162						Geometric Mean	76.79				SD of log Data	0.61
163						Median	74.1					
164						SD	54.32					
165						Std. Error of Mean	6.151					
166						Coefficient of Variation	0.593					
167						Skewness	0.913					
168												
169						**Relevant UCL Statistics**						
170						**Normal Distribution Test**					**Lognormal Distribution Test**	
171						Lilliefors Test Statistic	0.156				Lilliefors Test Statistic	0.101
172						Lilliefors Critical Value	0.1				Lilliefors Critical Value	0.1
173						**Data not Normal at 5% Significance Level**					**Data not Lognormal at 5% Significance Level**	
174												
175						**Assuming Normal Distribution**					**Assuming Lognormal Distribution**	
176						95% Student's-t UCL	101.9				95% H-UCL	105.7
177						**95% UCLs (Adjusted for Skewness)**					95% Chebyshev (MVUE) UCL	122.1
178						95% Adjusted-CLT UCL (Chen-1995)	102.4				97.5% Chebyshev (MVUE) UCL	135.1
179						95% Modified-t UCL (Johnson-1978)	102				99% Chebyshev (MVUE) UCL	160.5
180												
181						**Gamma Distribution Test**					**Data Distribution**	
182						k star (bias corrected)	2.879				**Data do not follow a Discernable Distribution (0.05)**	
183						Theta Star	31.83					
184						MLE of Mean	91.63					
185						MLE of Standard Deviation	54					
186						nu star	449.1					
187						Approximate Chi Square Value (.05)	401				**Nonparametric Statistics**	
188						Adjusted Level of Significance	0.0469				95% CLT UCL	101.8
189						Adjusted Chi Square Value	400.2				95% Jackknife UCL	101.9
190											95% Standard Bootstrap UCL	101.6
191						Anderson-Darling Test Statistic	1.166				95% Bootstrap-t UCL	102.7
192						Anderson-Darling 5% Critical Value	0.759				95% Hall's Bootstrap UCL	102.4
193						Kolmogorov-Smirnov Test Statistic	0.112				95% Percentile Bootstrap UCL	101.7
194						Kolmogorov-Smirnov 5% Critical Value	0.102				95% BCA Bootstrap UCL	101.9
195						**Data not Gamma Distributed at 5% Significance Level**					95% Chebyshev(Mean, Sd) UCL	118.4
196											97.5% Chebyshev(Mean, Sd) UCL	130
197						**Assuming Gamma Distribution**					99% Chebyshev(Mean, Sd) UCL	152.8
198						95% Approximate Gamma UCL (Use when n >= 40)	102.6					
199						95% Adjusted Gamma UCL (Use when n < 40)	102.9					
200												

	A	B	C	D	E	F	G	H	I	J	K	L
201	Potential UCL to Use						Use 95% Chebyshev (Mean, Sd) UCL					118.4
202												
203	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
204	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
205	and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.											
206												
207												
208	Copper											
209												
210	General Statistics											
211	Number of Valid Observations					78	Number of Distinct Observations					64
212												
213	Raw Statistics						Log-transformed Statistics					
214	Minimum					1.5	Minimum of Log Data					0.405
215	Maximum					140	Maximum of Log Data					4.942
216	Mean					29.21	Mean of log Data					2.803
217	Geometric Mean					16.5	SD of log Data					1.117
218	Median					17						
219	SD					32.49						
220	Std. Error of Mean					3.679						
221	Coefficient of Variation					1.112						
222	Skewness					1.786						
223												
224	Relevant UCL Statistics											
225	Normal Distribution Test						Lognormal Distribution Test					
226	Lilliefors Test Statistic					0.218	Lilliefors Test Statistic					0.0599
227	Lilliefors Critical Value					0.1	Lilliefors Critical Value					0.1
228	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
229												
230	Assuming Normal Distribution						Assuming Lognormal Distribution					
231	95% Student's-t UCL					35.33	95% H-UCL					41.71
232	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL					51.06
233	95% Adjusted-CLT UCL (Chen-1995)					36.06	97.5% Chebyshev (MVUE) UCL					60
234	95% Modified-t UCL (Johnson-1978)					35.46	99% Chebyshev (MVUE) UCL					77.56
235												
236	Gamma Distribution Test						Data Distribution					
237	k star (bias corrected)					0.979	Data appear Lognormal at 5% Significance Level					
238	Theta Star					29.84						
239	MLE of Mean					29.21						
240	MLE of Standard Deviation					29.52						
241	nu star					152.7						
242	Approximate Chi Square Value (.05)					125.2	Nonparametric Statistics					
243	Adjusted Level of Significance					0.0469	95% CLT UCL					35.26
244	Adjusted Chi Square Value					124.7	95% Jackknife UCL					35.33
245							95% Standard Bootstrap UCL					35.11
246	Anderson-Darling Test Statistic					1.153	95% Bootstrap-t UCL					36.39
247	Anderson-Darling 5% Critical Value					0.781	95% Hall's Bootstrap UCL					36.34
248	Kolmogorov-Smirnov Test Statistic					0.117	95% Percentile Bootstrap UCL					35.32
249	Kolmogorov-Smirnov 5% Critical Value					0.104	95% BCA Bootstrap UCL					36.35
250	Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL					45.25

	A	B	C	D	E	F	G	H	I	J	K	L
251											97.5% Chebyshev(Mean, Sd) UCL	52.18
252				Assuming Gamma Distribution							99% Chebyshev(Mean, Sd) UCL	65.82
253				95% Approximate Gamma UCL (Use when n >= 40)		35.64						
254				95% Adjusted Gamma UCL (Use when n < 40)		35.78						
255												
256				Potential UCL to Use							Use 95% H-UCL	41.71
257												
258				ProUCL computes and outputs H-statistic based UCLs for historical reasons only.								
259				H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.								
260				It is therefore recommended to avoid the use of H-statistic based 95% UCLs.								
261				Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.								
262												
263				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
264				These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)								
265				and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.								
266												
267												
268	Lead											
269												
270				General Statistics								
271				Number of Valid Data		82					Number of Detected Data	81
272				Number of Distinct Detected Data		65					Number of Non-Detect Data	1
273											Percent Non-Detects	1.22%
274												
275				Raw Statistics							Log-transformed Statistics	
276				Minimum Detected		0.96					Minimum Detected	-0.0408
277				Maximum Detected		1465					Maximum Detected	7.29
278				Mean of Detected		198.9					Mean of Detected	3.806
279				SD of Detected		343.1					SD of Detected	1.877
280				Minimum Non-Detect		7.44					Minimum Non-Detect	2.007
281				Maximum Non-Detect		7.44					Maximum Non-Detect	2.007
282												
283												
284				UCL Statistics								
285				Normal Distribution Test with Detected Values Only							Lognormal Distribution Test with Detected Values Only	
286				Lilliefors Test Statistic		0.322					Lilliefors Test Statistic	0.0779
287				5% Lilliefors Critical Value		0.0984					5% Lilliefors Critical Value	0.0984
288				Data not Normal at 5% Significance Level							Data appear Lognormal at 5% Significance Level	
289												
290				Assuming Normal Distribution							Assuming Lognormal Distribution	
291				DL/2 Substitution Method							DL/2 Substitution Method	
292				Mean		196.5					Mean	3.775
293				SD		341.7					SD	1.886
294				95% DL/2 (t) UCL		259.3					95% H-Stat (DL/2) UCL	506.5
295												
296				Maximum Likelihood Estimate(MLE) Method							Log ROS Method	
297				Mean		148.7					Mean in Log Scale	3.774
298				SD		389.9					SD in Log Scale	1.888
299				95% MLE (t) UCL		220.4					Mean in Original Scale	196.5
300				95% MLE (Tiku) UCL		218.5					SD in Original Scale	341.7

	A	B	C	D	E	F	G	H	I	J	K	L
301											95% t UCL	259.3
302											95% Percentile Bootstrap UCL	260.1
303											95% BCA Bootstrap UCL	273.2
304											95% H UCL	508.3
305												
306				Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only			
307					k star (bias corrected)	0.428			Data appear Lognormal at 5% Significance Level			
308					Theta Star	464.2						
309					nu star	69.4						
310												
311					A-D Test Statistic	3.01			Nonparametric Statistics			
312					5% A-D Critical Value	0.834					Kaplan-Meier (KM) Method	
313					K-S Test Statistic	0.834					Mean	196.5
314					5% K-S Critical Value	0.106					SD	339.6
315				Data not Gamma Distributed at 5% Significance Level							SE of Mean	37.73
316											95% KM (t) UCL	259.3
317				Assuming Gamma Distribution							95% KM (z) UCL	258.6
318					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	259.3
319					Minimum	0.000001					95% KM (bootstrap t) UCL	268.1
320					Maximum	1465					95% KM (BCA) UCL	269.3
321					Mean	196.5					95% KM (Percentile Bootstrap) UCL	261.3
322					Median	34.7					95% KM (Chebyshev) UCL	361
323					SD	341.7					97.5% KM (Chebyshev) UCL	432.1
324					k star	0.385					99% KM (Chebyshev) UCL	571.9
325					Theta star	510.7						
326					Nu star	63.09			Potential UCLs to Use			
327					AppChi2	45.82					97.5% KM (Chebyshev) UCL	432.1
328					95% Gamma Approximate UCL (Use when n >= 40)	270.5						
329					95% Adjusted Gamma UCL (Use when n < 40)	272.1						
330	Note: DL/2 is not a recommended method.											
331												
332				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
333				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
334				For additional insight, the user may want to consult a statistician.								
335												
336												
337	Mercury											
338												
339					General Statistics							
340					Number of Valid Data	78					Number of Detected Data	47
341					Number of Distinct Detected Data	40					Number of Non-Detect Data	31
342											Percent Non-Detects	39.74%
343												
344				Raw Statistics					Log-transformed Statistics			
345					Minimum Detected	0.01					Minimum Detected	-4.605
346					Maximum Detected	0.96					Maximum Detected	-0.0408
347					Mean of Detected	0.245					Mean of Detected	-1.858
348					SD of Detected	0.235					SD of Detected	1.01
349					Minimum Non-Detect	0.021					Minimum Non-Detect	-3.863
350					Maximum Non-Detect	0.12					Maximum Non-Detect	-2.12

	A	B	C	D	E	F	G	H	I	J	K	L
351												
352	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	50
353	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	28
354	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	64.10%
355												
356						UCL Statistics						
357				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
358					Shapiro Wilk Test Statistic	0.803					Shapiro Wilk Test Statistic	0.965
359					5% Shapiro Wilk Critical Value	0.946					5% Shapiro Wilk Critical Value	0.946
360				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
361												
362				Assuming Normal Distribution						Assuming Lognormal Distribution		
363					DL/2 Substitution Method						DL/2 Substitution Method	
364					Mean	0.158					Mean	-2.623
365					SD	0.211					SD	1.276
366					95% DL/2 (t) UCL	0.198					95% H-Stat (DL/2) UCL	0.238
367												
368					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
369				MLE yields a negative mean							Mean in Log Scale	-2.647
370											SD in Log Scale	1.276
371											Mean in Original Scale	0.157
372											SD in Original Scale	0.212
373											95% t UCL	0.196
374											95% Percentile Bootstrap UCL	0.197
375											95% BCA Bootstrap UCL	0.198
376											95% H-UCL	0.232
377												
378				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
379					k star (bias corrected)	1.187				Data appear Lognormal at 5% Significance Level		
380					Theta Star	0.206						
381					nu star	111.6						
382												
383					A-D Test Statistic	0.973				Nonparametric Statistics		
384					5% A-D Critical Value	0.773					Kaplan-Meier (KM) Method	
385					K-S Test Statistic	0.773					Mean	0.156
386					5% K-S Critical Value	0.132					SD	0.211
387				Data not Gamma Distributed at 5% Significance Level							SE of Mean	0.0243
388											95% KM (t) UCL	0.196
389				Assuming Gamma Distribution							95% KM (z) UCL	0.196
390					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.196
391					Minimum	0.000001					95% KM (bootstrap t) UCL	0.202
392					Maximum	0.96					95% KM (BCA) UCL	0.198
393					Mean	0.147					95% KM (Percentile Bootstrap) UCL	0.199
394					Median	0.0715					95% KM (Chebyshev) UCL	0.261
395					SD	0.218					97.5% KM (Chebyshev) UCL	0.307
396					k star	0.164					99% KM (Chebyshev) UCL	0.397
397					Theta star	0.897						
398					Nu star	25.61				Potential UCLs to Use		
399					AppChi2	15.08					95% KM (Chebyshev) UCL	0.261
400					95% Gamma Approximate UCL (Use when n >= 40)	0.25						

	A	B	C	D	E	F	G	H	I	J	K	L
401				95% Adjusted Gamma UCL (Use when n < 40)		0.253						
402	Note: DL/2 is not a recommended method.											
403												
404	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
405	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
406	For additional insight, the user may want to consult a statistician.											
407												
408												
409	Nickel											
410												
411	General Statistics											
412					Number of Valid Observations	78				Number of Distinct Observations		56
413												
414	Raw Statistics						Log-transformed Statistics					
415					Minimum	12				Minimum of Log Data		2.485
416					Maximum	290				Maximum of Log Data		5.67
417					Mean	88.67				Mean of log Data		4.143
418					Geometric Mean	62.99				SD of log Data		0.868
419					Median	59.75						
420					SD	69.63						
421					Std. Error of Mean	7.884						
422					Coefficient of Variation	0.785						
423					Skewness	0.868						
424												
425	Relevant UCL Statistics											
426	Normal Distribution Test						Lognormal Distribution Test					
427					Lilliefors Test Statistic	0.173				Lilliefors Test Statistic		0.143
428					Lilliefors Critical Value	0.1				Lilliefors Critical Value		0.1
429	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
430												
431	Assuming Normal Distribution						Assuming Lognormal Distribution					
432					95% Student's-t UCL	101.8				95% H-UCL		113.5
433	95% UCLs (Adjusted for Skewness)									95% Chebyshev (MVUE) UCL		136.2
434					95% Adjusted-CLT UCL (Chen-1995)	102.5				97.5% Chebyshev (MVUE) UCL		155.7
435					95% Modified-t UCL (Johnson-1978)	101.9				99% Chebyshev (MVUE) UCL		193.9
436												
437	Gamma Distribution Test						Data Distribution					
438					k star (bias corrected)	1.556	Data do not follow a Discernable Distribution (0.05)					
439					Theta Star	57						
440					MLE of Mean	88.67						
441					MLE of Standard Deviation	71.09						
442					nu star	242.7						
443					Approximate Chi Square Value (.05)	207.6	Nonparametric Statistics					
444					Adjusted Level of Significance	0.0469				95% CLT UCL		101.6
445					Adjusted Chi Square Value	207				95% Jackknife UCL		101.8
446										95% Standard Bootstrap UCL		101.8
447					Anderson-Darling Test Statistic	1.72				95% Bootstrap-t UCL		102.5
448					Anderson-Darling 5% Critical Value	0.769				95% Hall's Bootstrap UCL		101.7
449					Kolmogorov-Smirnov Test Statistic	0.118				95% Percentile Bootstrap UCL		101.6
450					Kolmogorov-Smirnov 5% Critical Value	0.103				95% BCA Bootstrap UCL		103

	A	B	C	D	E	F	G	H	I	J	K	L
451	Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL					123
452							97.5% Chebyshev(Mean, Sd) UCL					137.9
453	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					167.1
454	95% Approximate Gamma UCL (Use when n >= 40)					103.6						
455	95% Adjusted Gamma UCL (Use when n < 40)					103.9						
456												
457	Potential UCL to Use						Use 95% Chebyshev (Mean, Sd) UCL					123
458												
459	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
460	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
461	and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.											
462												
463												
464	Selenium											
465												
466	General Statistics											
467	Number of Valid Data					74	Number of Detected Data					13
468	Number of Distinct Detected Data					11	Number of Non-Detect Data					61
469							Percent Non-Detects					82.43%
470												
471	Raw Statistics						Log-transformed Statistics					
472	Minimum Detected					0.35	Minimum Detected					-1.05
473	Maximum Detected					5.9	Maximum Detected					1.775
474	Mean of Detected					1.698	Mean of Detected					0.236
475	SD of Detected					1.532	SD of Detected					0.776
476	Minimum Non-Detect					0.25	Minimum Non-Detect					-1.386
477	Maximum Non-Detect					2.9	Maximum Non-Detect					1.065
478												
479	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect					72
480	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected					2
481	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage					97.30%
482												
483	UCL Statistics											
484	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
485	Shapiro Wilk Test Statistic					0.767	Shapiro Wilk Test Statistic					0.98
486	5% Shapiro Wilk Critical Value					0.866	5% Shapiro Wilk Critical Value					0.866
487	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
488												
489	Assuming Normal Distribution						Assuming Lognormal Distribution					
490	DL/2 Substitution Method						DL/2 Substitution Method					
491	Mean					0.727	Mean					-0.687
492	SD					0.83	SD					0.829
493	95% DL/2 (t) UCL					0.887	95% H-Stat (DL/2) UCL					0.869
494												
495	Maximum Likelihood Estimate(MLE) Method					N/A	Log ROS Method					
496	MLE method failed to converge properly						Mean in Log Scale					-1.632
497							SD in Log Scale					1.023
498							Mean in Original Scale					0.421
499							SD in Original Scale					0.863
500							95% t UCL					0.588

	A	B	C	D	E	F	G	H	I	J	K	L
501											95% Percentile Bootstrap UCL	0.585
502											95% BCA Bootstrap UCL	0.638
503											95% H-UCL	0.434
504												
505				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
506					k star (bias corrected)	1.476				Data appear Gamma Distributed at 5% Significance Level		
507					Theta Star	1.15						
508					nu star	38.37						
509												
510					A-D Test Statistic	0.39				Nonparametric Statistics		
511					5% A-D Critical Value	0.745					Kaplan-Meier (KM) Method	
512					K-S Test Statistic	0.745					Mean	0.627
513					5% K-S Critical Value	0.24					SD	0.808
514				Data appear Gamma Distributed at 5% Significance Level							SE of Mean	0.101
515											95% KM (t) UCL	0.795
516				Assuming Gamma Distribution							95% KM (z) UCL	0.793
517					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.773
518					Minimum	0.000001					95% KM (bootstrap t) UCL	0.885
519					Maximum	5.9					95% KM (BCA) UCL	1.076
520					Mean	0.303					95% KM (Percentile Bootstrap) UCL	0.957
521					Median	0.000001					95% KM (Chebyshev) UCL	1.066
522					SD	0.899					97.5% KM (Chebyshev) UCL	1.255
523					k star	0.0888					99% KM (Chebyshev) UCL	1.628
524					Theta star	3.412						
525					Nu star	13.15				Potential UCLs to Use		
526					AppChi2	5.992					95% KM (t) UCL	0.795
527					95% Gamma Approximate UCL (Use when n >= 40)	0.665						
528					95% Adjusted Gamma UCL (Use when n < 40)	0.676						
529	Note: DL/2 is not a recommended method.											
530												
531				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
532				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
533				For additional insight, the user may want to consult a statistician.								
534												
535												
536	Vanadium											
537												
538					General Statistics							
539					Number of Valid Observations	78					Number of Distinct Observations	50
540												
541				Raw Statistics						Log-transformed Statistics		
542					Minimum	13					Minimum of Log Data	2.565
543					Maximum	190					Maximum of Log Data	5.247
544					Mean	55.91					Mean of log Data	3.854
545					Geometric Mean	47.16					SD of log Data	0.606
546					Median	52						
547					SD	32.42						
548					Std. Error of Mean	3.67						
549					Coefficient of Variation	0.58						
550					Skewness	1.164						

	A	B	C	D	E	F	G	H	I	J	K	L
551												
552						Relevant UCL Statistics						
553					Normal Distribution Test					Lognormal Distribution Test		
554					Lilliefors Test Statistic	0.12				Lilliefors Test Statistic		0.112
555					Lilliefors Critical Value	0.1				Lilliefors Critical Value		0.1
556					Data not Normal at 5% Significance Level					Data not Lognormal at 5% Significance Level		
557												
558					Assuming Normal Distribution					Assuming Lognormal Distribution		
559					95% Student's-t UCL	62.02				95% H-UCL		64.73
560					95% UCLs (Adjusted for Skewness)					95% Chebyshev (MVUE) UCL		74.72
561					95% Adjusted-CLT UCL (Chen-1995)	62.46				97.5% Chebyshev (MVUE) UCL		82.6
562					95% Modified-t UCL (Johnson-1978)	62.1				99% Chebyshev (MVUE) UCL		98.09
563												
564					Gamma Distribution Test					Data Distribution		
565					k star (bias corrected)	2.985				Data appear Gamma Distributed at 5% Significance Level		
566					Theta Star	18.73						
567					MLE of Mean	55.91						
568					MLE of Standard Deviation	32.36						
569					nu star	465.7						
570					Approximate Chi Square Value (.05)	416.7				Nonparametric Statistics		
571					Adjusted Level of Significance	0.0469				95% CLT UCL		61.94
572					Adjusted Chi Square Value	415.8				95% Jackknife UCL		62.02
573										95% Standard Bootstrap UCL		62.03
574					Anderson-Darling Test Statistic	0.684				95% Bootstrap-t UCL		62.63
575					Anderson-Darling 5% Critical Value	0.758				95% Hall's Bootstrap UCL		62.73
576					Kolmogorov-Smirnov Test Statistic	0.0913				95% Percentile Bootstrap UCL		61.92
577					Kolmogorov-Smirnov 5% Critical Value	0.102				95% BCA Bootstrap UCL		62.72
578					Data appear Gamma Distributed at 5% Significance Level					95% Chebyshev(Mean, Sd) UCL		71.91
579										97.5% Chebyshev(Mean, Sd) UCL		78.83
580					Assuming Gamma Distribution					99% Chebyshev(Mean, Sd) UCL		92.43
581					95% Approximate Gamma UCL (Use when n >= 40)	62.49						
582					95% Adjusted Gamma UCL (Use when n < 40)	62.62						
583												
584					Potential UCL to Use					Use 95% Approximate Gamma UCL		62.49
585												
586					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
587					These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)							
588					and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.							
589												
590												
591	Zinc											
592												
593					General Statistics							
594					Number of Valid Observations	78				Number of Distinct Observations		57
595												
596					Raw Statistics					Log-transformed Statistics		
597					Minimum	11				Minimum of Log Data		2.398
598					Maximum	960				Maximum of Log Data		6.867
599					Mean	127.9				Mean of log Data		4.242
600					Geometric Mean	69.53				SD of log Data		1.065

	A	B	C	D	E	F	G	H	I	J	K	L
601					Median	52.25						
602					SD	170.2						
603					Std. Error of Mean	19.27						
604					Coefficient of Variation	1.331						
605					Skewness	2.633						
606												
607					**Relevant UCL Statistics**							
608				**Normal Distribution Test**						**Lognormal Distribution Test**		
609					Lilliefors Test Statistic	0.27					Lilliefors Test Statistic	0.117
610					Lilliefors Critical Value	0.1					Lilliefors Critical Value	0.1
611				**Data not Normal at 5% Significance Level**							**Data not Lognormal at 5% Significance Level**	
612												
613				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**		
614					95% Student's-t UCL	159.9					95% H-UCL	162.7
615				**95% UCLs (Adjusted for Skewness)**							95% Chebyshev (MVUE) UCL	198.7
616					95% Adjusted-CLT UCL (Chen-1995)	165.7					97.5% Chebyshev (MVUE) UCL	232.2
617					95% Modified-t UCL (Johnson-1978)	160.9					99% Chebyshev (MVUE) UCL	298
618												
619				**Gamma Distribution Test**						**Data Distribution**		
620					k star (bias corrected)	0.925				**Data do not follow a Discernable Distribution (0.05)**		
621					Theta Star	138.3						
622					MLE of Mean	127.9						
623					MLE of Standard Deviation	133						
624					nu star	144.3						
625					Approximate Chi Square Value (.05)	117.5				**Nonparametric Statistics**		
626					Adjusted Level of Significance	0.0469					95% CLT UCL	159.6
627					Adjusted Chi Square Value	117.1					95% Jackknife UCL	159.9
628											95% Standard Bootstrap UCL	159.1
629					Anderson-Darling Test Statistic	3.033					95% Bootstrap-t UCL	171.2
630					Anderson-Darling 5% Critical Value	0.784					95% Hall's Bootstrap UCL	172.6
631					Kolmogorov-Smirnov Test Statistic	0.177					95% Percentile Bootstrap UCL	161.6
632					Kolmogorov-Smirnov 5% Critical Value	0.104					95% BCA Bootstrap UCL	166.7
633				**Data not Gamma Distributed at 5% Significance Level**							95% Chebyshev(Mean, Sd) UCL	211.8
634											97.5% Chebyshev(Mean, Sd) UCL	248.2
635				**Assuming Gamma Distribution**							99% Chebyshev(Mean, Sd) UCL	319.6
636					95% Approximate Gamma UCL (Use when n >= 40)	157						
637					95% Adjusted Gamma UCL (Use when n < 40)	157.6						
638												
639				**Potential UCL to Use**							Use 95% Chebyshev (Mean, Sd) UCL	211.8
640												
641	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
642	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
643	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
644												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects - Baseline Pesticides								
2			User Selected Options									
3			From File	Tbl 4 rev3.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	4,4'-DDD											
10												
11						General Statistics						
12						Number of Valid Data	54			Number of Detected Data		6
13						Number of Distinct Detected Data	6			Number of Non-Detect Data		48
14										Percent Non-Detects		88.89%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	1.4			Minimum Detected		0.336
18						Maximum Detected	34			Maximum Detected		3.526
19						Mean of Detected	12.77			Mean of Detected		2.119
20						SD of Detected	11.79			SD of Detected		1.112
21						Minimum Non-Detect	2.16			Minimum Non-Detect		0.77
22						Maximum Non-Detect	59			Maximum Non-Detect		4.078
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		54
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		0
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		100.00%
27												
28						Warning: There are only 6 Detected Values in this data						
29						Note: It should be noted that even though bootstrap may be performed on this data set						
30						the resulting calculations may not be reliable enough to draw conclusions						
31												
32						It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.						
33												
34												
35						UCL Statistics						
36				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
37						Shapiro Wilk Test Statistic	0.877			Shapiro Wilk Test Statistic		0.963
38						5% Shapiro Wilk Critical Value	0.788			5% Shapiro Wilk Critical Value		0.788
39						Data appear Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level		
40												
41						Assuming Normal Distribution				Assuming Lognormal Distribution		
42						DL/2 Substitution Method				DL/2 Substitution Method		
43						Mean	6.218			Mean		1.444
44						SD	6.703			SD		0.83
45						95% DL/2 (t) UCL	7.745			95% H-Stat (DL/2) UCL		7.64
46												
47						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
48						MLE method failed to converge properly				Mean in Log Scale		0.455
49										SD in Log Scale		0.794
50										Mean in Original Scale		2.658

	A	B	C	D	E	F	G	H	I	J	K	L
51											SD in Original Scale	5.141
52											95% t UCL	3.83
53											95% Percentile Bootstrap UCL	3.994
54											95% BCA Bootstrap UCL	4.437
55											95% H-UCL	2.72
56												
57			Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only			
58					k star (bias corrected)	0.766			Data appear Normal at 5% Significance Level			
59					Theta Star	16.66						
60					nu star	9.197						
61												
62					A-D Test Statistic	0.208			Nonparametric Statistics			
63					5% A-D Critical Value	0.711					Kaplan-Meier (KM) Method	
64					K-S Test Statistic	0.711					Mean	2.99
65					5% K-S Critical Value	0.339					SD	5.293
66			Data appear Gamma Distributed at 5% Significance Level								SE of Mean	0.847
67											95% KM (t) UCL	4.407
68			Assuming Gamma Distribution								95% KM (z) UCL	4.383
69					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	5.358
70					Minimum	0.000001					95% KM (bootstrap t) UCL	4.579
71					Maximum	34					95% KM (BCA) UCL	14.47
72					Mean	2.366					95% KM (Percentile Bootstrap) UCL	7.962
73					Median	0.000001					95% KM (Chebyshev) UCL	6.68
74					SD	5.532					97.5% KM (Chebyshev) UCL	8.277
75					k star	0.106					99% KM (Chebyshev) UCL	11.41
76					Theta star	22.41						
77					Nu star	11.41			Potential UCLs to Use			
78					AppChi2	4.838					95% KM (t) UCL	4.407
79					95% Gamma Approximate UCL (Use when n >= 40)	5.578					95% KM (Percentile Bootstrap) UCL	7.962
80					95% Adjusted Gamma UCL (Use when n < 40)	5.717						
81	Note: DL/2 is not a recommended method.											
82												
83			Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.									
84			These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).									
85			For additional insight, the user may want to consult a statistician.									
86												
87												
88	alpha-BHC											
89												
90					General Statistics							
91					Number of Valid Data	54					Number of Detected Data	7
92					Number of Distinct Detected Data	7					Number of Non-Detect Data	47
93											Percent Non-Detects	87.04%
94												
95			Raw Statistics						Log-transformed Statistics			
96					Minimum Detected	0.68					Minimum Detected	-0.386
97					Maximum Detected	10					Maximum Detected	2.303
98					Mean of Detected	4.954					Mean of Detected	1.305
99					SD of Detected	3.344					SD of Detected	0.946
100					Minimum Non-Detect	1.29					Minimum Non-Detect	0.255

	A	B	C	D	E	F	G	H	I	J	K	L
101					Maximum Non-Detect	31					Maximum Non-Detect	3.434
102												
103	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	54
104	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
105	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
106												
107	**Warning: There are only 7 Detected Values in this data**											
108	**Note: It should be noted that even though bootstrap may be performed on this data set**											
109	**the resulting calculations may not be reliable enough to draw conclusions**											
110												
111	**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**											
112												
113												
114	**UCL Statistics**											
115	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
116					Shapiro Wilk Test Statistic	0.974					Shapiro Wilk Test Statistic	0.921
117					5% Shapiro Wilk Critical Value	0.803					5% Shapiro Wilk Critical Value	0.803
118	**Data appear Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
119												
120	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
121					DL/2 Substitution Method						DL/2 Substitution Method	
122					Mean	3.084					Mean	0.778
123					SD	2.997					SD	0.807
124					95% DL/2 (t) UCL	3.767					95% H-Stat (DL/2) UCL	3.817
125												
126					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
127	**MLE method failed to converge properly**										Mean in Log Scale	0.0593
128											SD in Log Scale	0.694
129											Mean in Original Scale	1.47
130											SD in Original Scale	1.797
131											95% t UCL	1.88
132											95% Percentile Bootstrap UCL	1.906
133											95% BCA Bootstrap UCL	2.003
134											95% H-UCL	1.638
135												
136	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
137					k star (bias corrected)	1.148	**Data appear Normal at 5% Significance Level**					
138					Theta Star	4.314						
139					nu star	16.08						
140												
141					A-D Test Statistic	0.214	**Nonparametric Statistics**					
142					5% A-D Critical Value	0.717					Kaplan-Meier (KM) Method	
143					K-S Test Statistic	0.717					Mean	1.598
144					5% K-S Critical Value	0.316					SD	1.956
145	**Data appear Gamma Distributed at 5% Significance Level**										SE of Mean	0.377
146											95% KM (t) UCL	2.229
147	**Assuming Gamma Distribution**										95% KM (z) UCL	2.218
148					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	2.307
149					Minimum	0.000001					95% KM (bootstrap t) UCL	2.245
150					Maximum	10					95% KM (BCA) UCL	4.915

	A	B	C	D	E	F	G	H	I	J	K	L
151					Mean	1.664				95% KM (Percentile Bootstrap) UCL		4.089
152					Median	1.169				95% KM (Chebyshev) UCL		3.242
153					SD	1.979				97.5% KM (Chebyshev) UCL		3.954
154					k star	0.238				99% KM (Chebyshev) UCL		5.352
155					Theta star	6.991						
156					Nu star	25.71				**Potential UCLs to Use**		
157					AppChi2	15.15				95% KM (t) UCL		2.229
158				95% Gamma Approximate UCL (Use when n >= 40)		2.823				95% KM (Percentile Bootstrap) UCL		4.089
159				95% Adjusted Gamma UCL (Use when n < 40)		2.865						
160	**Note: DL/2 is not a recommended method.**											
161												
162	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
163	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
164	**For additional insight, the user may want to consult a statistician.**											
165												
166												
167	**alpha-Chlordane**											
168												
169	**General Statistics**											
170					Number of Valid Data	54				Number of Detected Data		6
171					Number of Distinct Detected Data	6				Number of Non-Detect Data		48
172										Percent Non-Detects		88.89%
173												
174	**Raw Statistics**						**Log-transformed Statistics**					
175					Minimum Detected	0.74				Minimum Detected		-0.301
176					Maximum Detected	91				Maximum Detected		4.511
177					Mean of Detected	18.71				Mean of Detected		1.633
178					SD of Detected	35.58				SD of Detected		1.689
179					Minimum Non-Detect	1.09				Minimum Non-Detect		0.0862
180					Maximum Non-Detect	31				Maximum Non-Detect		3.434
181												
182	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		53
183	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		1
184	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		98.15%
185												
186	**Warning: There are only 6 Detected Values in this data**											
187	**Note: It should be noted that even though bootstrap may be performed on this data set**											
188	**the resulting calculations may not be reliable enough to draw conclusions**											
189												
190	**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**											
191												
192												
193	**UCL Statistics**											
194	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
195					Shapiro Wilk Test Statistic	0.582				Shapiro Wilk Test Statistic		0.95
196					5% Shapiro Wilk Critical Value	0.788				5% Shapiro Wilk Critical Value		0.788
197	**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
198												
199	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
200					DL/2 Substitution Method					DL/2 Substitution Method		

	A	B	C	D	E	F	G	H	I	J	K	L
201					Mean	4.484					Mean	0.757
202					SD	12.35					SD	0.952
203					95% DL/2 (t) UCL	7.297					95% H-Stat (DL/2) UCL	4.517
204												
205				Maximum Likelihood Estimate(MLE) Method		N/A					Log ROS Method	
206				**MLE method failed to converge properly**							Mean in Log Scale	-0.255
207											SD in Log Scale	1.006
208											Mean in Original Scale	2.711
209											SD in Original Scale	12.34
210											95% t UCL	5.522
211											95% Percentile Bootstrap UCL	5.981
212											95% BCA Bootstrap UCL	7.956
213											95% H-UCL	1.774
214												
215				**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**		
216					k star (bias corrected)	0.357				**Data appear Gamma Distributed at 5% Significance Level**		
217					Theta Star	52.41						
218					nu star	4.283						
219												
220					A-D Test Statistic	0.578				**Nonparametric Statistics**		
221					5% A-D Critical Value	0.737					Kaplan-Meier (KM) Method	
222					K-S Test Statistic	0.737					Mean	3.005
223					5% K-S Critical Value	0.349					SD	12.19
224				**Data appear Gamma Distributed at 5% Significance Level**							SE of Mean	1.829
225											95% KM (t) UCL	6.067
226				**Assuming Gamma Distribution**							95% KM (z) UCL	6.013
227					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	5.505
228					Minimum	0.000001					95% KM (bootstrap t) UCL	17.19
229					Maximum	91					95% KM (BCA) UCL	10
230					Mean	2.493					95% KM (Percentile Bootstrap) UCL	7.77
231					Median	0.000001					95% KM (Chebyshev) UCL	10.98
232					SD	12.51					97.5% KM (Chebyshev) UCL	14.42
233					k star	0.0782					99% KM (Chebyshev) UCL	21.2
234					Theta star	31.87						
235					Nu star	8.449				**Potential UCLs to Use**		
236					AppChi2	2.998					95% KM (t) UCL	6.067
237					95% Gamma Approximate UCL (Use when n >= 40)	7.027						
238					95% Adjusted Gamma UCL (Use when n < 40)	7.241						
239	**Note: DL/2 is not a recommended method.**											
240												
241				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
242				**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**								
243				**For additional insight, the user may want to consult a statistician.**								
244												
245												
246	**beta-BHC**											
247												
248					**General Statistics**							
249					Number of Valid Data	54					Number of Detected Data	5
250					Number of Distinct Detected Data	5					Number of Non-Detect Data	49

	A	B	C	D	E	F	G	H	I	J	K	L
251											Percent Non-Detects	90.74%
252												
253	**Raw Statistics**						**Log-transformed Statistics**					
254					Minimum Detected	2.3					Minimum Detected	0.833
255					Maximum Detected	14					Maximum Detected	2.639
256					Mean of Detected	9.44					Mean of Detected	2.059
257					SD of Detected	5.088					SD of Detected	0.768
258					Minimum Non-Detect	1.7					Minimum Non-Detect	0.531
259					Maximum Non-Detect	31					Maximum Non-Detect	3.434
260												
261	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	54
262	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
263	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
264												
265	**Warning: There are only 5 Detected Values in this data**											
266	**Note: It should be noted that even though bootstrap may be performed on this data set**											
267	**the resulting calculations may not be reliable enough to draw conclusions**											
268												
269	**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**											
270												
271												
272	**UCL Statistics**											
273	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
274					Shapiro Wilk Test Statistic	0.87					Shapiro Wilk Test Statistic	0.821
275					5% Shapiro Wilk Critical Value	0.762					5% Shapiro Wilk Critical Value	0.762
276	**Data appear Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
277												
278	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
279					DL/2 Substitution Method						DL/2 Substitution Method	
280					Mean	3.536					Mean	0.886
281					SD	3.591					SD	0.832
282					95% DL/2 (t) UCL	4.354					95% H-Stat (DL/2) UCL	4.384
283												
284					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
285	**MLE method failed to converge properly**										Mean in Log Scale	-0.766
286											SD in Log Scale	1.115
287											Mean in Original Scale	1.253
288											SD in Original Scale	2.998
289											95% t UCL	1.935
290											95% Percentile Bootstrap UCL	2.005
291											95% BCA Bootstrap UCL	2.137
292											95% H-UCL	1.264
293												
294	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
295					k star (bias corrected)	1.273	**Data appear Normal at 5% Significance Level**					
296					Theta Star	7.414						
297					nu star	12.73						
298												
299					A-D Test Statistic	0.515	**Nonparametric Statistics**					
300					5% A-D Critical Value	0.683					Kaplan-Meier (KM) Method	

	A	B	C	D	E	F	G	H	I	J	K	L
301					K-S Test Statistic	0.683					Mean	3.033
302					5% K-S Critical Value	0.36					SD	2.576
303			Data appear Gamma Distributed at 5% Significance Level								SE of Mean	0.409
304											95% KM (t) UCL	3.717
305			Assuming Gamma Distribution								95% KM (z) UCL	3.705
306				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	5.264
307					Minimum	0.000001					95% KM (bootstrap t) UCL	3.487
308					Maximum	14					95% KM (BCA) UCL	13.1
309					Mean	0.874					95% KM (Percentile Bootstrap) UCL	13
310					Median	0.000001					95% KM (Chebyshev) UCL	4.814
311					SD	3.095					97.5% KM (Chebyshev) UCL	5.585
312					k star	0.0779					99% KM (Chebyshev) UCL	7.099
313					Theta star	11.22						
314					Nu star	8.412			Potential UCLs to Use			
315					AppChi2	2.976					95% KM (t) UCL	3.717
316				95% Gamma Approximate UCL (Use when n >= 40)		2.471					95% KM (Percentile Bootstrap) UCL	13
317				95% Adjusted Gamma UCL (Use when n < 40)		2.546						
318	Note: DL/2 is not a recommended method.											
319												
320			Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.									
321			These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).									
322			For additional insight, the user may want to consult a statistician.									
323												
324												
325	delta-BHC											
326												
327					General Statistics							
328					Number of Valid Data	54					Number of Detected Data	10
329					Number of Distinct Detected Data	10					Number of Non-Detect Data	44
330											Percent Non-Detects	81.48%
331												
332			Raw Statistics						Log-transformed Statistics			
333					Minimum Detected	1.4					Minimum Detected	0.336
334					Maximum Detected	25					Maximum Detected	3.219
335					Mean of Detected	7.875					Mean of Detected	1.784
336					SD of Detected	6.685					SD of Detected	0.805
337					Minimum Non-Detect	1.7					Minimum Non-Detect	0.531
338					Maximum Non-Detect	31					Maximum Non-Detect	3.434
339												
340	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	54
341	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
342	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
343												
344					UCL Statistics							
345			Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only			
346					Shapiro Wilk Test Statistic	0.782					Shapiro Wilk Test Statistic	0.974
347					5% Shapiro Wilk Critical Value	0.842					5% Shapiro Wilk Critical Value	0.842
348			Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level			
349												
350			Assuming Normal Distribution						Assuming Lognormal Distribution			

	A	B	C	D	E	F	G	H	I	J	K	L
351					DL/2 Substitution Method						DL/2 Substitution Method	
352					Mean	3.844					Mean	0.936
353					SD	4.287					SD	0.87
354					95% DL/2 (t) UCL	4.821					95% H-Stat (DL/2) UCL	4.834
355												
356					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
357					**MLE method failed to converge properly**						Mean in Log Scale	0.493
358											SD in Log Scale	0.796
359											Mean in Original Scale	2.528
360											SD in Original Scale	3.793
361											95% t UCL	3.392
362											95% Percentile Bootstrap UCL	3.455
363											95% BCA Bootstrap UCL	3.826
364											95% H-UCL	2.832
365												
366					**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**	
367					k star (bias corrected)	1.423					**Data appear Gamma Distributed at 5% Significance Level**	
368					Theta Star	5.536						
369					nu star	28.45						
370												
371					A-D Test Statistic	0.272					**Nonparametric Statistics**	
372					5% A-D Critical Value	0.736					Kaplan-Meier (KM) Method	
373					K-S Test Statistic	0.736					Mean	2.837
374					5% K-S Critical Value	0.27					SD	3.804
375					**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean	0.573
376											95% KM (t) UCL	3.795
377					**Assuming Gamma Distribution**						95% KM (z) UCL	3.779
378					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	3.688
379					Minimum	0.000001					95% KM (bootstrap t) UCL	4.219
380					Maximum	25					95% KM (BCA) UCL	6.243
381					Mean	1.838					95% KM (Percentile Bootstrap) UCL	5.587
382					Median	0.000001					95% KM (Chebyshev) UCL	5.333
383					SD	4.115					97.5% KM (Chebyshev) UCL	6.413
384					k star	0.106					99% KM (Chebyshev) UCL	8.535
385					Theta star	17.37						
386					Nu star	11.43					**Potential UCLs to Use**	
387					AppChi2	4.853					95% KM (t) UCL	3.795
388					95% Gamma Approximate UCL (Use when n >= 40)	4.329						
389					95% Adjusted Gamma UCL (Use when n < 40)	4.437						
390	**Note: DL/2 is not a recommended method.**											
391												
392					**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**							
393					**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**							
394					**For additional insight, the user may want to consult a statistician.**							
395												
396												
397	**gamma-BHC(Lindane)**											
398												
399					**General Statistics**							
400					Number of Valid Data	58					Number of Detected Data	9

	A	B	C	D	E	F	G	H	I	J	K	L
401					Number of Distinct Detected Data	8					Number of Non-Detect Data	49
402											Percent Non-Detects	84.48%
403												
404					Raw Statistics						Log-transformed Statistics	
405					Minimum Detected	1.1					Minimum Detected	0.0953
406					Maximum Detected	9.9					Maximum Detected	2.293
407					Mean of Detected	4.467					Mean of Detected	1.351
408					SD of Detected	2.491					SD of Detected	0.604
409					Minimum Non-Detect	0.33					Minimum Non-Detect	-1.109
410					Maximum Non-Detect	31					Maximum Non-Detect	3.434
411												
412	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	58
413	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
414	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
415												
416	Warning: There are only 9 Detected Values in this data											
417	Note: It should be noted that even though bootstrap may be performed on this data set											
418	the resulting calculations may not be reliable enough to draw conclusions											
419												
420	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.											
421												
422												
423	UCL Statistics											
424	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
425					Shapiro Wilk Test Statistic	0.906					Shapiro Wilk Test Statistic	0.936
426					5% Shapiro Wilk Critical Value	0.829					5% Shapiro Wilk Critical Value	0.829
427	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
428												
429	Assuming Normal Distribution						Assuming Lognormal Distribution					
430					DL/2 Substitution Method						DL/2 Substitution Method	
431					Mean	2.917					Mean	0.666
432					SD	2.895					SD	0.934
433					95% DL/2 (t) UCL	3.553					95% H-Stat (DL/2) UCL	3.984
434												
435					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
436	MLE method failed to converge properly										Mean in Log Scale	-0.0402
437											SD in Log Scale	0.748
438											Mean in Original Scale	1.371
439											SD in Original Scale	1.654
440											95% t UCL	1.734
441											95% Percentile Bootstrap UCL	1.761
442											95% BCA Bootstrap UCL	1.853
443											95% H-UCL	1.561
444												
445	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
446					k star (bias corrected)	2.47	Data appear Normal at 5% Significance Level					
447					Theta Star	1.809						
448					nu star	44.46						
449												
450					A-D Test Statistic	0.278	Nonparametric Statistics					

	A–E	F	G–K	L
451	5% A-D Critical Value	0.726	Kaplan-Meier (KM) Method	
452	K-S Test Statistic	0.726	Mean	1.818
453	5% K-S Critical Value	0.281	SD	1.671
454	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	0.265
455			95% KM (t) UCL	2.261
456	**Assuming Gamma Distribution**		95% KM (z) UCL	2.254
457	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.874
458	Minimum	0.000001	95% KM (bootstrap t) UCL	2.316
459	Maximum	9.9	95% KM (BCA) UCL	3.891
460	Mean	0.693	95% KM (Percentile Bootstrap) UCL	3.669
461	Median	0.000001	95% KM (Chebyshev) UCL	2.973
462	SD	1.88	97.5% KM (Chebyshev) UCL	3.473
463	k star	0.0832	99% KM (Chebyshev) UCL	4.455
464	Theta star	8.327		
465	Nu star	9.655	**Potential UCLs to Use**	
466	AppChi2	3.728	95% KM (t) UCL	2.261
467	95% Gamma Approximate UCL (Use when n >= 40)	1.795	95% KM (Percentile Bootstrap) UCL	3.669
468	95% Adjusted Gamma UCL (Use when n < 40)	1.842		
469	**Note: DL/2 is not a recommended method.**			
470				
471	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
472	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**			
473	**For additional insight, the user may want to consult a statistician.**			
474				
475				
476	**gamma-Chlordane**			
477				
478	**General Statistics**			
479	Number of Valid Data	54	Number of Detected Data	6
480	Number of Distinct Detected Data	5	Number of Non-Detect Data	48
481			Percent Non-Detects	88.89%
482				
483	**Raw Statistics**		**Log-transformed Statistics**	
484	Minimum Detected	4.6	Minimum Detected	1.526
485	Maximum Detected	32	Maximum Detected	3.466
486	Mean of Detected	14.27	Mean of Detected	2.489
487	SD of Detected	9.476	SD of Detected	0.638
488	Minimum Non-Detect	1.12	Minimum Non-Detect	0.113
489	Maximum Non-Detect	23	Maximum Non-Detect	3.135
490				
491	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	53
492	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
493	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	98.15%
494				
495	**Warning: There are only 6 Detected Values in this data**			
496	**Note: It should be noted that even though bootstrap may be performed on this data set**			
497	**the resulting calculations may not be reliable enough to draw conclusions**			
498				
499	**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**			
500				

	A	B	C	D	E	F	G	H	I	J	K	L
501												
502						UCL Statistics						
503				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
504					Shapiro Wilk Test Statistic	0.853					Shapiro Wilk Test Statistic	0.965
505					5% Shapiro Wilk Critical Value	0.788					5% Shapiro Wilk Critical Value	0.788
506				Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
507												
508				Assuming Normal Distribution						Assuming Lognormal Distribution		
509					DL/2 Substitution Method						DL/2 Substitution Method	
510					Mean	3.695					Mean	0.791
511					SD	5.183					SD	0.928
512					95% DL/2 (t) UCL	4.876					95% H-Stat (DL/2) UCL	4.515
513												
514					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
515				MLE method failed to converge properly							Mean in Log Scale	0.0598
516											SD in Log Scale	1.031
517											Mean in Original Scale	2.389
518											SD in Original Scale	5.166
519											95% t UCL	3.566
520											95% Percentile Bootstrap UCL	3.634
521											95% BCA Bootstrap UCL	4.246
522											95% H-UCL	2.522
523												
524				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
525					k star (bias corrected)	1.67				Data appear Normal at 5% Significance Level		
526					Theta Star	8.542						
527					nu star	20.04						
528												
529					A-D Test Statistic	0.297				Nonparametric Statistics		
530					5% A-D Critical Value	0.701					Kaplan-Meier (KM) Method	
531					K-S Test Statistic	0.701					Mean	5.705
532					5% K-S Critical Value	0.334					SD	4.208
533				Data appear Gamma Distributed at 5% Significance Level							SE of Mean	0.631
534											95% KM (t) UCL	6.762
535				Assuming Gamma Distribution							95% KM (z) UCL	6.744
536					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	9.019
537					Minimum	0.000001					95% KM (bootstrap t) UCL	7.068
538					Maximum	32					95% KM (BCA) UCL	13.76
539					Mean	1.585					95% KM (Percentile Bootstrap) UCL	13.06
540					Median	0.000001					95% KM (Chebyshev) UCL	8.458
541					SD	5.381					97.5% KM (Chebyshev) UCL	9.649
542					k star	0.0767					99% KM (Chebyshev) UCL	11.99
543					Theta star	20.67						
544					Nu star	8.281				Potential UCLs to Use		
545					AppChi2	2.899					95% KM (t) UCL	6.762
546					95% Gamma Approximate UCL (Use when n >= 40)	4.528					95% KM (Percentile Bootstrap) UCL	13.06
547					95% Adjusted Gamma UCL (Use when n < 40)	4.668						
548	Note: DL/2 is not a recommended method.											
549												
550	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
551	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
552	For additional insight, the user may want to consult a statistician.											
553												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects - Baseline Petroleum Hydrocarbons								
2			User Selected Options									
3			From File	Tbl 5 rev3.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Motor Oil											
10												
11						General Statistics						
12						Number of Valid Data	48			Number of Detected Data		10
13						Number of Distinct Detected Data	9			Number of Non-Detect Data		38
14										Percent Non-Detects		79.17%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	96			Minimum Detected		4.564
18						Maximum Detected	1500			Maximum Detected		7.313
19						Mean of Detected	587			Mean of Detected		5.848
20						SD of Detected	606.9			SD of Detected		1.091
21						Minimum Non-Detect	58			Minimum Non-Detect		4.06
22						Maximum Non-Detect	370			Maximum Non-Detect		5.914
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		44
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		4
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		91.67%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.736			Shapiro Wilk Test Statistic		0.87
31						5% Shapiro Wilk Critical Value	0.842			5% Shapiro Wilk Critical Value		0.842
32				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	187.5			Mean		4.603
37						SD	338.7			SD		0.94
38						95% DL/2 (t) UCL	269.5			95% H-Stat (DL/2) UCL		212.1
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41				MLE yields a negative mean						Mean in Log Scale		3.335
42										SD in Log Scale		1.516
43										Mean in Original Scale		137
44										SD in Original Scale		353.7
45										95% t UCL		222.7
46										95% Percentile Bootstrap UCL		226.5
47										95% BCA Bootstrap UCL		247.2
48										95% H-UCL		169.9
49												
50				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		

	A	B	C	D	E	F	G	H	I	J	K	L
51					k star (bias corrected)	0.826	**Data Follow Appr. Gamma Distribution at 5% Significance Level**					
52					Theta Star	710.3						
53					nu star	16.53						
54												
55					A-D Test Statistic	0.779	**Nonparametric Statistics**					
56					5% A-D Critical Value	0.747					Kaplan-Meier (KM) Method	
57					K-S Test Statistic	0.747					Mean	201.9
58					5% K-S Critical Value	0.273					SD	329.1
59	**Data follow Appr. Gamma Distribution at 5% Significance Level**										SE of Mean	50.16
60											95% KM (t) UCL	286
61			**Assuming Gamma Distribution**								95% KM (z) UCL	284.4
62				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	275.1
63					Minimum	0.000001					95% KM (bootstrap t) UCL	315.3
64					Maximum	1500					95% KM (BCA) UCL	319.6
65					Mean	122.3					95% KM (Percentile Bootstrap) UCL	306.9
66					Median	0.000001					95% KM (Chebyshev) UCL	420.5
67					SD	358.6					97.5% KM (Chebyshev) UCL	515.1
68					k star	0.0695					99% KM (Chebyshev) UCL	700.9
69					Theta star	1760						
70					Nu star	6.669	**Potential UCLs to Use**					
71					AppChi2	1.991					95% KM (t) UCL	286
72				95% Gamma Approximate UCL (Use when n >= 40)		409.7						
73				95% Adjusted Gamma UCL (Use when n < 40)		426.4						
74	**Note: DL/2 is not a recommended method.**											
75												
76				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
77				**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**								
78				**For additional insight, the user may want to consult a statistician.**								
79												
80												
81	**Diesel**											
82												
83					**General Statistics**							
84					Number of Valid Data	48					Number of Detected Data	33
85					Number of Distinct Detected Data	31					Number of Non-Detect Data	15
86											Percent Non-Detects	31.25%
87												
88				**Raw Statistics**			**Log-transformed Statistics**					
89					Minimum Detected	3					Minimum Detected	1.099
90					Maximum Detected	200					Maximum Detected	5.298
91					Mean of Detected	42.99					Mean of Detected	3.083
92					SD of Detected	53.19					SD of Detected	1.203
93					Minimum Non-Detect	1.2					Minimum Non-Detect	0.182
94					Maximum Non-Detect	7.3					Maximum Non-Detect	1.988
95												
96	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	22
97	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	26
98	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	45.83%
99												
100					**UCL Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
101	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
102					Shapiro Wilk Test Statistic	0.723					Shapiro Wilk Test Statistic	0.954
103					5% Shapiro Wilk Critical Value	0.931					5% Shapiro Wilk Critical Value	0.931
104	**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
105												
106	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
107					DL/2 Substitution Method						DL/2 Substitution Method	
108					Mean	30.07					Mean	2.229
109					SD	47.98					SD	1.654
110					95% DL/2 (t) UCL	41.69					95% H-Stat (DL/2) UCL	77.51
111												
112					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
113					Mean	5.553					Mean in Log Scale	2.243
114					SD	71.95					SD in Log Scale	1.613
115					95% MLE (t) UCL	22.98					Mean in Original Scale	30.04
116					95% MLE (Tiku) UCL	26.2					SD in Original Scale	47.99
117											95% t UCL	41.66
118											95% Percentile Bootstrap UCL	41.87
119											95% BCA Bootstrap UCL	43.25
120											95% H UCL	71.38
121												
122	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
123					k star (bias corrected)	0.808	**Data appear Lognormal at 5% Significance Level**					
124					Theta Star	53.18						
125					nu star	53.35						
126												
127					A-D Test Statistic	0.921	**Nonparametric Statistics**					
128					5% A-D Critical Value	0.782					Kaplan-Meier (KM) Method	
129					K-S Test Statistic	0.782					Mean	30.52
130					5% K-S Critical Value	0.159					SD	47.21
131	**Data not Gamma Distributed at 5% Significance Level**										SE of Mean	6.919
132											95% KM (t) UCL	42.13
133	**Assuming Gamma Distribution**										95% KM (z) UCL	41.9
134					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	41.93
135					Minimum	0.000001					95% KM (bootstrap t) UCL	45.03
136					Maximum	200					95% KM (BCA) UCL	43.1
137					Mean	29.55					95% KM (Percentile Bootstrap) UCL	42.3
138					Median	8.375					95% KM (Chebyshev) UCL	60.68
139					SD	48.29					97.5% KM (Chebyshev) UCL	73.73
140					k star	0.144					99% KM (Chebyshev) UCL	99.37
141					Theta star	204.8						
142					Nu star	13.86	**Potential UCLs to Use**					
143					AppChi2	6.473					95% KM (Chebyshev) UCL	60.68
144					95% Gamma Approximate UCL (Use when n >= 40)	63.26						
145					95% Adjusted Gamma UCL (Use when n < 40)	64.83						
146	**Note: DL/2 is not a recommended method.**											
147												
148	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
149	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
150	**For additional insight, the user may want to consult a statistician.**											

	A	B	C	D	E	F	G	H	I	J	K	L
151												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects - Post-Remediation Metals								
2			User Selected Options									
3			From File	Tbl 2 rev5.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Arsenic											
10												
11						General Statistics						
12						Number of Valid Data	53			Number of Detected Data		29
13						Number of Distinct Detected Data	26			Number of Non-Detect Data		24
14										Percent Non-Detects		45.28%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	0.4			Minimum Detected		-0.916
18						Maximum Detected	27			Maximum Detected		3.296
19						Mean of Detected	5.767			Mean of Detected		1.057
20						SD of Detected	7.572			SD of Detected		1.186
21						Minimum Non-Detect	1.2			Minimum Non-Detect		0.182
22						Maximum Non-Detect	8.4			Maximum Non-Detect		2.128
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		48
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		5
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		90.57%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.683			Shapiro Wilk Test Statistic		0.953
31						5% Shapiro Wilk Critical Value	0.926			5% Shapiro Wilk Critical Value		0.926
32				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	4.09			Mean		0.814
37						SD	5.915			SD		1.02
38						95% DL/2 (t) UCL	5.451			95% H-Stat (DL/2) UCL		5.285
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41				MLE yields a negative mean						Mean in Log Scale		0.605
42										SD in Log Scale		1.045
43										Mean in Original Scale		3.677
44										SD in Original Scale		6.028
45										95% t UCL		5.064
46										95% Percentile Bootstrap UCL		5.151
47										95% BCA Bootstrap UCL		5.424
48										95% H-UCL		4.456
49												
50				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		

	A	B	C	D	E	F	G	H	I	J	K	L
51					k star (bias corrected)	0.783	Data appear Lognormal at 5% Significance Level					
52					Theta Star	7.369						
53					nu star	45.39						
54												
55					A-D Test Statistic	1.205	Nonparametric Statistics					
56					5% A-D Critical Value	0.78					Kaplan-Meier (KM) Method	
57					K-S Test Statistic	0.78					Mean	3.746
58					5% K-S Critical Value	0.168					SD	5.979
59		Data not Gamma Distributed at 5% Significance Level									SE of Mean	0.843
60											95% KM (t) UCL	5.158
61		Assuming Gamma Distribution									95% KM (z) UCL	5.133
62				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	5.147
63					Minimum	0.000001					95% KM (bootstrap t) UCL	5.711
64					Maximum	27					95% KM (BCA) UCL	5.161
65					Mean	3.614					95% KM (Percentile Bootstrap) UCL	5.155
66					Median	1.615					95% KM (Chebyshev) UCL	7.421
67					SD	6.099					97.5% KM (Chebyshev) UCL	9.012
68					k star	0.239					99% KM (Chebyshev) UCL	12.14
69					Theta star	15.11						
70					Nu star	25.36	Potential UCLs to Use					
71					AppChi2	14.89					95% KM (Chebyshev) UCL	7.421
72					95% Gamma Approximate UCL (Use when n >= 40)	6.157						
73					95% Adjusted Gamma UCL (Use when n < 40)	6.251						
74	Note: DL/2 is not a recommended method.											
75												
76				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
77				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
78				For additional insight, the user may want to consult a statistician.								
79												
80												
81	Cadmium											
82												
83					General Statistics							
84					Number of Valid Data	34					Number of Detected Data	0
85					Number of Distinct Detected Data	0					Number of Non-Detect Data	34
86											Percent Non-Detects	100.00%
87												
88				Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!								
89				Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!								
90				The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).								
91												
92				The data set for variable Cadmium was not processed!								
93												
94												
95												
96	Chromium											
97												
98					General Statistics							
99					Number of Valid Observations	50					Number of Distinct Observations	38
100												

	A	B	C	D	E	F	G	H	I	J	K	L
101	**Raw Statistics**						**Log-transformed Statistics**					
102					Minimum	25					Minimum of Log Data	3.219
103					Maximum	230					Maximum of Log Data	5.438
104					Mean	86.48					Mean of log Data	4.294
105					Geometric Mean	73.29					SD of log Data	0.587
106					Median	71.2						
107					SD	50.8						
108					Std. Error of Mean	7.185						
109					Coefficient of Variation	0.587						
110					Skewness	0.979						
111												
112	**Relevant UCL Statistics**											
113	**Normal Distribution Test**						**Lognormal Distribution Test**					
114					Shapiro Wilk Test Statistic	0.898					Shapiro Wilk Test Statistic	0.961
115					Shapiro Wilk Critical Value	0.947					Shapiro Wilk Critical Value	0.947
116	**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
117												
118	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
119					95% Student's-t UCL	98.52					95% H-UCL	102.5
120	**95% UCLs (Adjusted for Skewness)**										95% Chebyshev (MVUE) UCL	120.2
121					95% Adjusted-CLT UCL (Chen-1995)	99.36					97.5% Chebyshev (MVUE) UCL	134.7
122					95% Modified-t UCL (Johnson-1978)	98.69					99% Chebyshev (MVUE) UCL	163.1
123												
124	**Gamma Distribution Test**						**Data Distribution**					
125					k star (bias corrected)	3	**Data appear Gamma Distributed at 5% Significance Level**					
126					Theta Star	28.82						
127					MLE of Mean	86.48						
128					MLE of Standard Deviation	49.93						
129					nu star	300						
130					Approximate Chi Square Value (.05)	260.9	**Nonparametric Statistics**					
131					Adjusted Level of Significance	0.0452					95% CLT UCL	98.3
132					Adjusted Chi Square Value	259.8					95% Jackknife UCL	98.52
133											95% Standard Bootstrap UCL	98.07
134					Anderson-Darling Test Statistic	0.578					95% Bootstrap-t UCL	99.85
135					Anderson-Darling 5% Critical Value	0.756					95% Hall's Bootstrap UCL	99.09
136					Kolmogorov-Smirnov Test Statistic	0.114					95% Percentile Bootstrap UCL	98.17
137					Kolmogorov-Smirnov 5% Critical Value	0.126					95% BCA Bootstrap UCL	99.89
138	**Data appear Gamma Distributed at 5% Significance Level**										95% Chebyshev(Mean, Sd) UCL	117.8
139											97.5% Chebyshev(Mean, Sd) UCL	131.3
140	**Assuming Gamma Distribution**										99% Chebyshev(Mean, Sd) UCL	158
141					95% Approximate Gamma UCL (Use when n >= 40)	99.45						
142					95% Adjusted Gamma UCL (Use when n < 40)	99.86						
143												
144	**Potential UCL to Use**										Use 95% Approximate Gamma UCL	99.45
145												
146	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
147	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
148	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
149												
150												

	A	B	C	D	E	F	G	H	I	J	K	L
151	Copper											
152												
153	General Statistics											
154	Number of Valid Observations					50	Number of Distinct Observations					43
155												
156	Raw Statistics						Log-transformed Statistics					
157	Minimum					1.2	Minimum of Log Data					0.182
158	Maximum					45	Maximum of Log Data					3.807
159	Mean					13.9	Mean of log Data					2.27
160	Geometric Mean					9.678	SD of log Data					0.924
161	Median					9.95						
162	SD					11.25						
163	Std. Error of Mean					1.592						
164	Coefficient of Variation					0.809						
165	Skewness					1.106						
166												
167	Relevant UCL Statistics											
168	Normal Distribution Test						Lognormal Distribution Test					
169	Shapiro Wilk Test Statistic					0.874	Shapiro Wilk Test Statistic					0.96
170	Shapiro Wilk Critical Value					0.947	Shapiro Wilk Critical Value					0.947
171	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
172												
173	Assuming Normal Distribution						Assuming Lognormal Distribution					
174	95% Student's-t UCL					16.57	95% H-UCL					20
175	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL					24.29
176	95% Adjusted-CLT UCL (Chen-1995)					16.79	97.5% Chebyshev (MVUE) UCL					28.46
177	95% Modified-t UCL (Johnson-1978)					16.61	99% Chebyshev (MVUE) UCL					36.65
178												
179	Gamma Distribution Test						Data Distribution					
180	k star (bias corrected)					1.447	Data appear Gamma Distributed at 5% Significance Level					
181	Theta Star					9.608						
182	MLE of Mean					13.9						
183	MLE of Standard Deviation					11.56						
184	nu star					144.7						
185	Approximate Chi Square Value (.05)					117.9	Nonparametric Statistics					
186	Adjusted Level of Significance					0.0452	95% CLT UCL					16.52
187	Adjusted Chi Square Value					117.2	95% Jackknife UCL					16.57
188							95% Standard Bootstrap UCL					16.47
189	Anderson-Darling Test Statistic					0.345	95% Bootstrap-t UCL					16.81
190	Anderson-Darling 5% Critical Value					0.767	95% Hall's Bootstrap UCL					16.89
191	Kolmogorov-Smirnov Test Statistic					0.0844	95% Percentile Bootstrap UCL					16.61
192	Kolmogorov-Smirnov 5% Critical Value					0.127	95% BCA Bootstrap UCL					16.76
193	Data appear Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL					20.84
194							97.5% Chebyshev(Mean, Sd) UCL					23.84
195	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					29.74
196	95% Approximate Gamma UCL (Use when n >= 40)					17.06						
197	95% Adjusted Gamma UCL (Use when n < 40)					17.17						
198												
199	Potential UCL to Use						Use 95% Approximate Gamma UCL					17.06
200												

	A	B	C	D	E	F	G	H	I	J	K	L
201	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
202	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
203	and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.											
204												
205												
206	Lead											
207												
208	General Statistics											
209					Number of Valid Data	57			Number of Detected Data			51
210					Number of Distinct Detected Data	42			Number of Non-Detect Data			6
211									Percent Non-Detects			10.53%
212												
213	Raw Statistics						Log-transformed Statistics					
214					Minimum Detected	0.72			Minimum Detected			-0.329
215					Maximum Detected	82			Maximum Detected			4.407
216					Mean of Detected	16.76			Mean of Detected			2.148
217					SD of Detected	18.69			SD of Detected			1.261
218					Minimum Non-Detect	3			Minimum Non-Detect			1.099
219					Maximum Non-Detect	8.4			Maximum Non-Detect			2.128
220												
221	Note: Data have multiple DLs - Use of KM Method is recommended								Number treated as Non-Detect			30
222	For all methods (except KM, DL/2, and ROS Methods),								Number treated as Detected			27
223	Observations < Largest ND are treated as NDs								Single DL Non-Detect Percentage			52.63%
224												
225	UCL Statistics											
226	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
227					Lilliefors Test Statistic	0.209			Lilliefors Test Statistic			0.12
228					5% Lilliefors Critical Value	0.124			5% Lilliefors Critical Value			0.124
229	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
230												
231	Assuming Normal Distribution						Assuming Lognormal Distribution					
232					DL/2 Substitution Method				DL/2 Substitution Method			
233					Mean	15.34			Mean			2.04
234					SD	18.16			SD			1.238
235					95% DL/2 (t) UCL	19.36			95% H-Stat (DL/2) UCL			26.04
236												
237					Maximum Likelihood Estimate(MLE) Method				Log ROS Method			
238					Mean	5.521			Mean in Log Scale			2.028
239					SD	28.47			SD in Log Scale			1.244
240					95% MLE (t) UCL	11.83			Mean in Original Scale			15.29
241					95% MLE (Tiku) UCL	13.55			SD in Original Scale			18.19
242									95% t UCL			19.32
243									95% Percentile Bootstrap UCL			19.52
244									95% BCA Bootstrap UCL			20.01
245									95% H UCL			26.03
246												
247	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
248					k star (bias corrected)	0.836	Data appear Lognormal at 5% Significance Level					
249					Theta Star	20.06						
250					nu star	85.26						

	A	B	C	D	E	F	G	H	I	J	K	L
251												
252					A-D Test Statistic	0.88				Nonparametric Statistics		
253					5% A-D Critical Value	0.787					Kaplan-Meier (KM) Method	
254					K-S Test Statistic	0.787					Mean	15.27
255					5% K-S Critical Value	0.129					SD	18.05
256				Data not Gamma Distributed at 5% Significance Level							SE of Mean	2.416
257											95% KM (t) UCL	19.31
258				Assuming Gamma Distribution							95% KM (z) UCL	19.24
259					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	19.3
260					Minimum	0.000001					95% KM (bootstrap t) UCL	20.4
261					Maximum	82					95% KM (BCA) UCL	19.48
262					Mean	15.02					95% KM (Percentile Bootstrap) UCL	19.63
263					Median	7.8					95% KM (Chebyshev) UCL	25.79
264					SD	18.4					97.5% KM (Chebyshev) UCL	30.35
265					k star	0.363					99% KM (Chebyshev) UCL	39.3
266					Theta star	41.42						
267					Nu star	41.34				Potential UCLs to Use		
268					AppChi2	27.6					95% KM (Chebyshev) UCL	25.79
269					95% Gamma Approximate UCL (Use when n >= 40)	22.49						
270					95% Adjusted Gamma UCL (Use when n < 40)	22.73						
271	Note: DL/2 is not a recommended method.											
272												
273	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
274	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
275	For additional insight, the user may want to consult a statistician.											
276												
277												
278	Mercury											
279												
280					General Statistics							
281					Number of Valid Data	50					Number of Detected Data	12
282					Number of Distinct Detected Data	12					Number of Non-Detect Data	38
283											Percent Non-Detects	76.00%
284												
285				Raw Statistics						Log-transformed Statistics		
286					Minimum Detected	0.01					Minimum Detected	-4.605
287					Maximum Detected	0.2					Maximum Detected	-1.609
288					Mean of Detected	0.0828					Mean of Detected	-2.793
289					SD of Detected	0.0595					SD of Detected	0.898
290					Minimum Non-Detect	0.019					Minimum Non-Detect	-3.963
291					Maximum Non-Detect	0.42					Maximum Non-Detect	-0.868
292												
293	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	50
294	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
295	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
296												
297					UCL Statistics							
298				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
299					Shapiro Wilk Test Statistic	0.916					Shapiro Wilk Test Statistic	0.94
300					5% Shapiro Wilk Critical Value	0.859					5% Shapiro Wilk Critical Value	0.859

	A	B	C	D	E	F	G	H	I	J	K	L
301	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
302												
303	Assuming Normal Distribution						Assuming Lognormal Distribution					
304					DL/2 Substitution Method						DL/2 Substitution Method	
305					Mean	0.0661					Mean	-3.184
306					SD	0.0609					SD	1.021
307					95% DL/2 (t) UCL	0.0806					95% H-Stat (DL/2) UCL	0.0986
308												
309					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
310	MLE method failed to converge properly										Mean in Log Scale	-3.876
311											SD in Log Scale	0.823
312											Mean in Original Scale	0.0319
313											SD in Original Scale	0.0407
314											95% t UCL	0.0416
315											95% Percentile Bootstrap UCL	0.0417
316											95% BCA Bootstrap UCL	0.0437
317											95% H-UCL	0.0375
318												
319	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
320					k star (bias corrected)	1.414	Data appear Normal at 5% Significance Level					
321					Theta Star	0.0585						
322					nu star	33.93						
323												
324					A-D Test Statistic	0.213	Nonparametric Statistics					
325					5% A-D Critical Value	0.743					Kaplan-Meier (KM) Method	
326					K-S Test Statistic	0.743					Mean	0.0358
327					5% K-S Critical Value	0.249					SD	0.0453
328	Data appear Gamma Distributed at 5% Significance Level										SE of Mean	0.00783
329											95% KM (t) UCL	0.049
330	Assuming Gamma Distribution										95% KM (z) UCL	0.0487
331					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.0471
332					Minimum	0.000001					95% KM (bootstrap t) UCL	0.051
333					Maximum	0.2					95% KM (BCA) UCL	0.0648
334					Mean	0.0278					95% KM (Percentile Bootstrap) UCL	0.0576
335					Median	0.015					95% KM (Chebyshev) UCL	0.07
336					SD	0.0442					97.5% KM (Chebyshev) UCL	0.0847
337					k star	0.192					99% KM (Chebyshev) UCL	0.114
338					Theta star	0.144						
339					Nu star	19.21	Potential UCLs to Use					
340					AppChi2	10.27					95% KM (t) UCL	0.049
341					95% Gamma Approximate UCL (Use when n >= 40)	0.0519					95% KM (Percentile Bootstrap) UCL	0.0576
342					95% Adjusted Gamma UCL (Use when n < 40)	0.0529						
343	Note: DL/2 is not a recommended method.											
344												
345	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
346	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
347	For additional insight, the user may want to consult a statistician.											
348												
349												
350	Nickel											

	A	B	C	D	E	F	G	H	I	J	K	L
351												
352						General Statistics						
353					Number of Valid Observations	50					Number of Distinct Observations	35
354												
355					Raw Statistics						Log-transformed Statistics	
356					Minimum	12					Minimum of Log Data	2.485
357					Maximum	280					Maximum of Log Data	5.635
358					Mean	77.24					Mean of log Data	3.966
359					Geometric Mean	52.76					SD of log Data	0.9
360					Median	44.75						
361					SD	67.15						
362					Std. Error of Mean	9.497						
363					Coefficient of Variation	0.869						
364					Skewness	1.218						
365												
366						Relevant UCL Statistics						
367					Normal Distribution Test						Lognormal Distribution Test	
368					Shapiro Wilk Test Statistic	0.826					Shapiro Wilk Test Statistic	0.902
369					Shapiro Wilk Critical Value	0.947					Shapiro Wilk Critical Value	0.947
370					Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level	
371												
372					Assuming Normal Distribution						Assuming Lognormal Distribution	
373					95% Student's-t UCL	93.16					95% H-UCL	105.5
374					95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL	128
375					95% Adjusted-CLT UCL (Chen-1995)	94.61					97.5% Chebyshev (MVUE) UCL	149.5
376					95% Modified-t UCL (Johnson-1978)	93.44					99% Chebyshev (MVUE) UCL	191.8
377												
378					Gamma Distribution Test						Data Distribution	
379					k star (bias corrected)	1.382					Data do not follow a Discernable Distribution (0.05)	
380					Theta Star	55.89						
381					MLE of Mean	77.24						
382					MLE of Standard Deviation	65.7						
383					nu star	138.2						
384					Approximate Chi Square Value (.05)	112					Nonparametric Statistics	
385					Adjusted Level of Significance	0.0452					95% CLT UCL	92.86
386					Adjusted Chi Square Value	111.3					95% Jackknife UCL	93.16
387											95% Standard Bootstrap UCL	92.35
388					Anderson-Darling Test Statistic	2.033					95% Bootstrap-t UCL	95.1
389					Anderson-Darling 5% Critical Value	0.768					95% Hall's Bootstrap UCL	96.44
390					Kolmogorov-Smirnov Test Statistic	0.185					95% Percentile Bootstrap UCL	92.85
391					Kolmogorov-Smirnov 5% Critical Value	0.128					95% BCA Bootstrap UCL	95.07
392					Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL	118.6
393											97.5% Chebyshev(Mean, Sd) UCL	136.5
394					Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL	171.7
395					95% Approximate Gamma UCL (Use when n >= 40)	95.28						
396					95% Adjusted Gamma UCL (Use when n < 40)	95.88						
397												
398					Potential UCL to Use						Use 95% Chebyshev (Mean, Sd) UCL	118.6
399												
400					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Selenium

General Statistics

Number of Valid Data	50	Number of Detected Data	13
Number of Distinct Detected Data	11	Number of Non-Detect Data	37
		Percent Non-Detects	74.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.25	Minimum Detected	-1.386
Maximum Detected	5.6	Maximum Detected	1.723
Mean of Detected	2.303	Mean of Detected	0.475
SD of Detected	1.823	SD of Detected	0.957
Minimum Non-Detect	0.25	Minimum Non-Detect	-1.386
Maximum Non-Detect	3.4	Maximum Non-Detect	1.224
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	47
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.883	Shapiro Wilk Test Statistic	0.951
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.056	Mean	-0.504
SD	1.247	SD	1.08
95% DL/2 (t) UCL	1.352	95% H-Stat (DL/2) UCL	1.574
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.24
		SD in Log Scale	1.204
		Mean in Original Scale	0.73
		SD in Original Scale	1.307
		95% t UCL	1.04
		95% Percentile Bootstrap UCL	1.036
		95% BCA Bootstrap UCL	1.1
		95% H-UCL	0.93

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.235	Data appear Normal at 5% Significance Level
Theta Star	1.865	
nu star	32.1	

	A	B	C	D	E	F	G	H	I	J	K	L
451					A-D Test Statistic	0.271	Nonparametric Statistics					
452					5% A-D Critical Value	0.75					Kaplan-Meier (KM) Method	
453					K-S Test Statistic	0.75					Mean	0.852
454					5% K-S Critical Value	0.241					SD	1.268
455	Data appear Gamma Distributed at 5% Significance Level										SE of Mean	0.192
456											95% KM (t) UCL	1.173
457	Assuming Gamma Distribution										95% KM (z) UCL	1.167
458			Gamma ROS Statistics using Extrapolated Data								95% KM (jackknife) UCL	1.122
459					Minimum	0.000001					95% KM (bootstrap t) UCL	1.265
460					Maximum	5.6					95% KM (BCA) UCL	1.5
461					Mean	0.604					95% KM (Percentile Bootstrap) UCL	1.345
462					Median	0.000001					95% KM (Chebyshev) UCL	1.688
463					SD	1.36					97.5% KM (Chebyshev) UCL	2.049
464					k star	0.0963					99% KM (Chebyshev) UCL	2.76
465					Theta star	6.272						
466					Nu star	9.627	Potential UCLs to Use					
467					AppChi2	3.71					95% KM (t) UCL	1.173
468			95% Gamma Approximate UCL (Use when n >= 40)			1.567					95% KM (Percentile Bootstrap) UCL	1.345
469			95% Adjusted Gamma UCL (Use when n < 40)			1.614						
470	Note: DL/2 is not a recommended method.											
471												
472	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
473	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
474	For additional insight, the user may want to consult a statistician.											
475												
476												
477	Vanadium											
478												
479	General Statistics											
480					Number of Valid Observations	50					Number of Distinct Observations	37
481												
482	Raw Statistics						Log-transformed Statistics					
483					Minimum	16					Minimum of Log Data	2.773
484					Maximum	140					Maximum of Log Data	4.942
485					Mean	58.19					Mean of log Data	3.922
486					Geometric Mean	50.48					SD of log Data	0.552
487					Median	52						
488					SD	30.76						
489					Std. Error of Mean	4.351						
490					Coefficient of Variation	0.529						
491					Skewness	0.745						
492												
493	Relevant UCL Statistics											
494	Normal Distribution Test						Lognormal Distribution Test					
495					Shapiro Wilk Test Statistic	0.927					Shapiro Wilk Test Statistic	0.966
496					Shapiro Wilk Critical Value	0.947					Shapiro Wilk Critical Value	0.947
497	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
498												
499	Assuming Normal Distribution						Assuming Lognormal Distribution					
500					95% Student's-t UCL	65.49					95% H-UCL	68.43

	A	B	C	D	E	F	G	H	I	J	K	L
501	**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL					79.71
502	95% Adjusted-CLT UCL (Chen-1995)					65.84	97.5% Chebyshev (MVUE) UCL					88.85
503	95% Modified-t UCL (Johnson-1978)					65.56	99% Chebyshev (MVUE) UCL					106.8
504												
505	**Gamma Distribution Test**						**Data Distribution**					
506	k star (bias corrected)					3.468	**Data appear Gamma Distributed at 5% Significance Level**					
507	Theta Star					16.78						
508	MLE of Mean					58.19						
509	MLE of Standard Deviation					31.25						
510	nu star					346.8						
511	Approximate Chi Square Value (.05)					304.7	**Nonparametric Statistics**					
512	Adjusted Level of Significance					0.0452	95% CLT UCL					65.35
513	Adjusted Chi Square Value					303.5	95% Jackknife UCL					65.49
514							95% Standard Bootstrap UCL					65.41
515	Anderson-Darling Test Statistic					0.363	95% Bootstrap-t UCL					66.12
516	Anderson-Darling 5% Critical Value					0.755	95% Hall's Bootstrap UCL					65.79
517	Kolmogorov-Smirnov Test Statistic					0.0954	95% Percentile Bootstrap UCL					65.08
518	Kolmogorov-Smirnov 5% Critical Value					0.126	95% BCA Bootstrap UCL					66.6
519	**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL					77.16
520							97.5% Chebyshev(Mean, Sd) UCL					85.36
521	**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL					101.5
522	95% Approximate Gamma UCL (Use when n >= 40)					66.25						
523	95% Adjusted Gamma UCL (Use when n < 40)					66.5						
524												
525	**Potential UCL to Use**						Use 95% Approximate Gamma UCL					66.25
526												
527	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
528	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
529	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
530												
531												
532	**Zinc**											
533												
534	**General Statistics**											
535	Number of Valid Observations					50	Number of Distinct Observations					42
536												
537	**Raw Statistics**						**Log-transformed Statistics**					
538	Minimum					10	Minimum of Log Data					2.303
539	Maximum					180	Maximum of Log Data					5.193
540	Mean					47.1	Mean of log Data					3.635
541	Geometric Mean					37.91	SD of log Data					0.678
542	Median					44						
543	SD					32.25						
544	Std. Error of Mean					4.561						
545	Coefficient of Variation					0.685						
546	Skewness					1.645						
547												
548	**Relevant UCL Statistics**											
549	**Normal Distribution Test**						**Lognormal Distribution Test**					
550	Shapiro Wilk Test Statistic					0.867	Shapiro Wilk Test Statistic					0.964

	A	B	C	D	E	F	G	H	I	J	K	L
551					Shapiro Wilk Critical Value	0.947					Shapiro Wilk Critical Value	0.947
552			**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**			
553												
554			**Assuming Normal Distribution**						**Assuming Lognormal Distribution**			
555					95% Student's-t UCL	54.75					95% H-UCL	58.04
556			**95% UCLs (Adjusted for Skewness)**								95% Chebyshev (MVUE) UCL	69.05
557					95% Adjusted-CLT UCL (Chen-1995)	55.74					97.5% Chebyshev (MVUE) UCL	78.4
558					95% Modified-t UCL (Johnson-1978)	54.92					99% Chebyshev (MVUE) UCL	96.76
559												
560			**Gamma Distribution Test**						**Data Distribution**			
561					k star (bias corrected)	2.324			**Data appear Gamma Distributed at 5% Significance Level**			
562					Theta Star	20.26						
563					MLE of Mean	47.1						
564					MLE of Standard Deviation	30.89						
565					nu star	232.4						
566					Approximate Chi Square Value (.05)	198.2			**Nonparametric Statistics**			
567					Adjusted Level of Significance	0.0452					95% CLT UCL	54.6
568					Adjusted Chi Square Value	197.2					95% Jackknife UCL	54.75
569											95% Standard Bootstrap UCL	54.46
570					Anderson-Darling Test Statistic	0.617					95% Bootstrap-t UCL	56.14
571					Anderson-Darling 5% Critical Value	0.76					95% Hall's Bootstrap UCL	57.42
572					Kolmogorov-Smirnov Test Statistic	0.125					95% Percentile Bootstrap UCL	54.68
573					Kolmogorov-Smirnov 5% Critical Value	0.127					95% BCA Bootstrap UCL	55.7
574			**Data appear Gamma Distributed at 5% Significance Level**								95% Chebyshev(Mean, Sd) UCL	66.98
575											97.5% Chebyshev(Mean, Sd) UCL	75.58
576			**Assuming Gamma Distribution**								99% Chebyshev(Mean, Sd) UCL	92.48
577					95% Approximate Gamma UCL (Use when n >= 40)	55.25						
578					95% Adjusted Gamma UCL (Use when n < 40)	55.51						
579												
580			**Potential UCL to Use**								Use 95% Approximate Gamma UCL	55.25
581												
582	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
583	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
584	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
585												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects - Post-Remediation Petroleum Hydrocarbons								
2			User Selected Options									
3			From File	Tbl 5 rev5.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Motor Oil											
10												
11						General Statistics						
12						Number of Valid Data	8			Number of Detected Data		0
13						Number of Distinct Detected Data	0			Number of Non-Detect Data		8
14										Percent Non-Detects		100.00%
15												
16						Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!						
17						Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!						
18						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
19												
20						The data set for variable Motor Oil was not processed!						
21												
22												
23												
24	Diesel											
25												
26						General Statistics						
27						Number of Valid Data	8			Number of Detected Data		4
28						Number of Distinct Detected Data	4			Number of Non-Detect Data		4
29										Percent Non-Detects		50.00%
30												
31						Raw Statistics				Log-transformed Statistics		
32						Minimum Detected	3.6			Minimum Detected		1.281
33						Maximum Detected	15			Maximum Detected		2.708
34						Mean of Detected	9.65			Mean of Detected		2.125
35						SD of Detected	5.275			SD of Detected		0.653
36						Minimum Non-Detect	1.2			Minimum Non-Detect		0.182
37						Maximum Non-Detect	1.3			Maximum Non-Detect		0.262
38												
39						Note: Data have multiple DLs - Use of KM Method is recommended				Number treated as Non-Detect		4
40						For all methods (except KM, DL/2, and ROS Methods),				Number treated as Detected		4
41						Observations < Largest ND are treated as NDs				Single DL Non-Detect Percentage		50.00%
42												
43						Warning: There are only 4 Distinct Detected Values in this data						
44						Note: It should be noted that even though bootstrap may be performed on this data set						
45						the resulting calculations may not be reliable enough to draw conclusions						
46												
47						It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.						
48												
49												
50						UCL Statistics						

	A–F	G–L
51	**Normal Distribution Test with Detected Values Only**	**Lognormal Distribution Test with Detected Values Only**
52	Shapiro Wilk Test Statistic 0.936	Shapiro Wilk Test Statistic 0.92
53	5% Shapiro Wilk Critical Value 0.748	5% Shapiro Wilk Critical Value 0.748
54	**Data appear Normal at 5% Significance Level**	**Data appear Lognormal at 5% Significance Level**
55		
56	**Assuming Normal Distribution**	**Assuming Lognormal Distribution**
57	DL/2 Substitution Method	DL/2 Substitution Method
58	Mean 5.131	Mean 0.817
59	SD 5.938	SD 1.462
60	95% DL/2 (t) UCL 9.109	95% H-Stat (DL/2) UCL 85.56
61		
62	Maximum Likelihood Estimate(MLE) Method	Log ROS Method
63	Mean 1.887	Mean in Log Scale 1.137
64	SD 9.257	SD in Log Scale 1.18
65	95% MLE (t) UCL 8.087	Mean in Original Scale 5.453
66	95% MLE (Tiku) UCL 9.514	SD in Original Scale 5.673
67		95% t UCL 9.253
68		95% Percentile Bootstrap UCL 8.576
69		95% BCA Bootstrap UCL 9.325
70		95% H UCL 35.39
71		
72	**Gamma Distribution Test with Detected Values Only**	**Data Distribution Test with Detected Values Only**
73	k star (bias corrected) 1.087	**Data appear Normal at 5% Significance Level**
74	Theta Star 8.881	
75	nu star 8.692	
76		
77	A-D Test Statistic 0.313	**Nonparametric Statistics**
78	5% A-D Critical Value 0.659	Kaplan-Meier (KM) Method
79	K-S Test Statistic 0.659	Mean 6.625
80	5% K-S Critical Value 0.396	SD 4.425
81	**Data appear Gamma Distributed at 5% Significance Level**	SE of Mean 1.807
82		95% KM (t) UCL 10.05
83	**Assuming Gamma Distribution**	95% KM (z) UCL 9.597
84	Gamma ROS Statistics using Extrapolated Data	95% KM (jackknife) UCL 9.994
85	Minimum 0.000001	95% KM (bootstrap t) UCL 8.692
86	Maximum 15	95% KM (BCA) UCL N/A
87	Mean 4.825	95% KM (Percentile Bootstrap) UCL 13.5
88	Median 1.8	95% KM (Chebyshev) UCL 14.5
89	SD 6.207	97.5% KM (Chebyshev) UCL 17.91
90	k star 0.151	99% KM (Chebyshev) UCL 24.6
91	Theta star 31.94	
92	Nu star 2.417	**Potential UCLs to Use**
93	AppChi2 0.223	95% KM (t) UCL 10.05
94	95% Gamma Approximate UCL (Use when n >= 40) 52.31	95% KM (Percentile Bootstrap) UCL 13.5
95	95% Adjusted Gamma UCL (Use when n < 40) N/A	
96	**Note: DL/2 is not a recommended method.**	
97		
98	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**	
99	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**	
100	**For additional insight, the user may want to consult a statistician.**	

	A	B	C	D	E	F	G	H	I	J	K	L
101												

SEVERN TRENT STL

RECEIVED
MAR - 6 2003
ERLER & KALINOWSKI, INC

March 4, 2003

Ms. Michelle King
Erler & Kalinowski, Inc.
1870 Ogden Drive
Burlingame, CA 94010-5306

Dear Ms. King:

Thank you for your patience while STL San Francisco has reviewed your questions regarding the Presidio of San Francisco site investigation. The purpose of this letter is to address your issues regarding Cadmium data reported for this project.

Erler & Kalinowski (EKI) noted and communicated to STL San Francisco that Cadmium levels reported for this project were slightly elevated with respect to previous data. Based on that observation, EKI requested that STL SF review the metals data associated with this project. All QC measurements and supporting documentation were reviewed by STL San Francisco. It was determined that the performance of the instrumentation and procedures used at the time of data generation were in accordance with the SW-846 protocol. Since iron is known to cause positive interference for Cadmium by ICP technology, a specific focus was made on that issue during our review.

STL-San Francisco analyzes Interference Correction Samples (ICSAB) at a minimum of twice daily in order to assure that the Interelement Correction Factors previously established produce results within control limits when the check is performed. In the case of the data produced for Presidio, the results of the ICSAB check standard are well within control limits for this QC check. However, due to our focus on the interference caused by iron for cadmium, it was noted that there is a slightly low bias for the correction applied to Cadmium in the presence of Iron. In solid samples, that low bias for correcting for iron interference with Cadmium translates to between 1 and 2 PPM in the sample. We feel this may account for the slight elevation observed for the Presidio project. ICP technology may not be not well-suited to the tighter requirements needed at Presidio when analyzing samples very close to the detection limit of the technology.

Due to the complexity of interelement correction in ICP technology, it is not possible to state with certainty exactly how much Cadmium in each sample is due to interference from other elements, including iron. However, it is not unreasonable to assume that the amounts of Cadmium reported by the laboratory in this project could be elevated by as much as 1 to 2 PPM as a result of Iron interference and the data can be qualified as such.

We greatly appreciate the opportunity to work with EKI on this important project and hope that this discussion addresses your concerns. Please do not hesitate to contact me should you have any additional questions or concerns regarding this project.

Regards,
Severn Trent Laboratories

Tod Granicher
Project Manager

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

04 November 2003

Ms. Dorinda Shipman
Treadwell & Rollo
555 Montgomery St.
Suite 1300
San Francisco, CA 94111

Subject: Cadmium Data for Presidio Firing Ranges (C&T Reports 166460, 166561, 166566, 166624, 166682)

Dear Ms. Shipman:

Curtis & Tompkins has investigated the cadmium results reported above 0.8 mg/Kg in the sample delivery groups (SDGs) listed above based upon a request by Dave Kleesattel of Treadwell & Rollo. The request was made September 18, 2003; the original analyses were completed on August 8, 2003.

These analyses were performed by ICP-AES (EPA 6010B), a technique that measures the presence of elements via their characteristic light spectra emitted when burned in a torch. Many elements have overlapping spectra that cause a well understood method bias toward false positives and over-limit error. C&T routinely implements procedures to minimize the effects of inter-element interferences in environmental measurements.

These samples contain reasonably high levels of Iron, an element that potentially interferes with low level Cadmium measurements. After discussion discussion between Treadwell & Rollo and C&T about the original analysis performed in August, the original digestates still available in September were screened for cadmium using ICP-MS (EPA 6020) in order to remove the potential interference. All samples analyzed by ICP-MS produced ND (none detected) results for cadmium. The screen results were inserted into the table provided at the original request which is included as an attachment. Based on these observations, C&T is implementing additional procedures designed to reduce this type of inter-element interference.

I hope this addresses your concerns regarding this issue. If you have any questions or would like to discuss this information, please call me at (510)-486-0925 x 104.

Sincerely,

Steven Stanley
Project Manager

Curtis & Tompkins, Ltd.

Sample ID (T&R)	Lab ID (C&T)	Cadmium (mg/kg)	Cadmium (mg/kg)
		ICP	ICP-MS
MGBSB06[1]	166460-017	1.2	<0.25
MGBSB16[1]	166460-001	1.7	<0.25
CHPSB02[0.3]	166624-041	1.1	No digest
CHPSB08[1]	166624-011	0.81	No digest
CHPSB12[2]	166624-037	0.97	No digest
CHPSB12[3]	166624-038	1.9	No digest
CHPSB22[0.3]	166561-042	1	<0.25
CHPSB25[1]	***	1	No digest
BAPSB10[1]MSD	166682-013	1.2	<0.25
BAPSB12[1]	166682-004	1.1	<0.25
BAPSB13[0.3]	166566-004	1.7	<0.25
BAPSB13[1]	166566-005	1.3	<0.25
DUP072503A	166561-029	1	<0.25
DUP08103C	166682-005	1.2	<0.25

"No digest" indicates the original digest has already been discarded

Appendix E

Evaluation of Background Metals in Mountain Lake Sediment

Appendix E: Evaluation of Background Metals in Mountain Lake Sediment

This appendix presents the background soil types that exist in Mountain Lake sediment and evaluates whether metals concentrations detected in Mountain Lake sediment are consistent with concentrations associated with native material. Bivariate scatter plots for metals data were prepared for sediment samples collected from Mountain Lake to assist in the evaluation. The data for Mountain Lake are compared with data representing background at the Presidio for serpentinite and the Colma formation and with regional background data for greenstone. This evaluation demonstrates that Mountain Lake sediment is likely a mix of Colma formation and greenstone. As such, concentrations of chromium, nickel, and vanadium in Mountain Lake sediment are likely representative of background in the native soil and fill deposited in Mountain Lake.

E.1 Introduction

Mountain Lake overlies the Colma formation (Trust et.al. 2000). However, the Lake was filled in 1939 with cuttings and materials from construction of Park Presidio Boulevard and the associated MacArthur Tunnel. Boring logs for Mountain Lake show the presence of olive/gray fines, which indicates the possible presence of greenstone materials (URS 2011). Therefore, sediment in the Lake contains imported materials from nearby areas in the Presidio and is not necessarily representative of the underlying Colma formation.

Bivariate scatter plots have been used previously at the Presidio to evaluate soil metals data (EKI 2002, MACTEC 2009). The bivariate scatter plots present pairs of metal concentrations (e.g. chromium and nickel) for site data and background data sets. The scatter plots can be visually examined to assess whether the site data are consistent with one or more background data sets, which would indicate that the site data are representative of background conditions and not contamination.

The cleanup levels that were used as screening levels in the *Remedial Investigation Summary and Risk Evaluation* are based upon background metals concentrations characterized for the Colma formation (RI Summary; URS 2011). Following the proposed remedial action in the FS/RAP, several metals (chromium, nickel, and vanadium) would remain at concentrations above Colma formation background levels.

Bivariate scatter plots were prepared for chromium, nickel, and vanadium to evaluate whether the concentrations in Mountain Lake sediment are representative of background conditions associated with either serpentinite or the Colma formation. Scatter plots were not prepared for the greenstone formation because a Presidio background data set is not available for greenstone.

E.2 Data Used for Scatter Plots

The analytical data that were used in the bivariate scatter plots are presented in Table E-1. The analytical data for chromium, nickel, and vanadium in Mountain Lake sediment are presented in Appendix A of this FS/RAP and were obtained from Table 2 of the RI Summary (URS 2011). To focus on the data that might be associated with contamination, all existing data for only those locations where concentrations would exceed cleanup levels following removal of sediment from the remedial action area (main text, Section 3.6.3) were used. The analytical data for chromium, nickel, and vanadium that represent background concentrations in serpentinite and the Colma formation

were obtained from Appendix C of the *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water* (EKI 2002).

For non-detect results, the reporting limit was used in the bivariate plots.

E.3 Evaluation and Results of Scatter Plots

Initially, bivariate scatter plots were prepared for the three metals (chromium, nickel, and vanadium) for background serpentinite, background Colma formation, and Mountain Lake sediment. These scatter plots are presented in Figure E-1. Overall, the Mountain Lake data appear to be more closely correlated with the Colma formation data.

To better evaluate the Mountain Lake data relative to the Colma formation background, bivariate scatter plots were prepared for chromium, nickel, and vanadium in Mountain Lake sediment and Colma formation samples. These scatter plots are presented in Figure E-2. Overall, the relationship between the paired metals appears to be consistent between the Mountain Lake and Colma formation; however, the overall concentrations are generally higher in the Mountain Lake samples.

E.4 Evidence of Greenstone Formation and Background Metals Concentrations in Mountain Lake Sediment

Greenstone is a native, secondary geologic unit that occurs at the Presidio (Schlocker 1974; EKI 2002). It is a dark greenish gray to gray olive colored basaltic rock that is interbedded with the Jurassic/Cretaceous sedimentary rocks and the Chert/Shale of the Franciscan Formation (EKI 2002). Greenstone has been identified in fill at Graded Area 9, which is in the vicinity of Mountain Lake at the Presidio, and at the Transfer Station, which is located above the MacArthur Tunnel from which the cuttings were placed in Mountain Lake during construction of Park Presidio Boulevard (EKI 2002).

A Presidio background data set is not available for greenstone. However, concentrations in greenstone are reported to range from 15 to 300 milligrams per kilogram (mg/kg) for chromium, 150 to 300 mg/kg for nickel, and 150 to 300 mg/kg for vanadium (EKI 2002) based on the chemical compositions of greenstone in the San Francisco Quadrangle (Schlocker 1974). Greenstone is geochemically similar to serpentinite in that it naturally contains higher concentrations of chromium and nickel than other geologic units. It is distinctive from serpentine in that it contains nickel and chromium in the hundreds of parts per million (ppm) instead of thousands of ppm, and greenstone typically contains several hundred ppm of vanadium (EKI 2002).

The following evidence supports that greenstone is present in sediment of Mountain Lake, and concentrations of chromium, nickel, and vanadium in Mountain Lake sediment are indicative of this soil type:

- Samples collected from Lake sediment contain concentrations of chromium, nickel, and vanadium within the expected range for greenstone in the San Francisco Quadrangle. Detected concentrations in the Mountain Lake samples range from 44 to 190 mg/kg for chromium, 23 to 230 mg/kg for nickel, and 36 to 140 mg/kg for vanadium.

- The concentration distribution of metals in the Mountain Lake sediment compare with the distribution of metals in the Colma and serpentinite data sets as expected for greenstone. As shown on the scatter plots, the sediment samples in Mountain Lake contain levels of nickel and chromium that are higher than in the Colma formation background data set, but lower than in

the serpentinite data set. The Mountain Lake sediment samples also contain higher concentrations of vanadium than both the Colma and serpentinite background data sets. These metal distributions in Lake sediment are characteristic of greenstone.

- The relationships between chromium, nickel, and vanadium concentrations in Mountain Lake sediment are consistent, which suggests a similar source for these metals.
- Olive/gray fines were noted in logs from Lake cores (URS 2011). These fines are consistent with the characterization of moderately altered greenstone; whereas, exposed and weathered greenstone would likely be moderate brown, dark yellowish-brown, or moderate reddish-brown in color (Schlocker 1974).

E.5 Conclusion

Mountain Lake sediment appears to contain native materials and fill at the Presidio that are likely a mix of Colma formation and greenstone. The concentrations of chromium, nickel, and vanadium detected in Mountain Lake sediment are consistent with the presence of greenstone, which is further supported by the boring logs for Mountain Lake and the history of fill placement in the Lake.

E.6 References

EKI. 2002. Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water, Presidio of San Francisco. October 2002. Revised 16 May 2006.

MACTEC. 2009. Field Data Report, Data Gaps Investigation for Fill Site 1 and Landfill 2.

Schlocker, J. 1974. Geology of the San Francisco North Quadrangle, CA.

URS Corporation. 2011. Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco. Prepared for the Presidio Trust. October 2011.

Table E-1: Metals Data for Scatter Plots

Data Set	Sample ID	Depth (ft)[a]	Sample Date	Chromium (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)
Mountain Lake Sediment[b]						
	MLSE - 1	6	01/24/01	140	150	100
		7	01/24/01	110	110	70
		9	01/24/01	53	25	43
	MLSE - 2	6	01/25/01	190	150	110
		8	01/25/01	110	120	78
	MLSE - 3	6	01/25/01	100	120	74
		7	01/25/01	190	210	140
		9	01/25/01	110	120	76
	MLSE - 6	5	01/25/01	140	170	85
		6	01/25/01	160	220	97
		8	01/25/01	190	200	110
	MLSE - 7	6	01/25/01	93	96	73
		7	01/25/01	110	120	84
		9	01/25/01	80	88	57
	MLSE - 8	6	01/24/01	160	81	120
		7	01/24/01	44	26	37
		9	01/24/01	48	26	41
	MLSE - 9	6	01/24/01	100	120	76
		8	01/24/01	82	90	68
	MLSE - 12	5	01/24/01	120	110	84
		6	01/24/01	87	120	64
		8	01/24/01	60	33	56
	MLSE - 16	6	09/28/04	-[c]	-	-
		7	09/28/04	-	-	-
	MLSE-24	1	09/29/04	48	29	36
		2.5	09/29/04	63	53	39
		5	09/29/04	94	110	69
	MLSE - 27	5	09/30/04	110	93	94
		6	09/30/04	44	23	37
Background Serpentinite[d]						
	1a	NA	10/16/96	1380	2590	29.3
	1b	NA	10/16/96	1310	2290	34.7
	1c	NA	10/16/96	1520	2210	38.6
	1d	NA	10/16/96	1680	2290	39.7
	BKGDSB04	0	09/02/92	750	1120	27.7
	BKGDSB10	18	12/07/94	1290	1940	36.2
	BKGDSB14	1.5	12/08/94	1050	3670	27
	BKGDSB15	14.5	12/08/94	672	3950	40.2
	BKGDSB15	20.5	12/08/94	910	2530	34.2
	BKGDSO03A	0.3	11/27/90	812	2190	11.8
	UBR01SB02	NA	02/24/99	1160	2070	35.2
	UBR02SB02	NA	02/25/99	-	1950	10.4
	1261 WEST	10	06/21/93	493	1430	50.2
	1351SO01B	17	10/26/90	753	2600	28.4
	1351SO02B	15	10/29/90	1270	2530	56
	GCEX01	3	10/19/98	1350	3510	48.7
	GCEX02	3	10/19/98	1090	4290	28.8
	GCEX03	3	10/19/98	586	2880	25.3
	GCEX05	2	08/07/92	556	1020	84.4
	TRENCH II	1	09/16/93	914	1430	35.8
	UST 1221.3 EAST	14	09/29/93	786	882	61
	UST 1221.4 EAST	14	09/29/93	527	686	54.4

Table E-1: Metals Data for Scatter Plots

Data Set	Sample ID	Depth (ft)[(a)]	Sample Date	Chromium (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)
Background Colma[(d)]						
	BKGDSB01	2	08/21/92	100	97.5	63.3
	BKGDSB01	5	08/21/92	90.2	89.1	55.4
	BKGDSB11	5	12/07/94	78.3	34.6	64.9
	BKGDSB12	5	12/07/94	51.8	63	37.2
	BKGDSB12	9.5	12/07/94	64.6	69.3	43.3
	BKGDSB13	5	12/07/94	78.4	78.5	43.7
	BKGDSB13	9.5	12/07/94	67.8	38.5	41.6
	LF10BK01	21.5	09/06/94	55.6	34.1	43.4
	LF10BK03	57.5	09/06/94	103	123	49.4
	LF10BK1BDUP	0	09/06/94	41.4	40.6	42.6
	CFLSSB01	4	11/18/94	58	31.2	42.4
	CFLSSB02	3	11/18/94	58.3	48.1	35
	DAEGW04	8	10/19/92	96.9	67.8	43.1
	DAESB03	28	08/26/92	58.9	59.1	40.3
	LF6SB01	20	11/20/94	24	37.2	12
	LF6SB01	9	11/20/94	43.7	43.7	34.7
	LF6SB02	20	11/20/94	30.5	43.6	19.6
	LF6SB02	3	11/20/94	49.7	61	31.6
	LF6SB02	8	11/20/94	41.8	53.9	27.5
	LF6SB03	20	11/20/94	51.5	64	29.2
	LF6SB03	3	11/20/94	81	72.1	49.9
	LF6SB03	8	11/20/94	50.2	50.2	32.7
	LF6SB04	20.5	11/20/94	41.8	32.5	29
	LF6SB04	8	11/20/94	26.4	37.4	16.5
	LF6SB05	20	11/20/94	28	40.3	19
	LF6SB05	3.5	11/20/94	41.4	51.5	29.1
	LF6SB05	8.5	11/20/94	42.1	42.1	23.8
	LF6SB06	20	11/20/94	36.9	47.6	31
	LF6SB06	3	11/20/94	91.8	71.7	54.9
	LF6SB06	8	11/20/94	52.3	62.2	48
	LF6SO03B	7.5	11/08/90	149	77.4	-
	LF8SO02B	19	10/01/90	79.2	77	73.1
	LF8SO03B	19	10/02/90	120	84.2	85
	NKSB13	10	12/05/94	40.2	-	34.1
	NKSB14	1.5	12/07/94	53.6	31.2	45.8
	NKSB15	5	12/07/94	53.8	51.8	44.8

Notes:

(a) Depths are below sediment surface for Mountain Lake sediment and below ground surface for background serpentinite and Colma data.

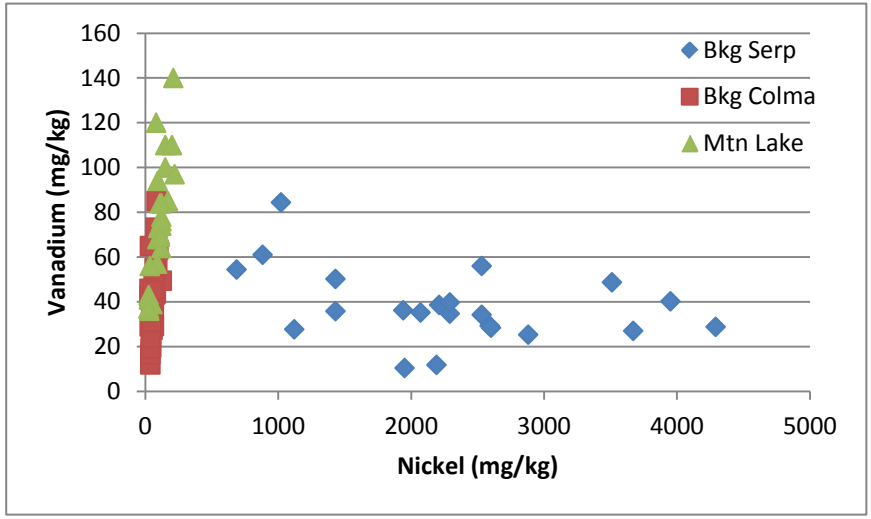
(b) Mountain Lake sediment data were obtained from Table 2 of the Remedial Investigation Summary and Risk Evaluation (URS 2011). Only those locations in Option 4 where metal concentrations exceed cleanup levels following remediation are included.

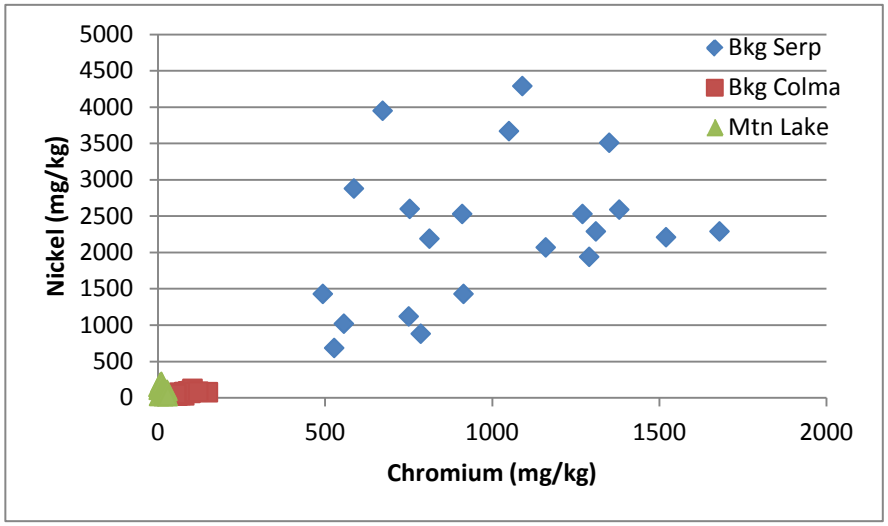
(c) '-' indicates that the sample was not analyzed for the metal.

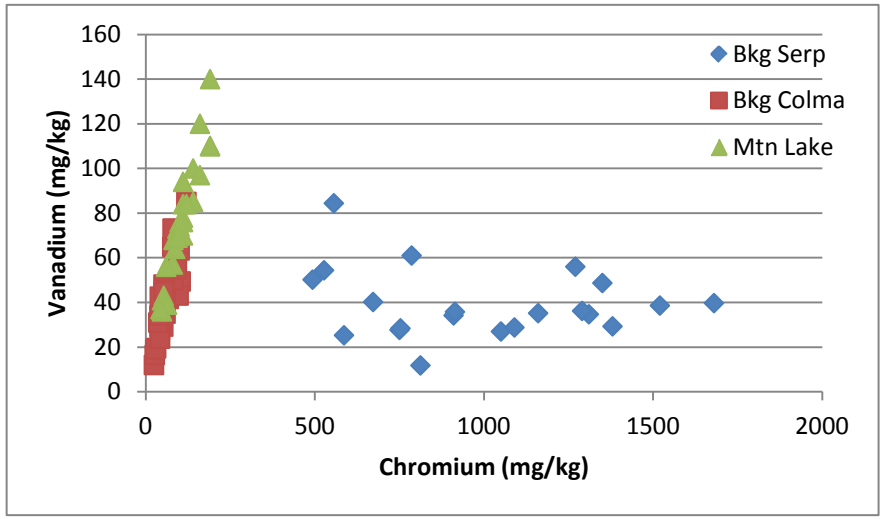
(d) Background serpentinite and Colma data were obtained from Table I2 of the Field Data Report for Fill Site 1 and Landfill 2 (MACTEC 2009).

Abbreviations:

ft - feet
mg/kg - milligrams per kilogram
NA - not available







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San Francisco, California

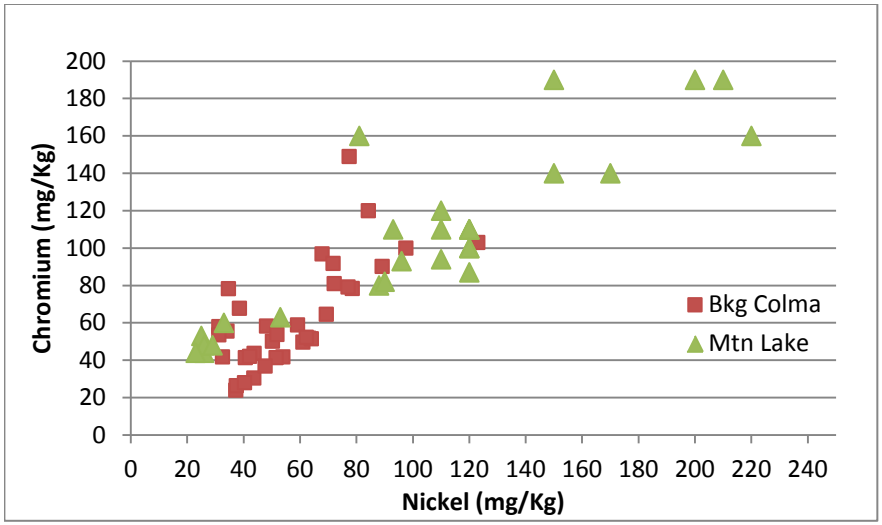
Mountain Lake - Feasibility Study/Remedial Action Plan

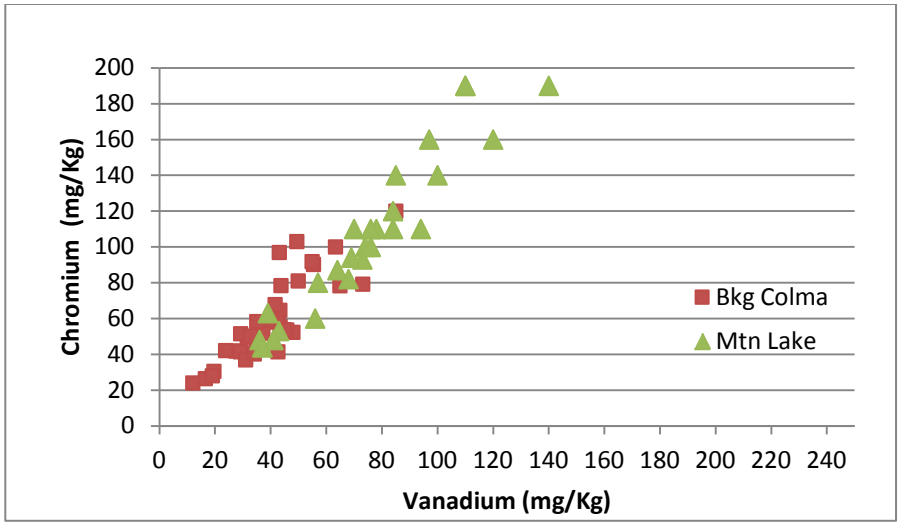
Mountain Lake versus Background Data

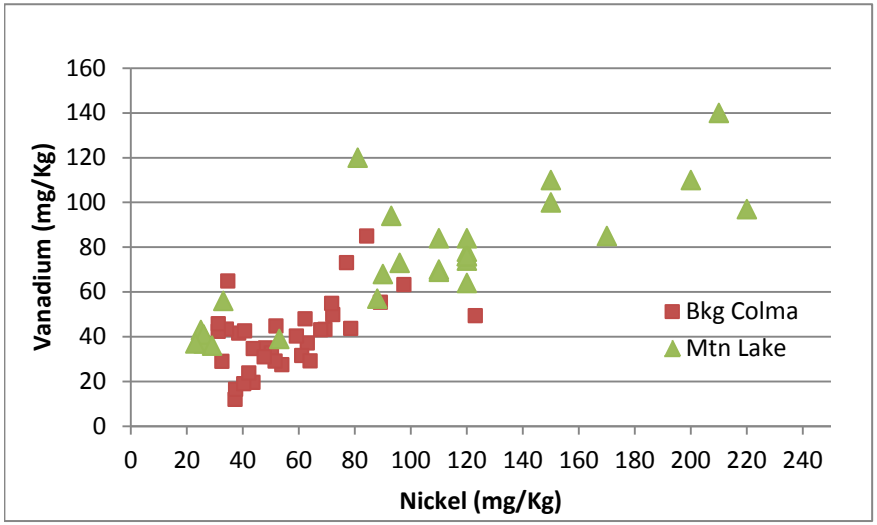
K/J 1165014*00

March 2012

Figure E-1







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Mountain Lake - Feasibility Study/Remedial Action Plan

Background Colma versus Mountain Lake

K/J 1165014*00

March 2012

Figure E-2

Appendix F

Green Remediation Evaluation Matrices

Table F-1: Green Remediation Evaluation Matrix (GREM)[a]
Alternative 1: No Action

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Substance Release/Production				
Airborne NOx & SOx	Air	Acid rain & photochemical smog	N	This remedial alternative is not a source of substantial airborne NOx and SOx emissions.
Chloro-fluorocarbon vapors	Air	Ozone depletion	N	This remedial alternative is not a source of substantial chloro-fluorocarbon vapors.
Greenhouse gas emissions	Air	Atmospheric warming	N	This remedial alternative is not a source of greenhouse gas emissions.
Airborne particulates, toxic vapors, gases, water vapor	Air	General air pollution, toxic air, humidity increase	N	This remedial alternative is not a source of substantial airborne particulates, toxic vapors, gases, or water vapor.
Liquid waste production	Water	Water toxicity, sediment toxicity, sediment	N	This remedial alternative is not a source of substantial liquid waste production.
Solid waste production	Land	Land use, toxicity	N	This remedial alternative is not a source of substantial solid waste production.
Thermal Releases				
Warm water	Water	Habitat warming	N	This remedial alternative is not a source of substantial warm water.
Warm vapor	Air	Atmospheric humidity	N	This remedial alternative is not a source of substantial warm vapor.
Physical Disturbances/Disruptions				
Soil structure disruption	Land	Habitat destruction/ soil Infertility	N	This remedial alternative is not a source of substantial soil structure disruption.
Noise, odor, vibration, aesthetics	General environment	Nuisance & safety	N	This remedial alternative is not a source of substantial noise, odor, vibration, or aesthetic disruptions.
Traffic	Land; general environment	Nuisance & safety	N	This remedial alternative is not a source of traffic disruption.
Land stagnation	Land; general environment	Remediation time; cleanup efficiency; re-development	Y	The primary land stagnation issue in this remedial alternative is due to the loss of beneficial use of Mountain Lake sediments for support of ecological resources, as the No Action alternative has been deemed to be insufficiently protective of ecological receptors.

Table F-1: Green Remediation Evaluation Matrix (GREM)[a]
Alternative 1: No Action

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Resource Depletion/Gain (Recycling)				
Petroleum (energy)	Subsurface	Consumption	N	This remedial alternative is not a source of substantial petroleum or energy depletion or gain.
Mineral	Subsurface	Consumption	N	This remedial alternative is not a source of substantial mineral depletion or gain.
Construction materials (soil, concrete, plastic)	Land	Consumption, reuse	N	This remedial alternative is not a source of substantial construction materials depletion or gain.
Land & space	Land	Impoundment, reuse	Y	The primary land & space depletion in this remedial alternative is due to the reduced of beneficial use of Mountain Lake for ecological habitat.
Surface water & groundwater	Water, land (subsidence)	Impoundment, sequester, reuse	Y	The primary land & space depletion in this remedial alternative is due to the reduced of beneficial use of Mountain Lake for ecological habitat.
Biology resources (plants, trees, animals, microorganisms)	Air, water, land, forest, subsurface	Species disappearance, diversity reduction regenerative ability reduction	Y	This remedial alternative is not a source of substantial biological depletion or gain during remedy implementation, but has the potential to stress biology resources through the risk of continued exposure, due to the current sediment quality.

Notes:

(a) Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).

(b) Advisory Instructions: "The impacts associated with physical, chemical, or biological stressors are evaluated for each alternative and then assembled into the GREM, a matrix of applicable environmental stress factors and their consequences, constituting a qualitative framework for comparing remedial options" (pg. 2). According to the advisory, qualitative scoring is the most practical approach to rendering the GREM matrix useful as a tool in evaluating opportunities for optimization of remedial alternatives (pg. 23).

Table F-2: Green Remediation Evaluation Matrix (GREM)[a]
Alternative 2: Capping

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Substance Release/Production				
Airborne NOx & SOx	Air	Acid rain & photochemical smog	Y	The primary emissions from this remedial alternative are due to engine exhaust from material handling. This alternative requires importing and placing approximately 10,390 cubic yards of material. New materials would be obtained from local sources where possible.
Chloro-fluorocarbon vapors	Air	Ozone depletion	N	This remedial alternative is not a source of substantial chloro-fluorocarbon vapors.
Greenhouse gas emissions	Air	Atmospheric warming	Y	The primary emissions from this remedial alternative are due to engine exhaust from material handling. This alternative requires importing and placing approximately 10,390 cubic yards of material. New materials would be obtained from local sources where possible.
Airborne particulates, toxic vapors, gases, water vapor	Air	General air pollution, toxic air, humidity increase	Y	The primary airborne particulate emissions from this remedial alternative are due to fugitive dust from material handling. This alternative requires importing and placing approximately 10,390 cubic yards of material. New materials would be obtained from local sources where possible.
Liquid waste production	Water	Water toxicity, sediment toxicity, sediment	Y	The primary source of liquid waste production in this remedial alternative is due to stormwater during an estimated half a year of construction activities. A Stormwater Pollution Prevention Plan is being developed for upcoming construction activities to minimize stormwater runoff from staging areas, and construction activities would be phased primarily in the dry season to minimize stormwater effects.
Solid waste production	Land	Land use, toxicity	N	This remedy focuses on on-site placement of clean material such that offhaul of sediments would not be required. The primary source of solid waste production in this remedial alternative is expected to be from general construction debris, over-ordering of engineered cover materials, etc.

Table F-2: Green Remediation Evaluation Matrix (GREM)[a] Alternative 2: Capping

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Thermal Releases				
Warm water	Water	Habitat warming	N	This remedial alternative is not a source of substantial warm water.
Warm vapor	Air	Atmospheric humidity	Y	The primary warm vapor release from this remedial alternative is due to engine exhaust from material handling. This alternative requires importing and placing approximately 6,500 cubic yards of material. New materials would be obtained from local sources where possible.
Physical Disturbances/Disruptions				
Soil structure disruption	Land	Habitat destruction, soil Infertility	Y	The primary soil structure disruption from this remedial alternative would occur as dredge and barge equipment is mobilized to the site and places approximately 10,390 cubic yards of new cover material in the lake.
Noise, odor, vibration, aesthetics	General environment	Nuisance & safety	Y	The primary aesthetic disruption in this remedial alternative is due to the noise, odor, vibration and aesthetic impact of importing and placing approximately 10,390 cubic yards of material. This process is expected to require approximately half a year of active construction.
Traffic	Land; general environment	Nuisance & safety	Y	The primary traffic disruption in this remedial alternative is due to the import of approximately 10,390 cubic yards of locally-obtained material for capping, over approximately half a year.
Land stagnation	Land; general environment	Remediation time; cleanup efficiency; re-development	Y	The primary land stagnation issue in this remedial alternative is due to the loss of beneficial use of Mountain Lake sediments for ecological habitat. This alternative involves permanent stagnation of the intended future land use outlined in the 2002 Presidio Trust Management Plan, since Alternative 2 involves capping existing sediments and deepening the lake water depth.
Resource Depletion/Gain (Recycling)				
Petroleum (energy)	Subsurface	Consumption	Y	The primary petroleum depletion in this remedial alternative is due to the engine fuel demands of material handling. This alternative requires importing and placing approximately 10,390 cubic yards of material. New materials would be obtained from local sources where possible.
Mineral	Subsurface	Consumption	N	This remedial alternative is not a source of substantial mineral depletion or gain.

Table F-2: Green Remediation Evaluation Matrix (GREM)[a] Alternative 2: Capping

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Construction materials (soil, concrete, plastic)	Land	Consumption, reuse	Y	The primary construction materials depletion in this remedial alternative is due to the consumption of approximately 10,390 cubic yards of imported clean cap material.
Land & space	Land	Impoundment, reuse	Y	The primary land & space depletion in this remedial alternative is due to the reduced of beneficial use of Mountain Lake for ecological habitat.
Surface water & groundwater	Water, land (subsidence)	Impoundment, sequester, reuse	Y	The primary land & space depletion in this remedial alternative is due to the reduced of beneficial use of Mountain Lake for ecological habitat.
Biology resources (plants, trees, animals, microorganisms)	Air, water, land, forest, subsurface	Species disappearance, diversity reduction regenerative ability reduction	Y	The primary biological gain in this remedial alternative is due to the protection against contact with Mountain Lake sediment.

Notes:

(a) Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).

(b) Advisory Instructions: "The impacts associated with physical, chemical, or biological stressors are evaluated for each alternative and then assembled into the GREM, a matrix of applicable environmental stress factors and their consequences, constituting a qualitative framework for comparing remedial options" (pg. 2). According to the advisory, qualitative scoring is the most practical approach to rendering the GREM matrix useful as a tool in evaluating opportunities for optimization of remedial alternatives (pg. 23).

Table F-3: Green Remediation Evaluation Matrix (GREM)[a]
Alternative 3: Dredging with Limited Capping

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Substance Release/Production				
Airborne NOx & SOx	Air	Acid rain & photochemical smog	Y	The primary emissions from this remedial alternative are due to engine exhaust from material handling. This alternative requires dredging and transport of approximately 15,600 cubic yards of sediment for disposal at a regional disposal facility located hundreds of miles from the site.
Chloro-fluorocarbon vapors	Air	Ozone depletion	N	This remedial alternative is not a source of substantial chloro-fluorocarbon vapors.
Greenhouse gas emissions	Air	Atmospheric warming	Y	The primary greenhouse gas emissions from this remedial alternative are due to engine exhaust from material handling. This alternative requires dredging and transport of approximately 15,600 cubic yards of sediment for disposal at a regional disposal facility located hundreds of miles from the site.
Airborne particulates, toxic vapors, gases, water vapor	Air	General air pollution, toxic air, humidity increase	Y	The primary airborne particulate emissions from this remedial alternative are due to odors from dredged material handling. This alternative requires dredging and transport of approximately 15,600 cubic yards of sediment for disposal at a regional disposal facility located hundreds of miles from the site.
Liquid waste production	Water	Water toxicity, sediment toxicity, sediment	Y	The primary source of liquid waste production in this remedial alternative is elutriate from the sediment dewatering operations. It is anticipated that the elutriate would meet water quality standards for discharge back into the lake. However, confirmation testing and contingent treatment would be implemented as needed.
Solid waste production	Land	Land use, toxicity	Y	By far, the primary source of solid waste production in this remedial alternative is the approximately 15,600 cubic yards of dredged sediment requiring off-site disposal.
Thermal Releases				
Warm water	Water	Habitat warming	N	This remedial alternative is not a source of substantial warm water.
Warm vapor	Air	Atmospheric humidity	Y	The primary warm vapor release from this remedial alternative is due to engine exhaust from material handling. This alternative requires dredging and transport of approximately 15,600 cubic yards of sediment for disposal at a regional disposal facility located hundreds of miles from the site.

Table F-3: Green Remediation Evaluation Matrix (GREM)[a]
Alternative 3: Dredging with Limited Capping

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Physical Disturbances/Disruptions				
Soil structure disruption	Land	Habitat destruction, soil Infertility	Y	This remedial alternative involves extensive sediment structure disruption as dredging progresses and equipment is mobilized to the staging area to process the approximately 15,600 cubic yards of sediment.
Noise, odor, vibration, aesthetics	General environment	Nuisance & safety	Y	The primary aesthetic disruption in this remedial alternative is due to the noise, odor, vibration and aesthetic impact of dredging, processing, and off-hauling approximately 15,600 cubic yards of sediment. This process is expected to require approximately 6 months of active construction.
Traffic	Land; general environment	Nuisance & safety	Y	The primary traffic disruption in this remedial alternative is due to the offhauling of approximately 15,600 cubic yards of sediment to a facility located hundreds of miles from the site, over approximately 6 months.
Land stagnation	Land; general environment	Remediation time; cleanup efficiency; re-development	Y	The primary land stagnation issue in this remedial alternative is due to the loss of beneficial use of Mountain Lake sediment for ecological habitat during the anticipated 6-month construction period.
Resource Depletion/Gain (Recycling)				
Petroleum (energy)	Subsurface	Consumption	N	The primary petroleum depletion in this remedial alternative is due to the engine fuel demands of material handling. This alternative requires dredging and transport of approximately 15,600 cubic yards of sediment for disposal at a regional disposal facility located hundreds of miles from the site.
Mineral	Subsurface	Consumption	N	This remedial alternative is not a source of substantial mineral depletion or gain.
Construction materials (soil, concrete, plastic)	Land	Consumption, reuse	N	This remedial alternative is not a source of substantial consumption of construction materials.
Land & space	Land	Impoundment, reuse	Y	The primary land & space gain in this remedial alternative is due to the reinstated beneficial use of Mountain Lake sediment for ecological habitat.
Surface water & groundwater	Water, land (subsidence)	Impoundment, sequester, reuse	Y	The primary water resource gain in this remedial alternative is due to the deepening of the lake, which contributes to water quality and ecological habitat enrichment.

Table F-3: Green Remediation Evaluation Matrix (GREM)[a]
Alternative 3: Dredging with Limited Capping

Stressors	Affected Media	Mechanism/ Effect	Y/N	Score[b]
Biology resources (plants, trees, animals, microorganisms)	Air, water, land, forest, subsurface	Species disappearance, diversity reduction regenerative ability reduction	Y	The primary biological gain in this remedial alternative is due to the protection against contact with Mountain Lake contaminated sediments.

Notes:

(a) Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).

(b) Advisory Instructions: "The impacts associated with physical, chemical, or biological stressors are evaluated for each alternative and then assembled into the GREM, a matrix of applicable environmental stress factors and their consequences, constituting a qualitative framework for comparing remedial options" (pg. 2). According to the advisory, qualitative scoring is the most practical approach to rendering the GREM matrix useful as a tool in evaluating opportunities for optimization of remedial alternatives (pg. 23).

Appendix G

Summary of Cost Opinions

Table G-1: Summary of Costs - Alternative 2 Capping

Site: Mountain Lake
Location: The Presidio of San Francisco, California
Phase: Feasibility Study (-30% to +50%)
Base Year: 2012
Date: 03/06/12

Description: Alternative 2 consists of capping nearly the entire footprint of the Lake to eliminate exposure to contaminated sediments. Capital costs occur in Year 0. Annual O&M costs occur in Years 1 - 30. Periodic costs occur in Years 5, 10, 15, 20, 25, and 30.

CAPITAL COSTS:

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Mobilization/Demobilization					
Mobilization/Div 0&1 Submittals	1	LS	$214,000	$214,000	Say approximately 7.5% of other costs.
Demobilization	1	LS	$71,000	$71,000	Say approximately 2.5% of other costs.
SUBTOTAL				**$285,000**	
Site Preparation and Access					
Brush and Tree Removal	1	LS	$160,000	$160,000	Staging area, western slope, north arm
Temporary Security Fencing	1,800	LF	$18	$32,400	Chain link, 6' high, cost per RS Means
Plastic Net Fencing	1,800	LF	$3.00	$5,400	High visibility plastic ESA type
Utility Service (Electrical and Water)	1	LS	$100,000	$100,000	POC 1,200' to west, costs per other Presidio sites
Access Roads	800	SY	$11	$8,800	Temporary access to dock, ~485' x 14', costs per RS Means
Shoreline Access	800	SF	$73	$58,400	Wooden pier on piles; 20'x40', costs per RS Means
Clear and Grub	5	AC	$10,000	$50,000	Staging area and north arm of Lake, costs per contractor input
Class III T&D	900	TON	$60	$54,000	Disposal of green waste, costs per other Presidio sites
Site Grading to Prepare Level Laydown Areas	24,200	SY	$6.00	$145,200	Staging area and north arm of Lake, costs per contractor input
SUBTOTAL				**$614,200**	
Construction Stormwater Management and Erosion Control					
Linear Erosion Control	900	LF	$5.00	$4,500	e.g. silt fence, costs per other Presidio sites
Linear Sediment Control	7,500	LF	$4.00	$30,000	e.g. fiber rolls, costs per other Presidio sites
Aerial Erosion Control	24,200	SY	$5.00	$121,000	e.g. erosion control blankets, cost per other Presidio sites
Stockpile Management	28,100	CY	$4.00	$112,400	Cover and berm/fiber roll perimeter, costs per contractor input
Other SW Mngmnt & Erosion Control Measures	1	LS	$27,500	$27,500	Allowance for general SW housekeeping
SWPPP Documentation	1	LS	$27,500	$27,500	Includes initial prep and SMARTs updates
SUBTOTAL				**$322,900**	
Transport, Storage, and Placement of Cap Materials					
Purchase and Deliver	10,400	CY	$58	$603,200	24-in clean sand section, costs per RS Means
Loading from Staging Area to Short Haul Truck	10,400	CY	$7.00	$72,800	Excavator or front end loader, costs per RS Means
Short Haul from Staging Area to Barge	10,400	CY	$6.00	$62,400	Small dump truck, <0.5mi, costs per RS Means
Loading from Short Haul Truck to Barge	10,400	CY	$7.00	$72,800	Excavator or front end loader, costs per RS Means
Capping Operation	10,400	CY	$40	$416,000	Barge and tremie placement, costs per contractor input
SUBTOTAL				**$1,227,200**	
Construction Monitoring					
Bathymetric Surveying	4	EA	$5,600	$22,400	Initial, two progress, final, cost per surveyor quote
Cap Cores	20	EA	$570	$11,400	10 locations during progress then final
Natural Resource Monitoring	1	LS	$33,000	$33,000	During initial staging operations, cost per other Presidio sites
SUBTOTAL				**$66,800**	
Environmental Monitoring					
Turbidity Monitoring	60	DAY	$280	$16,800	4 locations per day, 12 weeks
Water Quality Sampling	48	EA	$570	$27,360	4 locations, 1 sample/location/week
Suspended Solids Analysis	48	EA	$26	$1,248	1 analysis per sample, costs per lab fee sheet
Total Dissolved Solids Analysis	48	EA	$26	$1,248	1 analysis per sample, costs per lab fee sheet
Title 22 Metals Analysis	48	EA	$166	$7,968	1 analysis per sample, costs per lab fee sheet
SUBTOTAL				**$54,624**	
Post-Construction Stormwater Management and Erosion Control					
Linear Erosion Control	900	LF	$5.00	$4,500	e.g. silt fence, costs per other Presidio sites
Linear Sediment Control	7,500	LF	$4.00	$30,000	e.g. fiber rolls, costs per other Presidio sites
Aerial Erosion Control	24,200	SY	$5.00	$121,000	e.g. erosion control blankets, cost per other Presidio sites
Other Stormwater Management and Erosion Control Measures	1	LS	$27,500	$27,500	Allowance for general SW housekeeping
SUBTOTAL				**$183,000**	

Table G-1: Summary of Costs - Alternative 2 Capping

CAPITAL COSTS (cont'd):

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Site Restoration					
Grading to Restore Drainage	24,200	SY	$3.00	$72,600	Staging area and north arm of Lake, costs per RS Means
Soil Preparation for Planting	220	MSF	$66	$14,520	Raking to accept amendments, costs per RS Means
Soil Amendments	24,200	SY	$0.12	$2,904	Common fertilizer, costs per RS Means
Temporary Irrigation	1	LS	$150,000	$150,000	May be required for forest/landscape, cost per other Presidio sites
Planting	1	LS	$150,000	$150,000	In accordance with VMP, cost per other Presidio sites
SUBTOTAL				**$390,024**	
SUBTOTAL				**$3,143,748**	
Contingency	25%			$785,937	10% scope + 15% bid contingencies per USEPA 2000
SUBTOTAL				**$3,929,685**	
Project Management	5%			$196,484	5% for $2M-$10M size projects per USEPA 2000
Remedial Design	8%			$314,375	8% for $2M-$10M size projects per USEPA 2000
Construction Management	6%			$235,781	6% for $2M-$10M size projects per USEPA 2000
Construction Completion Report				$50,000	
Institutional Controls					
Land Use Covenant				$10,000	Required by DTSC
Operation and Management Plan				$10,000	Required by DTSC
Site Information Database				$5,000	Required by DTSC
SUBTOTAL				**$821,640**	
TOTAL CAPITAL COST				**$3,965,388**	

O&M COSTS:

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Site Maintenance					
Annual Inspection	1	EA	$1,100	$1,100	Prep and 1-day site visit by tech
Annual Reporting	1	EA	$3,800	$3,800	Report includes updated mapping/photos
SUBTOTAL				**$4,900**	
Environmental Monitoring					
Bathymetric Survey and Camera	1	EA	$5,600	$5,600	Thickness monitored for integrity, cost per surveyor quote
Sediment Sampling	10	EA	$570	$5,700	10 locations annually
Title 22 Metals Analysis	10	EA	$155	$1,550	1 analysis per sample, costs per lab fee sheet
Water Quality Sampling	10	EA	$570	$5,700	10 locations annually
Title 22 Metals Analysis	10	EA	$155	$1,550	1 analysis per sample, costs per lab fee sheet
Annual Reporting	1	EA	$3,800	$3,800	Report includes updated figures/tables
SUBTOTAL				**$23,900**	
SUBTOTAL				**$28,800**	
Contingency	30%			$8,640	10% scope + 20% bid contingencies per USEPA 2000
SUBTOTAL				**$37,440**	
Project Management	5%			$1,872	5% per USEPA 2000
Technical Support	10%			$3,744	10% per USEPA 2000
Institutional Controls					
Update Site Information Database				$1,000	Update and maintain database
SUBTOTAL				**$6,616**	
TOTAL ANNUAL O&M COST				**$72,856**	

Table G-1: Summary of Costs - Alternative 2 Capping

PERIODIC COSTS:

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Year 5					
Special Inspection	1	EA	$1,800	$1,800	1-day site visit per inspection by PE
Five Year Review Report	1	EA	$7,200	$7,200	56 hours per report by PE and staff eng
Update Institutional Control Plans	1	EA	$5,000	$5,000	
SUBTOTAL				**$14,000**	
Year 10					
Special Inspection	1	EA	$1,800	$1,800	1-day site visit per inspection by PE
Five Year Review Report	1	EA	$7,200	$7,200	56 hours per report by PE and staff eng
Update Institutional Control Plans	1	EA	$5,000	$5,000	
SUBTOTAL				**$14,000**	
Year 15					
Special Inspection	1	EA	$1,800	$1,800	1-day site visit per inspection by PE
Five Year Review Report	1	EA	$7,200	$7,200	56 hours per report by PE and staff eng
Update Institutional Control Plans	1	EA	$5,000	$5,000	
SUBTOTAL				**$14,000**	
Year 20					
Special Inspection	1	EA	$1,800	$1,800	1-day site visit per inspection by PE
Five Year Review Report	1	EA	$7,200	$7,200	56 hours per report by PE and staff eng
Update Institutional Control Plans	1	EA	$5,000	$5,000	
SUBTOTAL				**$14,000**	
Year 25					
Special Inspection	1	EA	$1,800	$1,800	1-day site visit per inspection by PE
Five Year Review Report	1	EA	$7,200	$7,200	56 hours per report by PE and staff eng
Update Institutional Control Plans	1	EA	$5,000	$5,000	
SUBTOTAL				**$14,000**	
Year 30					
Special Inspection	1	EA	$1,800	$1,800	1-day site visit per inspection by PE
Five Year Review Report	1	EA	$7,200	$7,200	56 hours per report by PE and staff eng
Update Institutional Control Plans	1	EA	$5,000	$5,000	
SUBTOTAL				**$14,000**	

PRESENT VALUE ANALYSIS:

YEAR	COST TYPE	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
0	Capital Cost	$3,965,388	$3,965,388	1.000	$3,965,388	
1 - 30	Annual O&M Cost	$2,185,680	$72,856	12.409	$904,073	
5	Periodic Cost	$14,000	$14,000	0.713	$9,982	Five year review
10	Periodic Cost	$14,000	$14,000	0.508	$7,117	Five year review
15	Periodic Cost	$14,000	$14,000	0.362	$5,074	Five year review
20	Periodic Cost	$14,000	$14,000	0.258	$3,618	Five year review
25	Periodic Cost	$14,000	$14,000	0.184	$2,579	Five year review
30	Periodic Cost	$14,000	$14,000	0.131	$1,839	Five year review
					$4,899,671	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$4,899,671**	

Table G-1: Summary of Costs - Alternative 2 Capping

Notes:

(a) The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative.

(b) These are planning level costs and are developed to minus 30 percent to plus 50 percent accuracy.

(c) These costs have not been developed based on engineering designs, but rather represent a general opinion of cost based on estimates from similar projects, standard costing guidance documents, professional judgment, and information provided by the client.

(d) Excluded from the cost estimate are costs for labor, materials, and fees associated with permits and access agreements, construction bonds, construction insurance, permits, responses and revisions based on permit requirements, legal fees, and other administrative fees, unless otherwise noted.

(e) Assumed capping production rate equals 100 cubic yards per hour.

(f) Periodic costs do not include potential costs associated with cap repairs, which would be substantial (i.e. scope of work similar to initial cap installation).

(g) Costs associated with ramp design and construction are not included as the technical feasibility of constructing and operating the ramps is not yet known.

(h) USEPA 1994 - EPA 905-B94-003: ARCS Remediation Guidance Document. Chicago, Ill.: Great Lakes National Program Office.

(i) USEPA 2000 - EPA 540-R-00-002: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. July 2000.

(j) USEPA 2002 - Explanation of Significant Differences, Middle Waterway Commencement Bay Nearshore/Tidelflats Superfund Site. Office of Environmental Cleanup. February 2002.

Table G-2: Summary of Costs - Alternative 3 Dredging

Site: Mountain Lake
Location: The Presidio of San Francisco, California
Phase: Feasibility Study (-30% to +50%)
Base Year: 2012
Date: 03/06/12

Description: Alternative 3 consists of dredging nearly the entire footprint of the Lake to a depth ranging from 2.5 to 6.5 feet, off site disposal, and limited capping where slope stability prevents removal. Capital costs occur in Year 0. There are no annual O&M or periodic costs associated with this alternative.

CAPITAL COSTS:

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Mobilization/Demobilization					
Mobilization/Div 0&1 Submittals	1	LS	$418,000	$418,000	Say approximately 7.5% of other costs.
Demobilization	1	LS	$139,000	$139,000	Say approximately 2.5% of other costs.
SUBTOTAL				**$557,000**	
Site Preparation and Access					
Brush and Tree Removal	1	LS	$160,000	$160,000	Staging area, western slope, north arm
Temporary Security Fencing	1,800	LF	$18	$32,400	Chain link, 6' high, cost per RS Means
Plastic Net Fencing	1,800	LF	$3.00	$5,400	High visibility plastic ESA type
Utility Service (Electrical and Water)	1	LS	$100,000	$100,000	POC 1,200' to west, costs per other Presidio sites
Access Roads	800	SY	$11	$8,800	Temporary access to dock, ~485' x 14', costs per RS Means
Shoreline Access	800	SF	$73	$58,400	Wooden pier on piles; 20'x40', costs per RS Means
Clear and Grub	5	AC	$10,000	$50,000	Staging area and north arm of Lake, costs per contractor input
Class III T&D	900	TON	$60	$54,000	Disposal of green waste, costs per other Presidio sites
Site Grading to Prepare Level Laydown Areas	24,200	SY	$6.00	$145,200	Staging area and north arm of Lake, costs per contractor input
Temporary Sediment Storage	1	LS	$20,000	$20,000	3x20,000gal tanks, 60-day rental, costs per vendor quote
Sediment Transport Pipe	1,200	LF	$21	$25,200	12" diameter metal pipe, cost per RS Means
Elutriate Discharge Pipe	1,200	LF	$21	$25,200	12" diameter metal pipe, cost per RS Means
SUBTOTAL				**$684,600**	
Construction Stormwater Management and Erosion Control					
Linear Erosion Control	900	LF	$5.00	$4,500	e.g. silt fence, costs per other Presidio sites
Linear Sediment Control	7,500	LF	$4.00	$30,000	e.g. fiber rolls, costs per other Presidio sites
Aerial Erosion Control	24,200	SY	$5.00	$121,000	e.g. erosion control blankets, cost per other Presidio sites
Stockpile Management	9,900	CY	$4.00	$39,600	Cover and berm/fiber roll perimeter, costs per contractor input
Other SW Mngmnt & Erosion Control Measures	1	LS	$27,500	$27,500	Allowance for general SW housekeeping
SWPPP Documentation	1	LS	$27,500	$27,500	Includes initial prep and SMARTs updates
SUBTOTAL				**$250,100**	
Dredging					
Dredging Operation	15,600	CY	$29	$452,400	Hydraulic, 12" pipeline, soft sediments, costs per contractor input
Lake Bottom Recontouring	3,000	CY	$25	$75,000	Dragline to smooth bottom, costs per contractor input
Dewatering Operation	4,400	DRY TON	$366	$1,610,400	Belt filter press, 15% solids feed, costs per contractor input
SUBTOTAL				**$2,137,800**	
Transport, Storage, and Placement of Slope Stabilization Materials					
Purchase and Deliver	1,500	CY	$78	$117,000	Rip rap backfill along Park Presidio, costs per RS Means
Loading from Staging Area to Short Haul Truck	1,500	CY	$7.00	$10,500	Excavator or front end loader, costs per RS Means
Short Haul from Staging Area to Barge	1,500	CY	$6.00	$9,000	Small dump truck, <0.5mi, costs per RS Means
Loading from Short Haul Truck to Barge	1,500	CY	$7.00	$10,500	Excavator or front end loader, costs per RS Means
Placing	1,500	CY	$40	$60,000	Barge and tremie placement, costs per contractor input
SUBTOTAL				**$207,000**	
Waste Profiling					
Sediment Sampling	40	EA	$45	$1,800	1 sample per 250 cy
Title 22 Metals Analysis	40	EA	$183	$7,320	1 analysis per sample, costs per lab fee sheet
WET Analysis	40	EA	$88	$3,520	2 metals, 50% of samples, costs per lab fee sheet
TCLP Analysis	40	EA	$88	$3,520	2 metals, 50% of samples, costs per lab fee sheet
TPH Analysis	40	EA	$118	$4,720	1 analysis per sample, costs per lab fee sheet
Pesticides Analysis	40	EA	$159	$6,360	1 analysis per sample, costs per lab fee sheet
SUBTOTAL				**$27,240**	

Table G-2: Summary of Costs - Alternative 3 Dredging

CAPITAL COSTS (cont'd):

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Sediment Transport and Disposal					
Loading for Off-Haul	9,900	CY	$7.00	$69,300	Excavator or front end loader, costs per RS Means
RCRA Class I Transport and Disposal	900	TON	$200	$180,000	10% of dewatered material, 50% solids, cost per other Presidio sites
non-RCRA Class I Transport and Disposal	8,000	TON	$150	$1,200,000	90% of dewatered material, 50% solids, cost per other Presidio sites
Class II Transport and Disposal	0	TON	$50	$0	No Class II material
Generator Fees	1	LS	$77,000	$77,000	Per Trust program costs
SUBTOTAL				**$1,526,300**	
Construction Monitoring					
Bathymetric Surveying	4	EA	$5,600	$22,400	Initial, two progress, final, cost per surveyor quote
Elutriate Sampling	20	EA	$45	$900	2 per day for 2 weeks
Total Suspended Solids Analysis	20	EA	$28	$560	1 analysis per sample, costs per lab fee sheet
Total Dissolved Solids Analysis	20	EA	$28	$560	1 analysis per sample, costs per lab fee sheet
Title 22 Metals Analysis	20	EA	$183	$3,660	1 analysis per sample, costs per lab fee sheet
TPH Analysis	20	EA	$118	$2,360	1 analysis per sample, costs per lab fee sheet
Pesticides Analysis	20	EA	$159	$3,180	1 analysis per sample, costs per lab fee sheet
Natural Resource Monitoring	1	LS	$33,000	$33,000	During initial staging operations, cost per other Presidio sites
SUBTOTAL				**$66,620**	
Environmental Monitoring					
Turbidity Monitoring	60	DAY	$280	$16,800	4 locations per day, 12 weeks
Water Quality Sampling	48	EA	$400	$19,200	4 locations, 1 sample/location/week
Suspended Solids Analysis	48	EA	$26	$1,248	1 analysis per sample, costs per lab fee sheet
Total Dissolved Solids Analysis	48	EA	$26	$1,248	1 analysis per sample, costs per lab fee sheet
Title 22 Metals Analysis	48	EA	$166	$7,968	1 analysis per sample, costs per lab fee sheet
SUBTOTAL				**$46,464**	
Confirmation Testing					
Sediment Sampling	56	EA	$570	$31,977	50'x50' grid, vibracorer
Title 22 Metals Analysis	56	EA	$166	$9,313	1 analysis per sample, costs per lab fee sheet
TPH Analysis	56	EA	$107	$6,003	1 analysis per sample, costs per lab fee sheet
Pesticides Analysis	56	EA	$145	$8,135	1 analysis per sample, costs per lab fee sheet
SUBTOTAL				**$55,427**	
Post-Construction Stormwater Management and Erosion Control					
Linear Erosion Control	900	LF	$5.00	$4,500	e.g. silt fence, costs per other Presidio sites
Linear Sediment Control	7,500	LF	$4.00	$30,000	e.g. fiber rolls, costs per other Presidio sites
Aerial Erosion Control	24,200	SY	$5.00	$121,000	e.g. erosion control blankets, cost per other Presidio sites
Other Stormwater Management and Erosion Control Measures	1	LS	$27,500	$27,500	Allowance for general SW housekeeping
SUBTOTAL				**$183,000**	
Site Restoration					
Grading to Restore Drainage	24,200	SY	$3.00	$72,600	Staging area and north arm of Lake, costs per RS Means
Soil Preparation for Planting	220	MSF	$66	$14,520	Raking to accept amendments, costs per RS Means
Soil Amendments	24,200	SY	$0.12	$2,904	Common fertilizer, costs per RS Means
Temporary Irrigation	1	LS	$150,000	$150,000	May be required for forest/landscape, cost per other Presidio sites
Planting	1	LS	$150,000	$150,000	In accordance with VMP, cost per other Presidio sites
SUBTOTAL				**$390,024**	
SUBTOTAL				**$6,131,575**	
Contingency	25%			$1,532,894	10% scope + 15% bid contingencies per USEPA 2000
SUBTOTAL				**$7,664,469**	

Table G-2: Summary of Costs - Alternative 3 Dredging

CAPITAL COSTS (cont'd):

DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	NOTES
Project Management	5%			$383,223	5% for $2M-$10M size projects per USEPA 2000
Remedial Design	8%			$613,157	8% for $2M-$10M size projects per USEPA 2000
Construction Management	6%			$459,868	6% for $2M-$10M size projects per USEPA 2000
Construction Completion Report				$50,000	
SUBTOTAL				**$1,506,249**	
TOTAL CAPITAL COST				**$9,170,718**	

O&M COSTS:

There are no annual O&M costs associated with this alternative. However, if limited capping is required, annual monitoring and reporting costs may be applicable.

PERIODIC COSTS:

There are no periodic costs associated with this alternative. However, if limited capping is required, five-year reviews may be required as described for the Capping Alternative.

PRESENT VALUE ANALYSIS:

YEAR	COST TYPE	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
0	Capital Cost	$9,170,718	$9,170,718	1.000	$9,170,718	
1 - 30	Annual O&M Cost	$0	$0	12.409	$0	
5	Periodic Cost	$0	$0	0.713	$0	
10	Periodic Cost	$0	$0	0.508	$0	
15	Periodic Cost	$0	$0	0.362	$0	
20	Periodic Cost	$0	$0	0.258	$0	
25	Periodic Cost	$0	$0	0.184	$0	
30	Periodic Cost	$0	$0	0.131	$0	
					$9,170,718	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$9,170,718**	

Notes:

(a) The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative.
(b) These are planning level costs and are developed to minus 30 percent to plus 50 percent accuracy.
(c) These costs have not been developed based on engineering designs, but rather represent a general opinion of cost based on estimates from similar projects, standard costing guidance documents, professional judgment, and information provided by the client.
(d) Excluded from the cost estimate are costs for labor, materials, and fees associated with permits and access agreements, construction bonds, construction insurance, permits, responses and revisions based on permit requirements, legal fees, and other administrative fees, unless otherwise noted.
(e) Assumed dredging production rate equals 100 cubic yards per hour.
(f) Assumed dewatering production rate equals 100 gallons per minute.
(g) Assumes treatment of elutriate will not be required.
(h) Additional dredging, dewatering, transportation, and disposal costs that may be required based on confirmation sampling and analysis are not included.
(i) Costs associated with ramp design and construction are not included as the technical feasibility of constructing and operating the ramps is not yet known.
(j) Costs associated with limited capping in areas where complete sediment removal is infeasible are not included as these areas are not yet know. One possible area of the site that may require limited capping is the area along Park Boulevard at the submerged toe of the embankment slope. However, this area will likely require slope stabilization and the costs included for slope stabilization are considered inclusive of the limited capping that may be required in this area.
(k) USEPA 1994 - EPA 905-B94-003: ARCS Remediation Guidance Document. Chicago, Ill.: Great Lakes National Program Office.
(l) USEPA 2000 - EPA 540-R-00-002: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. July 2000.
(m) USEPA 2002 - Explanation of Significant Differences, Middle Waterway Commencement Bay Nearshore/Tidelflats Superfund Site. Office of Environmental Cleanup. February 2002.

Table G-3: Cost Comparison of Remedial Alternatives

Site: Mountain Lake
Location: The Presidio of San Francisco, California
Phase: Feasibility Study (-30% to +50%)
Base Year: 2012
Date: 03/06/12

DESCRIPTION	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAPPING	ALTERNATIVE 3 DREDGING
Total Project Duration (Years)	0	30	1
Capital Cost	$0	$3,965,388	$9,170,718
Annual O&M cost	$0	$72,856	$0
Total Periodic Costs	$0	$84,000	$0
TOTAL PRESENT VALUE OF ALTERNATIVE	**$0**	**$4,899,671**	**$9,170,718**

Notes:

(a) The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative.

(b) These are planning level costs and are developed to minus 30 percent to plus 50 percent accuracy.

(c) These costs have not been developed based on engineering designs, but rather represent a general opinion of cost based on estimates from similar projects, standard costing guidance documents, professional judgment, and information provided by the client.

(d) Excluded from the cost estimate are costs for labor, materials, and fees associated with permits and access agreements, construction bonds, construction insurance, permits, responses and revisions based on permit requirements, legal fees, and other administrative fees, unless otherwise noted.

Appendix H

Project Controls to Minimize Potential Impacts to Human Health and Resources

Table H-1: Project Controls to Minimize Potential Impacts to Human Health and Resources[a]

Resources	Potential Impact to Resource from Proposed Remedial Action	Project Controls to Minimize Potential Impacts to Human Health and Resources
Aesthetics	Construction activities will temporarily degrade the existing visual character or quality of the site and its immediate surroundings.	The scope of the construction activities will be limited to approximately five acres and will be short-term, lasting approximately 54 weeks. Post-project restoration activities to be undertaken by others are expected to improve the visual character and quality of the site and its surroundings.
Air Quality	During the construction activities, dust (particulate matter) may become airborne at loading operations, during grading, at soil stockpiles, and from vehicles transporting soils. Odors may be generated during the sediment processing operations.	Best management practices (BMPs), including application of vapor suppressing agents, placing tarps over stockpiled material, covering materials during transport, and minimizing construction equipment usage at all times (e.g., shutting off idle equipment as appropriate) will be implemented to reduce emissions. Construction equipment will be maintained and operated in a manner to minimize particulate emissions with best available control technologies (BACTs). Air quality monitoring will be implemented during sediment dewatering, stockpiling, transportation, and other earthwork operations, as necessary. In addition, truck loads and traffic will be scheduled and coordinated, to the extent possible, to minimize the vehicle loads per day traveling through the area.

Table H-1: Project Controls to Minimize Potential Impacts to Human Health and Resources[a]

Resources	Potential Impact to Resource from Proposed Remedial Action	Project Controls to Minimize Potential Impacts to Human Health and Resources
Biological Resources	The remedial actions will involve transportation of materials and grading.	No federal or California threatened or endangered species reside at the site. Areas with native habitat and species of concern will be avoided during site operations, to the extent practicable. Vegetation was removed from the site in late 2011 in compliance with the Presidio Vegetation Management Plan (VMP) and Tennessee Hollow Environmental Assessment (THEA) and to avoid bird nesting season. Additional vegetation removal will be coordinated with natural resource staff to avoid potential disruption to nesting or migrating birds. Specifically, efforts will be made to schedule vegetation removal outside of bird nesting season (January 1st - July 31st for raptors and hummingbirds; March 1 - July 31st for songbirds), as dictated by the Migratory Bird Treaty Act. However, vegetation removal may occur during bird nesting season provided a nesting survey indicates no disruption to nesting birds (including ground nesting birds) and approval is obtained from Trust natural resource staff. Nest surveys are not 100% accurate, therefore activities requiring nest surveys during nesting season will be avoided whenever practicable. If nesting birds are found near the project site, a Trust natural resource specialist will be notified. If required, the specialist may require protection measures to be implemented, such as setting up a buffer zone around the nest and installation of fencing or other barriers. Wetlands around the perimeter of the lake will be restored following remediation.
Cultural Resources	The remedial actions may involve removal of historic sediment layers.	The Presidio Archeology Department has prepared an Archeological Monitoring Assessment (AMA) for the Project to describe procedures for treating and handling archeological features during Project activities. These protocols include stopping work and notifying the Presidio archaeologist of any discoveries. Prior to dredging activities, the Trust will take measures to ensure that the record of lake sediments are preserved for future scientific research by extracting cores through a direct push technique and submitting the preserved samples to the National Lacustrine Core Facility.

Table H-1: Project Controls to Minimize Potential Impacts to Human Health and Resources[(a)]

Resources	Potential Impact to Resource from Proposed Remedial Action	Project Controls to Minimize Potential Impacts to Human Health and Resources
Geology and Soils	Once site grading associated with the staging area is underway, soil and fill materials will be susceptible to erosion, down slope movement, and landslides.	Erosion control measures will be implemented during and after construction for any work performed between October 15 and April 15 to minimize runoff from the site. A construction Storm Water Pollution Prevent Plan (SWPPP) will be prepared prior to construction to establish storm water goals and controls that will be applied during construction. Staging for the remedial activities will not result in significant soil erosion or loss of topsoil, as erosion control measures will be implemented. Earthwork and sediment processing activities will not be conducted during severe wet weather and soil disturbance will be limited to work areas. Grading plans will be designed to protect natural resources. There are several potential sources of surface water runoff from the remediation area during and after the work is performed. Project control measures include stabilization practices such as wattles, silt fences, berms, and temporary outlet protection that may be employed, if needed. The method chosen will depend on the planned activities and erosion potential of the area in question.
Greenhouse Gas (GHG) Emissions	The remedial actions will generate GHG emissions through the use of vehicles and equipment.	The period of construction will be short-term, and construction-phase GHG emissions will occur directly from the over-water dredging equipment, off-road heavy-duty equipment, and the on-road motor vehicles needed to mobilize crew, equipment, and materials, and to grade and restore the site. Levels of GHG emissions caused by construction equipment use will not occur in significant quantities.
Hazards and Hazardous Materials	The remedial actions will involve transportation of materials, disposal of significant quantities of waste materials offsite, and grading.	The remedial actions are designed to protect the public and environment from existing hazards. These remedial actions include sediment dredging and disposal at on offsite regulated landfill. The remedial actions will be conducted in accordance with the federal and state regulations identified in the RAP, as well as Trust Management Policies, as applicable. During site work, access to the site will be restricted to prevent potential public exposure to health or safety risks. Further, potential exposure of workers and public to contaminated materials during dredged material handling activities will be controlled through the air quality control measures and engineering and dust and odor control measures, including application of vapor suppressants to control odors from the exposed materials. Workers implementing the remedial activities will have appropriate training and will use personal protective equipment to minimize exposure to contaminants. Transport of hazardous materials will occur along authorized haul routes within the Presidio and along major thoroughfares outside the Presidio.

Table H-1: Project Controls to Minimize Potential Impacts to Human Health and Resources[(a)]

Resources	Potential Impact to Resource from Proposed Remedial Action	Project Controls to Minimize Potential Impacts to Human Health and Resources
Hydrology and Water Quality	The remedial actions will include sediment removal and bathymetric changes from dredging operations and may temporarily alter drainage patterns and potentially increase runoff to the lake.	During processing of dredged material at the staging area, existing local drainage patterns may be temporarily altered. Elutriate from the dewatering activities may be allowed to gravity drain back to the lake depending on water quality testing and possibly water treatment. In accordance with the erosion control plans to be developed during remedial design, post-construction erosion monitoring and erosion control measures will be implemented, as necessary. Examples of stabilization measures include installation of wattles, stabilization matting, fabric, and blankets on newly exposed soil and after work is completed on short, steep, and/or sparsely vegetated slopes. The rate or amount of surface runoff potentially could increase slightly during grading activities.
Noise	Highway stabilization, dredging, material processing, and off-hauling operations will increase noise levels. Noise generated by project activities will be temporary, intermittent, and dispersed. Nighttime noise will be generated.	Control measures will include, but not be limited to, proper maintenance and tuning of equipment, placement of noisy equipment away from sensitive receptors as practicable, noise-control mufflers, and scheduling noisier operations during periods of low visitor use, to the extent feasible. In addition, construction will be scheduled to limit impacts on wildlife and bird nesting activity in consultation with Trust natural resource specialists. Within the Presidio, transport of equipment and waste materials will occur along routes approved by the Trust. Outside of the Presidio, haul routes will follow major thoroughfares and signed routes approved for truck traffic.
Recreation	Public access will be redirected away from work zones during project activities.	During construction, the site will be fenced, as necessary, to restrict and redirect public access. The remedial design will include pedestrian and traffic detours designed to keep visitors out of active work areas while permitting full use of other park areas and facilities.
Traffic and Transportation	The remedial actions will temporarily redirect traffic and public access away from the work zones during project activities. One lane of northbound Highway 1 will be closed during highway work.	Within the Presidio, transport of equipment and waste materials will occur along routes approved by the Trust. Outside of the Presidio, haul routes will follow major thoroughfares and signed routes approved for truck traffic. Because work areas will be temporarily closed during construction, pedestrians (hikers) and bicyclists will be temporarily detoured. Work on Highway 1 will be limited to nighttime during low-use hours.

Notes:

(a) Potential impacts to resources from the proposed remedial action area evaluated in detail in the California Environmental Quality Act (CEQA) Initial Study in Appendix I. This table presents the controls incorporated into the project, as identified in the CEQA Initial Study. The project controls presented in this table will be implemented as part of the remedial actions to reduce the potential impacts to resources to less than significant.

Appendix I

California Environmental Quality Act (CEQA) Documentation

CALIFORNIA ENVIRONMENTAL QUALITY ACT
NEGATIVE DECLARATION

Department of Toxic Substances Control
Brownfields and Environmental Restoration Program
700 Heinz Avenue
Berkeley, California 94710

Subject: ☒ **DRAFT** ☐ FINAL ☐ MITIGATED

Project Title: Remedial Action Plan for Mountain Lake at Presidio of San Francisco

State Clearinghouse No.:

Project Location: Presidio of San Francisco

County: San Francisco

Project Description:

The project is implementation of the Remedial Action Plan (RAP) for Mountain Lake that is protective of public health and safety and the environment. Mountain Lake is approximately 4 acres located on the southern edge of the Presidio of San Francisco. Park Presidio Blvd (Highway 1) is immediately west of the lake and is separated from the lake by a narrow band of vegetation and a chainlink fence. Lead is the primary contaminant in lake sediment, and the presumed source is storm water runoff and drainage from the adjoining Park Presidio Blvd. Elevated concentrations of total petroleum hydrocarbon as motor oil tend to be co-located with elevated concentrations of lead, suggesting a common source.

The proposed actions to implement the RAP entail: 1) Caltrans stabilizing the Park Presidio Blvd roadway and treating runoff to the lake and 2) the Trust establishing site access, dredging sediment from the lake, sequestering the sediment onsite during dewatering, returning the water to the lake, trucking the dewatered sediment to an appropriately licensed landfill, and restoring the area disturbed by the Project. Approximately 15,600 cubic yards of sediment will be dredged from the lake at depths of 2 to 6 feet below sediment surface. As a contingency measure, a sand cover would be placed over contamination that is infeasible to dredge that could occur along Park Presidio Blvd.

Finding Of Significant Effect On Environment: *(An Initial Study supporting this finding is attached.)*

After conducting an Initial Study of the potential environmental impacts of the proposed project, DTSC has determined that implementation of the project will not result in any significant environmental impacts.

Mitigation Measures:

DTSC has determined that no additional mitigation measures would be required beyond those incorporated as part of the project.

Supervisor/Team Leader Signature		3/13/12 Date
Denise M. Tsuji Supervisor/Team Leader	Unit Chief Supervisor/Team Leader Title	510-540-3824 Phone #

CALIFORNIA ENVIRONMENTAL QUALITY ACT
INITIAL STUDY

The Department of Toxic Substances Control (DTSC) has completed the following document for this project in accordance with the California Environmental Quality Act (CEQA) [Pub. Resources Code, div. 13, § 21000 et seq] and accompanying Guidelines [Cal. Code Regs., tit. 14, § 15000 et seq].

PROJECT TITLE: Remedial Action Plan – Mountain Lake, Presidio of San Francisco		CALSTARS CODING: 201239-11
PROJECT ADDRESS: Presidio of San Francisco.	CITY: San Francisco	COUNTY: San Francisco
PROJECT SPONSOR: The Presidio Trust	CONTACT: Ms. Eileen Fanelli	PHONE: 415-561-4259

APPROVAL ACTION UNDER CONSIDERATION BY DTSC:

☐ Initial Permit Issuance ☐ Permit Renewal ☐ Permit Modification ☐ Closure Plan
☐ Removal Action Workplan ☒ Remedial Action Plan ☐ Interim Removal ☐ Regulations
☐ Other (specify):

STATUTORY AUTHORITY:

☐ California H&SC, Chap. 6.5 ☒ California H&SC, Chap. 6.8 ☐ Other (specify):

DTSC PROGRAM/ ADDRESS: Brownfields and Environmental Restoration Program 700 Heinz Avenue Berkeley, California 94710-2721	CONTACT: Remedios Sunga	PHONE: 510-540-3840

PROJECT DESCRIPTION

Introduction

The California Department of Toxic Substances Control (DTSC) is proposing to approve a draft Initial Study (IS) on a Remedial Action Plan (RAP) pursuant to authority granted under Chapter 6.8, Division 20 of the California Health and Safety Code (H&SC) for Mountain Lake (Lake) at the Presidio of San Francisco (Figure 1). The RAP [*Draft Feasibility Study/Remedial Action Plan (FS/RAP), Mountain Lake, Presidio of San Francisco, San Francisco, California* (Draft FS/RAP; (Kennedy/Jenks, 2012b)] is incorporated by reference. If approved, the RAP would allow for the removal by dredging of approximately 15,600 cubic yards (cy) of sediments contaminated with lead and total petroleum hydrocarbons as motor oil from Mountain Lake which would be transported to a permitted, off-site landfill. As part of the work activities, the California Department of Transportation (Caltrans) will stabilize the State Highway 1 roadbed and upgrade the drainage system of the roadway (originally installed in 1939) adjacent to the lake prior to dredging work. These activities are collectively referred to as the "Project" in this IS. It will take approximately 15 months to complete this Project.

The Presidio occupies 1,491 acres at the northernwestern tip of the San Francisco peninsula. It is bounded on the north by San Francisco Bay and on the west by Golden Gate Strait, which connects the Bay and the Pacific Ocean. Densely populated residential areas abut its southern and eastern boundaries. Figure 1 shows overall the location of the Project within the Presidio and its location relative to the City. Figure 2 shows the land uses and roads around the site. Figure 3 shows the relationship between the dredging operation and the primary staging area where dewatering would occur. (Figures referenced in the text are provided in Appendix B of this Initial Study.)

Background

For 146 years, from 1848 through 1994, the Presidio was a U.S. Army (Army) installation. On October 1, 1994, the Presidio was transferred to the National Park Service (NPS) and became part of the Golden Gate National Recreation Area (GGNRA). In 1998, The Presidio Trust (Trust), a single-purpose federal agency, was granted jurisdiction over 1,168 acres of the Presidio. This area (know as Area B) is managed by the Trust in accordance with the *Presidio Trust Management Plan* (PTMP)(Trust, 2002a). Mountain Lake is in Area B and is under the management of the Trust. NPS has jurisdiction over approximately 320 acres, the balance of the Presidio; this acreage is known as Area A and is along the Presidio's shore front and Lobos Creek. However, the Trust has the authority and responsibility to manage the remediation of contamination throughout the Presidio, in both Trust and NPS jurisdictional areas.

Mountain Lake is the only lake on the Presidio. The name of the lake is derived from its Spanish name, "Luguna de Loma Alta" (Lake of the High Mount). Early Spanish-era maps also identify it as "Luguna del Presidio" (Lake of the Presidio).

The lake is located near the midpoint of the Presidio's southern boundary and has a surface area of approximately 4.2 acres. The lake is situated adjacent to the east side of Park Presidio Blvd (Highway 1) and north of Lake St, in San Francisco's Richmond District. The watershed draining to the lake is small, estimated to be about 192 acres. Groundwater from the ongoing dewatering of the MacArthur Tunnel for Park Presidio Blvd is discharged to the Lake at the northern shore of the lake. In addition, storm water runoff from Park Presidio Blvd and adjacent Trust land enters Mountain Lake through three drainage structures located in the western bank of the Lake and a northern structure that discharges tunnel groundwater. A large portion of the watershed is occupied by the Presidio Golf Course.

At present, there are no natural surface outlets from the lake; water loss is through evaporation and seepage. Discharge by way of subsurface (groundwater) flow likely is westward to Lobos Creek. At times in the historic past, the lake overflowed its basin and drained via Lobos Creek to the Pacific Ocean, about 1 mile to the west. The lake is subject to seasonal water level fluctuations; in the past century the level has varied by as much as 8 feet (Riedy 2001). An overflow pipe, constructed in 1939 during construction of Park Presidio Blvd (Highway 1), runs from the southwest corner of the lake under Highway 1 to a City storm/sewer inlet in the Lobos Creek drainage. The overflow pipe elevation is set at 134 feet and controls the maximum water level in the lake so as to protect the adjacent highway. The pipe is damaged and in need of replacement. Replacement of the pipe is not part of the proposed Project.

This IS presents this Project that is proposed in the RAP for Mountain Lake, followed by an analysis of its impacts. Cumulative impacts are evaluated assuming a worst-case scenario, where the proposed Project, and other planned Presidio projects would be implemented concurrently.

The environmental impact analyses and sections of the Initial Study are presented on the following pages:

Project Description	Page 3
1. Aesthetics	Page 15
2. Agricultural and Forest Resources	Page 18
3. Air Quality	Page 19
4. Biological Resources	Page 25
5. Cultural Resources	Page 30
6. Geology and Soils	Page 33
7. Greenhouse Gas Emissions	Page 36
8. Hazards and Hazardous Materials	Page 39
9. Hydrology and Water Quality	Page 43
10. Land Use and Planning	Page 46
11. Mineral Resources	Page 48
12. Noise	Page 49
13. Population and Housing	Page 53
14. Public Services	Page 54
15. Recreation	Page 55
16. Transportation and Traffic	Page 57
17. Utilities and Service Systems	Page 62
18. Mandatory Findings of Significance	Page 64
References	Page 66
Appendices	
A: List of Acronyms	
B: Figures	

C: Stone Column Construction Process
D: Air Quality Calculations

Project Activities

Current Site Setting and Future Land Use

Mountain Lake is on the southern edge of the Presidio of San Francisco (Presidio). Park Presidio Blvd (Highway 1) is immediately west of the lake and is separated from the lake by a narrow band of vegetation and a chainlink fence. The highway roadbed at this location was created in 1939 by partially filling the lake, thereby reducing the lake surface area by approximately 40 percent. To the west of Park Presidio Blvd is the Public Health Service district, where buildings now provide housing and office/institutional uses. The Presidio Golf Course is to the east and north of the lake and is separated from the lake by an existing trail/road and chainlink fence. South of the lake are a City park, beyond which are private residences and apartments in the City and County of San Francisco. The residences are located on east-west running Lake St, which is parallel to the Presidio boundary, and at the northern termini of 9th, 10th, 11th, 12th Avenues, and Funston St, which deadend at the Presidio boundary.

The residences nearest the Project site to the south are separated from the lake and the Presidio by Mountain Lake Park, a small City-owned park. Formerly part of the Presidio reservation, the parkland was granted to San Francisco in 1874. While the lake is not used for swimmming and fishing; however, wading at the southern beach area may occur occasionally. The City park provides tennis courts and other recreational amenities in the adjacent upland. The south shore of Mountain Lake is within the City park and includes a small beach. Approximately 0.3 acre of City property lies within the lake itself; the balance of the lake is on Presidio property. Residences on the Presidio are found to the north along Washington Blvd and to the east along Wyman Ave.

There is no public vehicle access to Mountain Lake or the land surrounding the lake. From the City, pedestrian access to the lake and park is by way of trails leading from the termini of the adjacent numbered Avenues and from Funston St. From within the Presidio, pedestrian access from the west is by way of Mountain Lake Trail, which crosses under Highway 1 on West Pacific Ave at the north end of the lake. Access from the east is by way of West Pacific Ave, which runs between Arguello Blvd and the lake, inside the southern boundary wall of the Presidio. The west end of West Pacific Ave is closed to public vehicles and serves as a segment of Mountain Lake Trail between the lake and Arguello Blvd. The park, lake, and trails are popular recreation facilities, particularily for neighborhood residents and pedestrians and bicyclists who use the facilities or pass through.

The surface of the lake is approximately 134 feet above sea level. Northeast of the lake and at a higher elevation is the Presidio Golf Course, which opened over 110 years ago, in 1897. Low hills to the north, the highest of which is approximately 300 feet above sea level, are incorporated into the golf course. Highway 1 passes under the golf course by way of the MacArthur Tunnel.

During the mid- and late-19th century, various plans were made and partially executed to tap Mountain Lake as a water supply for the City. However, it was determined that the amount of water that could be obtained from the watershed was inadequate to meet the City's needs and plans for it to be a water supply were eventually abandoned. The Army diverted water from Mountain Lake for domestic purposes within the Presidio in 1897, and lake water was used for irrigating the Presidio Golf Course until 1964.

The lake is inhabited by non-native exotic species, including bullfrog, carp, and catfish. Over the past decade the east and southeast shores of the lake have been restored with native plants.

From November 2011 through January 2012, in advance of the proposed Project, the Trust cleared some vegetation around Mountain Lake consistent with the Vegetation Management Plan (VMP; Trust and NPS, 2001). The purpose of the clearing was to gain access to areas to complete a topographic map, conduct geotechnical studies of Park Presidio Blvd (Highway 1) adjacent to the lake, and evaluate access routes for the Project. Brush was cleared from a 15-foot wide corridor along the east side of Park Presidio Blvd. Some brush clearing occurred on the Presidio in the proposed staging area. Some clearing also was conducted in the northern arm of the lake. Plants removed were primarily non-native species. No trees were removed. In addition, in December 2011 through February 2012, in advance of the proposed Project, Caltrans performed initial geotechnical studies along the roadway.

Following remediation and restoration of the area disturbed by the Project, more extensive restoration in the area is planned under the Mountain Lake Enhancement Plan and Environmental Assessment (Trust, NPS, and GGNPA, 2000) and the VMP (Trust and NPS, 2001).

Extent of Project Area

The RAP is focused on removal of the contaminated sediment and control of highway storm water discharges. The area included in the RAP consists of the following: Mountain Lake; land required to access the site, stage

equipment, and manage dredged material; and the portion of Highway 1 adjacent to the lake to be stabilized. This area is shown in Figures 2 and 3.

Runoff from three storm water culverts along Park Presidio Blvd (Highway 1) discharges to Mountain Lake. Elevated concentrations of the chemicals of concern (COCs) in lake sediment have been attributed to highway drainage and other contributing storm water sources. These COCs are primarily lead and other metals and petroleum hydrocarbons. The Presidio Golf Course discharges runoff to the lake through culverts at the eastern and northern edges of the Lake. In the past, runoff from the golf course was a source of pesticide contamination to the Lake. However, the golf course now operates under an Integrated Pest Management Program which controls pesticide and fertilizer use at the golf course in a manner that minimizes risks to human health, ecological species, and the environment (Arnold Palmer Golf Management and Trust 2005). Pesticides are only used in very limited quantities when non-chemical methods have been ineffective at keeping pest levels below action thresholds. The golf course has annually monitored metals, pesticides, and/or general chemistry parameters in storm water since 1996 (Blankinship 2010). The data indicate that contaminants are not present at levels of concern in storm water from the golf course. Thus, the golf course is not a significant continuing source of contaminants to Mountain Lake.

This natural lake is roughly triangular in shape, with a north-south length of about 610 feet and a width of about 650 feet at its widest. The lake has been altered substantially from its original size and depth. The greatest change occurred when the lake was partially filled during construction of Park Presidio Blvd and the MacArthur Tunnel, which opened in 1940. The construction reduced the lake's area by 40 percent from its original size. Today, the lake's surface area is slightly over 4 acres. In addition to the reduction in surface area, the lake has shallowed considerablly from its original 30-foot depth; it now has an average depth of 6 feet and a maximum depth of about 10 feet.

Site Investigations

Over 185 samples of sediment have been collected from the lake during remedial investigations conducted between 1990 and 2011. Four samples have also been collected from sediment in Park Presidio Blvd storm drains that feed into the lake. Twelve surface water samples and seven sediment elutriate (i.e., liquid expressed during sample dewatering) samples have also been collected and analyzed.

The following reports document the methodology and outcomes of various investigations of the sediments and surface water of Mountain Lake:

- Final Remedial Investigation Report (Dames and Moore, January 1997);
- Report of Sediment Sampling at Mountain Lake (Erler & Kalinowski, Inc., (EKI) November 1998);
- Draft Sampling Results for Selected Public Health Service Hospital Sites (EKI, November 2000);
- Evidence of Environmental Change over the last 20 years at Mountain Lake, in the northern San Francisco Peninsula, thesis for Master of Arts in Geography (L. Riedy, 2001) [An independent study not completed as part of remedial investigations];
- Mountain Lake Sediment Investigation, Final Report (URS, July 2001);
- Remedial Investigation Summary and Risk Evaluation, Mountain Lake (URS, October 2011);
- Letter Report – Sediment Sampling at Mountain Lake (Kennedy/Jenks, 2012a); and
- Draft Feasibility Study/Remedial Action Plan (FS/RAP), Mountain Lake, Presidio of San Francisco, San Francisco, California (Kennedy/Jenks, 2012b).

The following are potential chemicals of concern (PCOCs) in Lake sediment that were detected at least once above a cleanup level or background concentration for the Colma formation (URS 2011):

- Metals, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc.
- Pesticides, including 4,4-DDD, 4,4-DDE, alpha-BHC, beta-BHC, gamma-BHC (lindane), delta-BHC, alpha chlordane, and gamma chlordane).
- Total petroleum hydrocarbons as diesel (TPHd) and as motor oil (TPHmo).

Site Risks and Chemicals of Concern

A human health and ecological risk evaluation of PCOCs in Lake sediment is presented in the Draft FS/RAP (Kennedy/Jenks, 2012b).

The current and planned future use of Mountain Lake is as wildlife habitat. Fishing and swimming are not

permitted in the Lake. Visitors to Mountain Lake typically engage in activities where there is no exposure to sediment. Wading may occur occasionally at the southern beach area; however, human exposure to sediments during wading is expected to be infrequent and of limited duration. Furthermore, concentrations of lead and other PCOCs in sediment samples collected from the southern beach area are below human health cleanup levels (Kennedy/Jenks 2012a). Also, the ecological-based cleanup level for lead, which is the primary PCOC, is lower than the cleanup level for human health, so remediation of sediment to address risk to ecological receptors would be protective of potential human exposures.

Previous evaluations of surface water in Mountain Lake concluded that contaminants in surface water meet water quality criteria for aquatic life and drinking water standards (e.g., maximum contaminant levels). Therefore, ecological risk from surface water exposure and domestic use of surface water in Mountain Lake are not exposure pathways of concern and were not evaluated further in the risk evaluation.

Ecological receptors could be exposed to PCOCs found in sediment at Mountain Lake. Common species of fish, amphibians, waterfowl, and mammals that occupy the Lake and surrounding area may be exposed to sediment at Mountain Lake. Exposure pathways for aquatic species living in the water column or sediment are direct contact with or uptake of PCOCs in sediment and dietary exposure to PCOCs. For aquatic-dependent wildlife, the primary exposure pathway of concern is dietary exposure to PCOCs. There are no sensitive species (i.e., species on federal or state lists of threatened and endangered species) residing in the Lake but these species could occupy the area after future lake enhancement activities.

Risks to ecological receptors were evaluated in the FS/RAP for baseline (existing) conditions at Mountain Lake, which assumed no remediation of sediments. To evaluate risk, the 95 percent upper confidence limit on the arithmetic mean (95 percent UCL) concentrations in sediment were determined for each of the PCOCs and compared with cleanup levels. The risk evaluation concluded that baseline conditions present an unacceptable risk to the ecosystem in and around Mountain Lake (Kennedy/Jenks, 2012b). Two contaminants, lead and total TPHmo were selected as chemicals of concern (COCs) in Mountain Lake sediment because they pose a potential risk to ecological receptors.

Remedial Action Area

Approximately 15,600 cubic yards (cy) of sediment in the lake are contaminated with COCs above cleanup levels, covering nearly the entire footprint of the lake to a depth of 2.5 feet below the sediment surface (bss), and some areas extend to 4.5 to 6.5 feet bss. This defines the remedial action area.

Remedial Action Objectives

The Draft FS/RAP identifies the following remedial action objectives (RAOs) for Mountain Lake:

- General RAOs:
  - Protection of human health and the environment.
  - Protection of water quality and ecological resources.
  - Remediation of contaminant mass (primarily lead) in the Lake sediment, and elimination or reduction in further accumulation of contaminant mass.
  - Preference for permanent remedies, whenever practicable, cost effective, and consistent with planned use of the Lake.

- Site-Specific RAOs:
  - Remediation of sediment in a manner that would not further impair Lake health or habitat quality.
  - Planning, design and performance of the sediment remediation activities in a manner that maintains structural stability of western shore and adjoining Park Presidio Blvd. Undermining or destabilization of Park Presidio Blvd is an unacceptable consequence of the sediment remediation activities.
  - Control of future chemical release to the Lake associated with stormwater discharges from Park Presidio Blvd.

Proposed Remedial Action (Project)

The proposed Project provides for the removal of sediment containing COCs above cleanup levels by wet removal (dredging) methods. Although mechanical and hydraulic dredging are both feasible, the sequence of work described herein includes hydraulic dredging as representative of wet removal operations. Similarly, there are multiple feasible dewatering processes that could be applied for the Project, but mechanical dewatering is described herein as representative of dewatering processes. The contractor would have flexibility with respect to means and methods to facilitate removal operations within constraints of the site space and schedule and without posing a threat to the integrity of Park Presidio Blvd.

Dredging would be done using a barge, and dredged material would be pumped through a temporary pipeline or other similar transport to the dewatering area approximately 600 feet north of the lake. Depending on staging at

the dewatering area, dredged material could temporarily be stored within a diked lagoon or tanks prior to dewatering. Dewatering of the excavated sediment would occur at the staging area. When sufficiently dewatered, the solids would be be trucked offsite to a landfill licensed to receive the material. If there are areas in the lake where dredging is infeasible, clean sand would be deposited over these locations to cap them in place. With the completion of dewatering, the lagoon or tanks would be removed.

The preferred cleanup method would:

- Stabilize Park Presidio Blvd (Highway 1) prior to sediment dredging
- Treat Park Presidio Blvd runoff entering the lake
- Dredge approximately 15,600 cubic yards of in situ sediment to meet ecological cleanup levels
    - Dredge top 2.5 feet of sediment across most of lake bottom
    - Dredge down 5.5 feet in locations where needed
    - Collect sediment confirmation samples during dredging
    - Over-dredge in areas where sediment confirmation samples indicate an unacceptable ecological risk
    - (If necessary) place sand cap where dredging is technically infeasible
    - Re-contour lake bottom to form stable/functional slopes
- Dewater sediment onsite
- Test and discharge water back to the lake
- Transport and dispose of sediment at an offsite facility licensed to accept the material

Site restoration would be conducted in areas disturbed by the Project to facilitate habitat and recreational development under the Mountain Lake Enhancement Plan and Environmental Assessment (Trust, NPS, and GGNPA, 2000) and the VMP (Trust and NPS, 2001). Following remediation of the lake and restoration of the disturbed area, the area would be used for wildlife habitat, passive recreation and education, as occurs at present. The City park would continue to be used for both active and passive recreation.

<u>Proposed Project Activities</u>:

The proposed actions to implement the RAP for Mountain Lake entail: 1) Caltrans stabilizing the Park Presidio Blvd roadway and treating runoff to the lake and 2) the Trust establishing site access, dredging sediment from the lake, sequestering the sediment onsite during dewatering, returning the water to the lake, trucking the dewatered sediment to an appropriately licensed landfill, and restoring the area disturbed by the Project.

Caltrans Stabilization and Drainage Work (2012)

Before dredging of the lake can begin, Highway 1 (Park Presidio Blvd) adjacent to the lake must be stabilized to alleviate the risk that dredging could compromise the integrity of the roadway. Runoff from the highway must also be controlled and treated prior to completion of remediation so that the potential for lake contamination is minimized after remediation.

The stabilization and runoff management work is estimated to take about 90 active working days over a 18 week period. The stabilization work would occur at night; however, the runoff improvements may occur either at night or during the day. Some of the runoff improvements could be concurrent with the installation of stone columns to stabilize the road. The Caltrans work is planned for completion in 2012.

Stone columns in the ground would be used to stabilize the road. Figure 4 provides typical plan and section views of how stone columns would be arrayed to provide the necessary stabilization. Figure 5 provides an illustration of the process of soil displacement and stone placement during column construction. Appendix C describes the column construction process and provides references to online videos illustrating this type of construction. Construction of each column would involve using a crane and vibratory probe to create a shaft that would then be filled with stone. The stone is compacted in place as the probe is withdrawn. The columns would be 3-feet in diameter and an estimated 450 columns would be installed. Half are assumed to be 60 feet deep and half 40 feet deep. It is estimated that 5,900 cy of aggregate would be required to create the columns. The rock would be delivered at night in sufficient quantity to support that shift's work, which is estimated to require 8 trucks per night. It would be temporarily stored on the shoulder of Highway 1. Other equipment required for the stabilization work includes a front loader, air compressor, generator, flatbed trailer, trucks for hauling aggregate to the site and spoil material off site, and two portable pole-mounted light plants for illumination. The amount of spoil to be hauled off is unknown, but is not expected to be large. As it works its way into the earth, the vibratory probe pushes the fill material aside, compacting the displaced soil at the sides of the shaft as it is formed. The stone columns will be installed through groundwater.

Appropriate traffic controls and worker protection would be in place during the work. A northbound lane of

Highway 1 would be closed during nighttime stabilization work. At the end of each nightshift, the closed northbound lane of Highway 1 would be reopened for morning traffic.

As a result of the Caltrans work, runoff from the highway would be managed so that it is controlled and treated prior to entering the lake. Figure 6 shows the location of the highway runoff controls. Approximately 685 linear feet (LF) of 18-inch reinforced concrete drainage pipe and 475 LF of 36-inch reinforced concrete pipe would be installed underground along the highway. Approximately 100 feet of 15-inch ductile iron pipe would be installed on the West Pacific Ave Bridge (which supports Park Presidio Blvd as it crosses over Mountain Lake trail/West Pacific Ave at the north end of the lake). Existing culverts and drainage inlets along the highway between the MacArthur Tunnel and the Mountain Lake overflow pipe would be upgraded by installing storm water treatment devices that remove pollutants and particulates. Three existing 18-inch cross culverts would be spiral lined. In addition, 3 manholes and 3 new inlets would be installed and 2 existing inlets would be removed and replaced. Approximately 18 storm water treatment devices would be installed in all new and existing inlets from the MacArthur Tunnel to the Mountain Lake Overflow Pipeline. Approximately 1,000 linear feet of chain link fence would be installed between the highway and lake and 1,000 LF of asphalt concrete dike 6-inches high would be installed along the shoulder between the highway and lake. This dike would prevent untreated runoff from entering the lake and would direct flow to the drainage inlets. To prevent erosion on the site until vegetation is reestablished, disturbed areas would be covered with erosion control materials and, depending on slopes, appropriate temporary degradable barriers would be installed to control water flow over disturbed areas.

Trust Access Construction Work (2012)

If determined to be needed and if permitted by Caltrans, temporary ramps to Park Presidio Blvd, these would be constructed in 2012. The ramps would consist of clean fill trucked to the site, where it would be deposited and compacted. A suitable tire cleaning mechanism would be installed to prevent soil from being tracked onto the public roadway. Although the specific location of the ramps, it is estimated that 3,700 cy of fill delivered to the site in roughly 200 truckloads. It is assumed it would take approximately 8 weeks to clear the ramp site of vegetation and construct the ramp. The fill to construct the ramps would need to be delivered by way of either West Pacific Ave or Park Blvd (through the golf course).

Trust Remediation Work (2013)

In 2013, subsequent to the Caltrans stabilization and drainage work and construction of the ramps, the Trust would begin remediation. If not previously developed, access to the remediation site and to the staging area for dewatering would be established. A floating dredge would be placed in the lake. Piping or other similar transport system would be installed between the dredge and the staging area north of the lake. This would allow dredged material to be pumped as a sediment/water slurry directly from the dredge to the dewatering site without additional handling. During dredging, samples would be taken of bottom sediments to ensure that cleanup levels are achieved. The final lake bottom surface would be contoured as needed to prevent excessive slumping of final slopes. At the dewatering site, a temporary basin (lagoon) or temporarily tanks would be installed to receive the slurry. The slurry from the holding basin or tanks would be put through a mechanical dewatering process, such as a belt press, which would mechanically press the water out of the slurry, leaving a sediment cake and the separated water. The water from the dewatering process would be tested before being piped back to the lake. The dewatered cake would be stockpiled temporarily until a sufficient amount is available for hauling. The dewatered solids would be hauled to a landfill facility licensed to accept the material. Depending on the rate of production from the dredge to the holding facility and the rate of production of dewatered sediment cake, the dredging and hauling aspects of the Project may be intermittent, so as to maintain a steady flow of material between the dredge, the holding facility, the press, the stockpile, and the landfill.

If constructed, the ramps would provide ingress and egress at the site. However, for safety, use of the ramps may require a lane closure on northbound Highway 1 during their use. Because of traffic volume, Caltrans would allow lane closure on Park Presidio Blvd only at night. Therefore, hauling by this route likely would need to be a nighttime operation and would require safety barriers on the road and appropriate lighting for the work area. Portable pole-mounted units with generators, such as those used on highway projects, would be used. Consistent with safety and operational needs, the lighting would be focused away from residences.

Alternative routes are available for site ingress and egress. One route would use West Pacific Ave from the remediation site to Arguello Blvd and then proceed from there through the Main Post to US 101 on the east side of the Presidio. The other route would pass under Park Presidio Blvd by way of West Pacific Ave and proceed north on the extension of Park Blvd that connects to Washington Ave at the northern edge of the golf course. This route would follow Washington Ave west to Lincoln Blvd and continue north to US 101 near the Golden Gate Bridge. Variations of the Park Blvd route would be to follow Washington Ave west to its intersection with Lincoln Blvd, continuing north to US 101/Doyle Drive, or follow Washington Ave east to its intersection with Arguello Blvd, continuing to US 101/Lombard St. Potential routes are shown in Figure 7. No final decision has been made on

the route to use; therefore, the potential route alternatives are evaluated in this Initial Study.

Dredging and mechanical dewatering would occur during the day. The dewatering site would be 1,500 feet from the nearest residences on Lake St (to the south) and Washington Blvd (to the north), 1,300 feet from the nearest residences at the terminus of 7th Ave, and 1,000 feet from the nearest residences on Wyman Ave west of Park Presidio Blvd. Intervening topography, vegetation, and structures between the site and these residences help screen the staging area from the residences. Figure 8 shows the location of the dewatering site relative to residences.

Areas disturbed by the Project would be restored to support habitat enhancement and recreational uses of the area, consistent with the Mountain Lake Enhancement Plan and Environmental Assessment (Trust, NPS, and GGNPA, 2000), the VMP (Trust and NPS, 2001), and site-specific planting and restoration plans to be developed. Future site restoration and activities envisioned in the Mountain Lake Enhancement Plan and Environmental Assessment (Trust, NPS, and GGNPA, 2000) that are not within the disturbed area are not considered a part of the remedial action described herein. Limited vegetation removal related to the Project occurred in early 2012. This was to accommodate data collection and mapping required for the Project. When implementing the remediation project in 2012-2013, between 50 and 100 trees along with brush would be removed to prepare the staging area and provide access to the lake for the barge, if needed. The removal would be consistent with the VMP, which calls for restoration and rehabilitation of the historic forest zone north of the lake. The vegetation may be chipped on site as mulch for erosion control or placed elsewhere in the Presidio.

Construction activities associated with the proposed remedial action would consist of the following:

Pre-Remediation Construction Activities

- Highway Stabilization and Runoff Management Installation by Caltrans
    - Installation of approximately 450 stone columns within the shoulder (and perhaps one lane) to stabilize the highway to prevent movement toward the lake.
- Installation of piping, culverts, and inlets to capture, manage, and treat runoff before entering the lake.
- Establishment of Site Access (Alternatives)
    - <u>Ramps</u>: Construct and use temporary earthen ramps between the remediation site and northbound Highway 1 for direct site ingress and egress.
    - <u>West Pacific Ave</u>: Use West Pacific Ave to Arguello Blvd through the Main Post to the Lombard, Marina, or Gorgas Gates on the east side of the Presidio.
    - <u>Park Blvd</u>: Use Park Blvd through the Presidio Golf Course. Pass under Park Presidio Blvd via West Pacific Ave and continue on Park Blvd between West Pacific Ave and Washington Blvd From that point, trucks could continue
        - north on Park Blvd to Lincoln Blvd and on to Highway 101
        - west on Washington Blvd to Lincoln Blvd and on to Highway 101
        - east on Washington Blvd to Arguello Blvd, and north on Arguello Blvd, continuing through the Main Post, to the Lombard, Marina, or Gorgas Gates on the east side of the Presidio.
    - <u>Combination of Routes</u>: Depending on Project needs, ingress and egress at the site could be by way of a combination of these routes, with ingress along one route and egress along another or with the routes changing based on the activity taking place.

Remediation Construction Activities

- Dredging
    - Site preparation and additional clearing and grubbing
    - Preparation of access point(s) for dredging barge and equipment (if not able to lift onto lake by crane)
    - Setting up wet sediment handling area and installing temporary piping/transport to move dredged material to dewatering site and to return water to lake
    - Preparation of dredged material temporary holding facilities (diked lagoon or tanks), setting up dewatering equipment, and establishing temporary dewatered sediment cake stockpile.
    - Dredging and pumping of slurry to dewatering site.
    - Dewatering by belt press or similar mechanical means
    - Trucking of dewatered sediment to appropriate landfill
    - Returning water to lake
- Environmental Protection and Public Safety
    - Installation of Best Management Practices on site, including surface water runoff and erosion controls and means of keeping soil off paved roads.
    - Installation of temporary exclusion fencing around the active work areas of the site and, if

necessary, along West Pacific Ave.
    - Establishment of traffic control signage and devices as needed at points of entry to public roadway.
- Sampling and Testing
    - Sampling and testing of the lake bottom during dredging to confirm cleanup levels are attained.
    - Sampling and testing of return water from dewatering prior to release to lake.

Post-Remediation Site Restoration

- Site restoration of areas disturbed by the Project, consistent with the Mountain Lake Enhancement Plan and Environmental Assessment (Trust, NPS, and GGNPA, 2000), VMP (Trust and NPS, 2001), and site-specific planting and restoration plans yet to be developed. Future post-remediation restoration activities envisioned in the Enhancement Plan and falling outside of the Project area would be implemented by others and is not part of the proposed Project although foreseeable activity is evaluated herein. The following may be required:
    - Removal of ramp (if installed) and grading to stabilize slopes and establish drainage.
    - Installation of post-construction erosion control to protect site during vegetation re-establishment.
    - Potentially install drainage features (swales, culverts, sediment basins) and temporary irrigation to facilitate revegetation.
    - Plant vegetation to restore site, consistent with VMP.

Specific Project construction activities are detailed below.

Contractor Mobilization

In 2012, there would be two contractor mobilizations in support of the Project: one by Caltrans contractors engaged in stabilizing Highway 1 and performing drainage work; the other by Trust contractors constructing access ramps and removing remaining trees and brush. In each case, the construction contractor would mobilize its equipment to the respective work areas. Equipment would remain at the sites as long as needed and would then be removed.

In 2013, the Trust remediation contractor would mobilize equipment and personnel to complete site preparation and undertake remediation.

Pre-Remediation Actions

Before remediation can be undertaken, a number of preparatory actions must occur. These include Caltrans stabilizing the section of Highway 1 adjacent to the lake and performing drainage work and the Trust constructing an access ramp between Highway 1 and the staging area (if feasibile and permitted by Caltrans), and, as needed, removing selected vegetation not previously removed. If construction of the ramps is not feasible, or if approval to construct the access ramp cannot be obtained or cannot be obtained in a timely manner, access would be via West Pacific Ave, between Arguello Blvd and the Mountain Lake site, or between Washington Blvd and the site.

- Highway Stabilization: Dredging of the lake would remove sediment adjacent to Highway 1, which is at a higher elevation than the lake. Based on the nature of the soils supporting the highway, there is a risk that dredging the lake would create an unstable condition along the highway's east side. To address this concern, rock columns would be constructed down through the road fill, to a depth of 40 to 60 feet below the surface. These columns would require 3-foot diameter wells being constructed using vibrating equipment that would compact the displaced material to the sides of the well, densifying the well walls and creating the well shaft. The final depth of each well would depend on the nature of the subsurface material encountered and its engineering characteristics. Upon its completion, each well would be backfilled with rock, creating a rock column. The rock would have a maximum diameter of 3-inches, but most rocks would be between ¼ to ½-inch in diameter. (See Figures 4 & 5 and Appendix C.) An estimated 450 such wells would be required, arrayed in a staggered grid pattern. Completion of this aspect of the pre-remediation construction would take approximately 90 active working days over a 18 week period during 2012. It would be done primarily at night, to reduce impacts on highway traffic. The work would require closure of one northbound lane of Highway 1 during off-peak (nighttime) hours throughout the construction duration.
- Highway Runoff Management Installation: Contaminated sediment has accumulated in Mountain Lake due to runoff from Highway 1. Performing The drainage work by Caltrans would manage, control, and treat storm water that would still enter the lake following lake remediation. The drainage work would be

undertaken concurrent with the highway stabilization activity.

- Site Access
  - Construct access ramps (2012). If access ramps are to be used, a lane on northbound Park Presidio Blvd may need to be closed during their use. If so, ramp use may be restricted to nighttime hours. Clean fill would need to be imported to construct the ramps. When no longer needed, the fill would be graded over the disturbed remediation site or hauled offsite. This would ensure all Project traffic is on Highway 1, minimizing disturbance to the Lake St and Presidio neighborhoods and the land uses surrounding the lake. This would keep work activity at the north end of the lake, leaving most other park and Presidio areas open to public use. Ramp construction would involve the removal of vegetation, ground preparation to receive the ramps, import of geotechnically suitable material, earthwork to form the ramps, and grading to integrate the ramps with the surrounding area. The earthen ramps would be removed when no longer required for site access. It is anticipated that the ramp material would be graded into the surrounding area and no offhaul would be required.
  - Designate haul route on existing roads (2013)(1)A West Pacific Ave route would be from the site along West Pacific Ave to Arguello Blvd, then north through the Main Post to the Lombard, Gorgas, or Marina Gates and out to U.S 101 (Lombard St). This route passes along the partially paved West Pacific Ave right of way, passing between the golf course and the southern Presidio boundary wall, then through Presido Golf Club parking area to Arguello Ave. Public access to Mountain Lake trail (located on West Pacific Ave) would be restricted during hauling. Periodic restrictions also may be in place at the north end of the lake depending on construction and remediation activities. (2) A Park Ave route would be lead from the site under Park Presidio Blvd (Hwy 1), then north on the closed portion of Park Ave the divides the Presidio Golf Course. At Washington Ave the route could: (a) continue north on Park Ave to Lincoln Blvd and from there to US 101 at the Bridge Toll Plaza, (b) continue west on Washington Ave to Lincoln and from there to US 101 at the Bridge Toll Plaza, or (c) continue east on Washington Ave to Arguello Blvd and from there through the Main Post ot an exit on the east side of the Presidio onto US 101 (Lombard St). Depending on Project needs, a circular route could be established, using either Park Ave and West Pacific Ave for ingress and the other for egress. Depending on Project needs, the designated route may change from time to time (e.g., one route for daily worker access, another for equipment and material delivery, and another for hauling.)

Site Preparation, Clearing, and Grubbing

The work area would be fenced and posted for no entry. Vegetation not previously cleared would be removed from areas west and north of the lake to gain access to the lake, construct the pipeline/transport system, and clear the staging area. Approximately 50 to 100 trees would be removed to clear the staging area and north arm of the lake to lay piping. If feasible, the barge would be directly loaded onto the lake from Highway 1, along the west side of the lake. Limited vegetation occurred in this area between November 2011 and January 2012 to facilitate surveying and development of topographic mapping to support access assessments and detailed design. Additional brush vegetation and tree removal would be performed in 2012 to prepare the staging area and north arm shoreline access prior to the remediation action. Placement of the dredge barge from Highway 1 would likely require a lane or shoulder closure of Highway 1 and may need to be conducted at night. Alternatively, the barge would be directly loaded from the north arm of the lake. Areas along the eastern shore of the lake would be avoided, to the extent practicable, to avoid damaging native plants. At the same time, a previously disturbed upland site northeast of the lake would be set up as the staging area to handle the sediment-water slurry that would be removed from the lake bottom. This would involve removal of vegetation not previously removed and the creation of a temporary lagoon or placement of temporary holding tanks.

Dredging and Dewatering

Approximately 15,600 cy of in situ sediment would be dredged from the lake bottom. This volume is estimated based on an average removal of 2.5 feet of sediment throughout the bottom, with some portions of the lake being dredged to 5.5 feet. Previous studies suggest that this removal would achieve appropriate remediation. Deeper sediment in the lake contains constituents that are below cleanup levels or are naturally occurring. Confirmation sampling during dredging would ensure that COCs at concentrations above cleanup levels in sediment are removed.

Dredging would be done using a barge with floating hydraulic dredging equipment. The dredged material would be pumped through a temporary pipeline (or other transport system) to the dewatering area 600 feet north of the lake. Removal of 15,600 cy of in situ sediment (compacted) would produce approximately 34,480 cy of discharged volume (sediment and water slurry) over an active dredging duration of approximately two weeks.

Depending on staging at the dewatering area, interim dredged material could temporarily be stored within a diked lagoon or tanks prior to dewatering. At the upslope staging area, the dredged sediment would dewater by mechanical belt press or other mechanic dewatering process. Following an active dewatering duration of approximately 10 weeks, approximately 9,850 cy of dewatered cake solids would be produced. The cake solids would be temporarily stockpiled and then hauled by truck to the offsite disposal facility. Water from the dewatering process would be tested before being returned to the lake via temporary piping. No additional treatment of the water generated during sediment drying is expected to be necessary (Kennedy/Jenks, 2012b).

Storm water best management practices (BMP) would be employed to prevent erosion of disturbed areas and migration of sediment in runoff to areas outside the work area. Soil stabilization measures would be installed along the Project perimeter to address soil erosion and prevent offsite migration. Soil stabilization measures would include use of silt fences, binders, straw, biodegradable mats, and other methods as necessary, taking into consideration the soil conditions and slope. Additionally, standard storm water pollution prevention plan (SWPPP) BMPs used at the Presidio would be implemented. These include but are not limited to sediment tracking controls such as tire sweeping/washing and road sweeping; erosion controls such as silt fencing and straw wattles in disturbed areas; dust control including vehicle speed restrictions and the use of water on access routes; and drainage inlet protection as needed, including sand bags around drainage inlets and filter fabric within inlets.

Transport of Sediment to Landfill

If trucks haul the dewatered sediment cake from the dewatering site by way of a temporary access ramp to Highway 1, the trucks would head north on Highway 1 through the MacArthur Tunnel to Highway 101. From there they would continue to the designated disposal site. Empty trucks returning from the landfill would enter the site from northbound Highway 1 by way of a temporary ramp. To ensure safe vehicle movements between the ramp and the highway, traffic controls and warning signs would be employed. A temporary lane closure would be needed. This may require that the hauling occur at night, when traffic volume is low.

If existing roads are used in lieu of ramps, these would be (1) West Pacific Ave east to Arguello Blvd and then north, exiting the east side of the Presidio to Highway 101 (Lombard St) or (2) by way of Park Blvd (a) north to Lincoln Blvd or (b) west on Washington Blvd to Lincoln Blvd or (c) east on Washington Blvd to Arguello Blvd. Figure 7 shows the alternative routes.

If the West Pacific Ave to Arguello Blvd route is used, loaded trucks leaving the staging area (dewatering site would travel south on West Pacific Ave to the point where it turns east and continue on the gravelled and paved portions of the road to Arguello Blvd, 0.4 miles east of the lake. From that point trucks would turn north (left) onto Arguello Blvd and from that point proceeed through the Main Post to Presidio Blvd and out the Lombard, Gorgas, or Marina Gates. The trucks would enter Highway 101 (Lombard St) and continue to the disposal site. Returning trucks would reverse this route.

If the Park Blvd route is used, trucks would exit the dewatering site by passing under Park Presidio Blvd on West Pacific Ave north of the lake, turn north onto the extension of Park Blvd through the golf course to Washington Blvd, then turn west (left) onto Washington Blvd and continue to Lincoln Blvd. At Lincoln Blvd, trucks would continue north to Highway 101. Variations on this route would have the trucks go west on Washington Ave to Lincoln Blvd or east on Washington Blvd to Arguello Blvd, and continue north to US 101 from there.

Any and all of these routes potentially could be used at various times, depending on the nature of Project needs.

Depending on the size of truck (10 cy or 18 cy), hauling approximately 9,850 cy of dewatered sediment would require about 550 to 990 truck round trips between the dewatering site and the disposal facility. Trucks of a relatively low capacity (10 cy) might be required to navigate steep ramps and narrow turns to Highway 1 or along one of the Park Blvd to Lincoln Blvd options. Larger trucks (18 cy) might be viable if the transport route is along West Pacific Ave to Arguello Blvd. Based on turn angles at Arguello Blvd, it is assumed that the Park Blvd/Washington Ave route east to Arguello would rely on smaller trucks. It is assumed that 25 trucks of either size would be available. Given the distance to a landfill in the Central Valley, no more than 25 round trips per day would occur over a 4 to 8 week period when dewatered sediment off-hauling would occur. Allowing for filling of the trucks, this would average 3 trucks per hour leaving the site and 3 trucks per hour entering the site. However, it is likely that most trucks would have departed by early afternoon in order to reach the disposal site before it closes, unless arrangements can be made for later delivery.

For this environmental analysis, the ultimate disposal site is assumed to be the Buttonwillow Landfill in Kern County. The one-way trip distance from the Presidio to the facility in Kings County is approximately 265 miles. However, depending on the constituents in the dewatered sediment, some or all of it may be suitable for disposal at a closer landfill. This would be determined by testing of the dewatered sediment. A small number of additional truck round trips may be required to transport equipment, construction fencing, and other materials to the site from suppliers and construction yards in the region. The number of workers at the site would be small; therefore, the number of personal vehicles would result in a negligible increase in Presidio and local automobile traffic.

Recontouring, Soil Stabilization, and Site Restoration

The lake bottom would settle to a new profile at the conclusion of dredging. Following removal of sediment, the new lake bottom would be contoured as needed to enhance slope stability and for proper lake functioning. Any disturbed dry land would be graded and the soil stabilized in accordance with the final site design. Measures to stabilize the soil would include using binders, straw, biodegradable mats, and other methods as necessary, taking into consideration the nature of the soil and slope.

Site restoration of areas impacted by the Project would be conducted to facilitate habitat and recreational development. Given the anticipated scope of impacts in the staging area and north arm, it is likely that the following site restoration activities may be required:

- Ramp removal (if installed) and grading to stabilize slopes and establish proper drainage. It is anticipated that imported soil used for the ramp would be retained on site, but graded into the surrounding topography.
- Installation of post-construction erosion control to protect the site during revegetation establishment.
- Potentially the installation of drainage features such as swales, culverts, and/or sedimentation basins to properly manage stormwater flows during the revegetation period and minimize sedimentation to the Lake.
- Potentially temporary irrigation infrastructure to facilitate revegetation. Irrigation requirements are not yet known.
- Plantings to restore vegetation removed during remedial action operations. Planting requirements are not yet known.

Site restoration would be implemented consistent with the Mountain Lake Enhancement Plan and Environmental Assessment (Trust, NPS, and GGNPA, 2000), VMP (Trust and NPS, 2001) and site-specific planting and restoration plans yet to be developed. Revegetation of the lake shores and upland areas would include use of native plant species, historic or native tree species, and landscape vegetation appropriate to the site's future uses. For this site restoration work, a small number of additional truck trips would be required to haul equipment, fencing, erosion control material, irrigation piping, and plants to the site.

Schedule

The Project would be in three primary phases. For phase one, pre-remediation construction performed by Caltrans (highway stabilization and highway runoff controls installation by Caltrans and construction of access ramps by the Trust) would take place in 2012 and is expected to take 90 active working days, over an approximately 18 week period. Because the Caltrans work is in and adjacent to the highway, it would occur primarily at night, generally between 9:00 p.m. and 5:00 a.m., Monday through Friday, with limited weekend and daytime work as necessary.

Pre-Remediation Construction Activity (Anticipated 2012)	***Duration***	***Period***
Highway Stabilization [Caltrans]	18 weeks	Week 0 to 18
Highway Runoff Management Installation [Caltrans]	18 weeks	Week 0 to 18

Pre-remediation and site preparation construction performed by the Trust in the staging and access areas to the north of the lake (tree removal, ramp construction, and surveying) would occur in 2012 and is expected to take approximatley 9 weeks. Construction of the access ramps would occur during the day, with limited nighttime work possible.

Pre-Remediation Construction Activity (Anticipated 2012)	***Duration***	***Period***
Tree Removal	4 weeks	Week 0 to 4
Ramp Construction	4 weeks	Week 4 to 8
Pre-Remediation Base Line Surveying	1 week	Week 8 to 9

For the next phase, the remediation contractor is scheduled to mobilize to the site in March 2013, and the remedial action is expected to be complete by October 2013, requiring approximately 28 weeks of activity. Site preparation and dredging would occur in the initial 4 weeks of remediation. Subsequent dewatering would occur over about 10 weeks, during which time some off-hauling would occur for up to 8 weeks. Based on the rate of dredging and subsequent dewatering, it is likely that some hauling can occur even while dredging is taking place. The general schedule of remediation activities is presented below.

Remediation Construction Activity (Anticipated 2013)	***Duration***	***Period***
Mobilization and Site Preparation	6 weeks	Week 0 to 6
Dredging and Depositing Sediment at Dewatering Site	2 weeks	Week 7 to 8
Dewatering Sediment	10 weeks	Week 7 to 16
Transport of Sediment to Landfill	4 *(to 8)* weeks	Week 17 to 20 *(or 17 to 24)*
Site Restoration	7 weeks	Week 21 to 27 *(or 25 to 31)*
Demobilization	2 weeks	Week 28 to 29 (*or 32 to 33)*
Duration	29 to 33 weeks	

Cumulative Impacts

CEQA requires consideration of the cumulative impacts of a proposed project in combination of impacts of other projects or activities that have the potential to combine with impacts of the proposed project. Although impacts of each project may be less than significant, the cumulative effect of all projects may be significant.

America's Cup: Major sailing regatta events are planned on San Francisco Bay for the summer of 2012 and 2013. These events are planned to take place in August and September 2012 and from July through September 2013. The events culminate with the America's Cup final in September 2013. Most events are planned for Thursday through Sunday each week, with the greatest attendance expected on Saturday and Sunday. Because of local wind conditions, events are planned primarily for afternoons. As with any major regional event, such as New Year's Eve, 4th of July, and Fleet Week, roadways may become highly congested, particularly main arteries and streets near the waterfront. Based on the sailing schedule and the Project construction schedule, both the Caltrans pre-remediation work and the Trust pre-remediation and remediation work have the potential to overlap with the Thursday and Friday events. However, the 2012 Caltrans work would occur primarily at night and, therefore, would not coincide with daytime traffic. The 2012 Trust work is limited in scope and primarily would involve delivery of fill for the ramps, if built, and the hauling of vegetation. However, the vegetation would be chipped or composed on the Presidio, and would not require hauling on local highways or streets. The 2013 Trust remediation work anticipates a 4 to 8 week period of hauling dried sediment from the site. Depending on when this hauling occurs and how it is scheduled, it would be possible to avoid the race-related heavy congestion periods. In particular, given that trucks would be traveling up to 265 miles to a disposal site, they would leave early in the day, before traffic associated with the afternoon events began to arrive. In addition, a contractor typically schedules hauling to make the most efficient use of drivers and trucks. Therefore, it is reasonable that a contractor would schedule around congested periods, when trucks could be caught in traffic. Given that there is no overlap of 2012 construction with race events, and that the 2013 hauling schedule can be adjusted to minimize contributing to congestion, the America's Cup events were not considered in the cumulative analysis.

2012 Cumulative Scenario: There are five known construction projects on or near the Presidio that would or may overlap with the Caltrans work in 2012. These are the ongoing 5-year Doyle Drive replacement project, the Presidio's Main Post update projects, a remediation project above Baker Beach (RAP BB1A), a remediation project northeast of the Golden Gate bridge toll plaza at the CHP Range, and a remediation project in the Main Post at the Bernard Avenue Protected Range (RAP 6C). Their locations are shown in Figure 9.

The Doyle Drive project is on the north side of the Presidio; the Mountain Lake remediation Project is on the south side, over one mile away. Detours and road closures would be required during the duration of the complex Doyle Drive work, and would change from time to time as the work progresses. The Doyle Drive project EIS concluded that implementation of the Transportation Management Plan (TMP) for that project would ensure that there are no significant transportation/traffic related impacts (FHWA & SFCTA, 2008)). Although the Mountain Lakes remediation work was not considered during the analysis of the Doyle Drive project and in the PTMP, the number of truck trips and the period over which they would occur are minor as compared to the Doyle Drive project. They would not contribute to a worsening of traffic conditions below the level of service attributable to the Doyle Drive work. Level of Service (LOS) is used to describe delay at intersections due to traffic volume and other conditions. In 2011, the level of service (LOS) at intersections on Lombard Street (US 101) during weekday peak hours was LOS C at Lombard St/ Divisadero St and Lombard St/ Fillmore St and LOS D at Lombard St/ Van Ness Ave. (San Francisco Planning Department, 2011) These levels reflect the Doyle Drive related construction traffic during that period. LOS C is described by traffic engineers as "acceptable delays"; LOS D as "tolerable delays". It is assumed that the contribution of construction-related traffic from the Doyle Drive project would remain similar in 2012 and 2013 to what is was in 2011.

The Main Post update project is within the Main Post of the Presidio, approximately 4,500 feet northeast of the Mountain Lake site. The Main Post upgrade project includes reconstruction of existing buildings, structural improvements and other seismic work, roadway and utility upgrades, and other infrastructure enhancements. The Main Post work is ongoing and does not occur all at once. Specific projects are fairly small. The Final

Supplemental EIS for the Main Post Update indicates that construction vehicle traffic would vary depending on the specific construction activity and schedule. Construction vehicles for the Main Post would generally enter the Presidio via Richardson Ave, Doyle Dr., or the Golden Gate bridge toll plaza (Trust, 2010).

Baker Beach site BB1A work would occur in approximately the same period as the Caltrans work on Highway 1 adjacent to Mountain Lake. The Baker Beach site is approximately 7,000 feet north-northwest of Mountain Lake and only 400 feet south of the Golden Gate Bridge toll plaza. An estimated 3,800 cy of fill would be removed from the site (MACTEC, 2011b). Access to the Baker Beach site is off Lincoln Blvd. Trucks would likely reach Highway 101 at the Golden Gate Bridge by way of Lincoln Blvd and Merchant Rd. Once on Highway 101, the Baker Beach trucks potentially would use similar off-Presidio routes as the Caltrans trucks if they are on Highway 101.

The CHP Range work would occur in approximately the same period as the Caltrans work on Highway 1 adjacent to Mountain Lake. The CHP site is approximately 8,000 feet north-northwest of Mountain Lake and only 700 feet northwest of the Golden Gate Bridge toll plaza. An estimated 600 cy of fill would be removed from the site. Access to the CHP Range site is off Lincoln Blvd. Trucks would reach Highway 101 at the Golden Gate Bridge by way of Lincoln Blvd and Merchant Rd. Once on Highway 101, the CHP Range trucks potentially would use similar off-Presidio routes as the Caltrans trucks if they are on Highway 101 (EKI, 2009).

The Bernard Avenue Protected Range (BAPR) site is south of Presidio Blvd, between Barnard Ave and Quarry Rd, south of Fernandez St. The range now is largely covered by Landfill E, which is a remediated site. However, a portion of BAPR is not covered by the landfill. It is estimated that 2,500 cy of material would be hauled from the site during remediation (Geosyntec, 2012). The haul route is likely to be via Presidio Blvd to Lombard Gate and onto US 101 (Lombard St).

The projects are a considerable distance from each other. In most respects the Mountain Lake site is isolated from the other projects in terms of the potential to contribute to cumulative effects. The only area in which the 2012 Caltrans work near Mountain Lake could contribute to a cumulative effect is in its use of trucks and equipment during construction and when hauling aggregate and material. This part of the construction activity has the potential to contribute to a cumulative impact on traffic congestion and, therefore, on air quality. All other potential impacts identified for the Caltrans work are specific to the site or the immediate vicinity. Most of this work would occur at night. The other projects identified as occurring in 2012 would occur primarily during the day. In addition, all impacts from the projects are short-term impacts that are associated with construction. There are no ongoing impacts once construction is finished. Consequently, the only resource topics for which cumulative impacts are considered in detail are Air Quality and Traffic/Transportation.

2013 Cumulative Scenario: There are three known construction projects on or near the Presidio that would or may overlap with the Trust's Mountain Lake remediation work in 2013. These are the ongoing 5-year Doyle Drive replacement project and the Presidio's Main Post update, discussed above for 2012, and another remediation project above Baker Beach (RAP 5C BB2). Their locations are shown in Figure 9.

The ongoing Doyle Drive and Main Post update projects are discussed above and are not repeated here. Baker Beach BB2 site is near the Baker Beach BB1A site that will be remediated in 2012. It is estimated that about 4,000 cy of fill material would be hauled from the BB2 site (MACTEC, 2011a). This is similar in volume to the BB1A work. This second Baker Beach project would use the same travel routes as the prior year's BB1A project. For purposes of understanding cumulative impacts, the two projects are very similar, with one occurring in 2012 and the other in 2013.

ENVIRONMENTAL IMPACT ANALYSIS:

1. Aesthetics

Project activities likely to create an impact:

- Night lighting for road work,
- Vegetation clearing
- Presence of equipment and materials on site
- Temporary storage of sediment during dewatering
- Potentially night dewatering operations.

Description of Environmental Setting:

The Project area shares its western boundary with Park Presidio Blvd (Highway 1) and its southern boundary with the City and County of San Francisco's Mountain Lake Park. To the north and east is the Presidio Golf Course, located within the Presidio. A fence marks the western edge of the golf course, approximately 120 to 160 feet from the lake. The residential areas near the lake are to the south and southeast of Mountain Lake Park, on 9th, 10th, 11th, and 12th Avenues and Fulton and Lake Streets; and to the west-northwest on Wyman Ave in the Presidio. The distance from the lake shore to residential buildings varies from approximately 600 feet at 9th Ave to approximately 200 feet at 12th Ave and Fulton St. The distance from Highway 1 to Wyman Ave is approximately 200 feet. If West Pacific Ave is used (Alternative Access), the route would pass residences located south of the Presidio boundary wall along West Pacific Ave. The nearest residences to West Pacific Ave are found between Arguello Blvd and 7th Ave. For about 1,000 feet, from Arguello Blvd to approximately 5th Ave, the West Pacific Ave route is paved and open to vehicles. For remainder of the route to the lake, a distance of 1,600 feet, the wide right of way is crushed rock with a paved path along the golf course side. Two trails pass through the area. From the south, Juan Bautista De Anza National Historic Trail (De Anza Trail) enters Mountain Lake Park at Fulton St and passes along the south side of the lake, approximately along the boundary between the City park and the Presidio. The trail then turns north-northwest on a paved roadbed, passing approximately 100 feet from the northeast shore of the lake. The De Anza Trail continues north on the roadbed before crossing under Park Presidio Blvd and continuing north. From the east, Mountain Lake Trail is co-located with West Pacific Ave. At the lake, the Mountain Lake Trail joins the De Anza Trail, and is co-located with the DeAnza trail past the lake and under Park Presidio Blvd. If Park Blvd is used, the route would pass under Park Presidio Blvd (Hwy 1) and proceed north on the extension of Park Blvd that crosses the western part of the golf course en route to Washington Blvd. Refer to Pages 3 - 14.

Analysis as to whether project activities would:
a. Have a substantial adverse effect on a scenic vista.

Less than significant. As a result of implementing the proposed highway work and remediation at Mountain Lake, temporary visual changes would occur. Temporary changes are associated with roadbed stabilization, dredging, dewatering, and trucking of sediment and include the presence of equipment used in the roadwork, dredging and sediment handling, trucks transporting material offsite, site fencing, and worker activity. Removal of vegetation for site access and clearing of the staging area would also temporarily change the landscape. The scope of the construction activities during 2012 would be limited primarily to Highway 1 work by Caltrans and ramp and site preparation work by the Trust. In 2013, activities would be limited to dredging in the lake and dewatering at a site in a wooded area north of the lake. Trucks would haul sediment from the site by way of an access ramp directly to Highway 1. If the ramp is not available, the haul route would be by way of West Pacific Ave to Arguello Blvd and through the Presidio or by way of Park Blvd to Washington Ave and through the Presidio. The impacts would be short-term, lasting about 18 weeks in 2012 and about 28 weeks in 2012. Owing to its topographic location relative to surrounding land and the presence of surrounding vegetation and nearby buildings, the overall site is not visible from a great distance. The lake and highway are visible from some residences to the south, but the view is moderated by trees in Mountain Lake Park. The lake also is visible from a few vantage points on the golf course, which sits at a higher elevation. Here the view also is moderated by trees and vegetation. Vegetation removed for preparation of the staging area for dewatering would open up this area to being viewed from various locations on and off the Presidio. Site areas impacted by the vegetation removals and site operations would be restored, which would include replanting consistent with the existing Vegetation Management Plan (VMP). The vegetation would take a number of years to mature, but this impact was considered in the Environmental Assessment of the VMP. Given the short duration of the work, the surrounding conditions, and post-remediation site restoration, the Project would not have an adverse effect on a scenic vista.

Changes attributable to the remediation would result in a visual environment not noticeably different from existing conditions. The stone columns stabilizing the highway and the runoff controls would be below ground. The sediment is

not visible in the lake. Following remediation, shrubs and trees would be restored consistent with the Mountain Lake Enhancement Plan, VMP and specific site plans, but would take a number of years to reach a mature size. The visual effects of construction and site restoration would be temporary, and the visual qualities of the site would be enhanced in the long term; therefore, impacts to any scenic vistas would be less than significant.

b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings and historic Buildings within a state scenic highway.

Less than significant. The Project is not near a designated state scenic highway. (While some portions of Highway 1 south of San Francisco are designated as scenic; Highway 1 in San Francisco is eligible but is not officially designated as a California Scenic Highway). Because the proposed actions are expected to retain or improve existing visual qualities, and would not have a lasting visual effect, there would be a less than significant impact on scenic resources. Installation of the pipe on the West Pacific Ave Bridge would be encapsulated in a soffit that would blend in with the existing structure. Views of the pipe would be minimal and limited primarily to people on the trail. Refer to 1.a.

c. Substantially degrade the existing visual character or quality of the site and its surroundings.

Less than significant. There would be short-term impacts that would degrade the existing visual character or quality of the site and its immediate surroundings due to vegetation removals, construction activities, and the presence of needed equipment, fencing, and safety devices. These impacts would not be substantial because they are temporary in nature and limited in geographic extent. Subsequent to remediation, restoration activities to be undertaken in the area disturbed by the Project and would be consistent with the VMP. This would improve the visual character and quality of the site and its surroundings. Impacts on the visual character and quality of the site would be less than significant.

d. Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

Less than significant. Work required to stabilize Highway 1 would occur primarily at night so as to minimize daytime traffic disruption. This work would require the use of temporary mobile lighting to illuminate the work area. The lighting would be down-focused on the work area. As part of traffic control and safety, an electric arrow panel would be used to direct motorists to merge left. The lighting would be visible to motorists on Highway 1 and to residences with windows facing the lake. The lighting would be temporary and would be removed upon completion of the stabilization work, which is expected to take approximately 18 weeks. Because of the somewhat higher elevation of the residences, the distance of the residences from the work site, and the relatively few residences affected, and the presence of existing street lighting, the effect of the night lighting would be less than significant.

If access ramps are permitted by Caltrans between the site and Park Presidio Blvd, they may be limited to nighttime use if they require a lane closure. In this case, temporary lighting similar to that required for the Caltrans highway stabilization work would be used. To the extent feasible, consistent with operating and safety needs, the lights would be directed away from residential areas and toward the immediate work area. Other remediation activities would be performed during daylight hours, as would the hauling if the ramps are not constructed. Glare may be visible during daytime as a reflection from glass and metal surfaces on vehicles and equipment. However, the remediation construction period would be temporary. Because construction vehicles would be constantly moving, any glare that might occur from vehicles would be transitory for viewers. It is possible that night hauling of sediment would occur if the access ramp to Highway 1 were available. This would require lighting of the temporary stockpile area in the staging area. However, the dewatering site is in a wooded area that is 1000 feet from the nearest residences, and there is additional vegetation between the wooded site and the residences. Depending on the rate of production of sediment/water slurry from dredging, it may be feasible and desirable to have mechanical (belt press) dewatering occur at night as well as in the day. If this is the case, lighting would be required for safety and would consist of either portable trailer pole-mounted lights or lights installed at the site and hooked into the electrical system. The lights would be down-focused and aimed away from residences, consistent with safe operating requirements. Based on this and the distances between residences and the dewatering site, night lighting would not create a significant impact. As a result of the duration and limited nature of the effects, the remediation would not produce permanent new sources of light or glare that would adversely affect day or nighttime views, resulting in a less-than-significant impact.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

NPS and Trust, 2003. *Presidio Trails and Bikeways Master Plan and Environmental Assessment*. July.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Final Environmental Impact Statement*. May.

Trust and NPS, 2001. *Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco.* December.

Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

2. Agricultural and Forest Resources

Project activities likely to create an impact:

None. There are no farmlands or areas zoned as forest land or timber land within the Presidio. The Presidio is zoned for recreational use,. Therefore, no impact on agricultural resources would occur. For this reason, no further analysis of impacts to this resource category is necessary.

Description of Environmental Setting:
Analysis as to whether or not project activities would:
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.

b. Conflict with existing zoning or agriculture use, or Williamson Act contract.

c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

d. Result in the loss of forest land or conversion of forest land to non-forest use?

e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Final Environmental Impact Statement*. May.

Trust and NPS, 2001. *Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco.* December.

Trust, NPS and Golden Gate National Parks Association (GGNPA)], 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☐ No Impact

3. Air Quality

Project activities likely to create an impact:

- Emissions from use of heavy equipment, trucks, and other vehicles for roadbed stabilization, dredging, dewatering, and transportation.

Description of Environmental Setting:

The Presidio is located within the San Francisco Bay Area air basin, which is under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). The nine-county air basin is a nonattainment area for the State ambient air quality standards for ozone and inhalable particulate matter 10 microns or less in diameter (PM10) and less than 2.5 microns in diameter (PM2.5). Additionally, the air basin is a nonattainment area for the federal ambient air quality standards for ozone and PM2.5. Air circulation in the vicinity of the site is excellent, as it is located in close proximity to air flow from San Francisco Bay and the Pacific Ocean. Refer to Pages 3 to 14.

The State CEQA Guidelines allow lead agencies, in making determinations of significance for air quality impacts, to rely on criteria recommended by the local air district. Table 3-1 shows each of the ambient air quality standards and the attainment designation of the BAAQMD with respect to each standard.

Table 3-1. National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	State-Level Attainment Status	National Standards	Federal Attainment Status
Ozone	1-hour	0.09 ppm	Nonattainment	—	
	8-hour	0.070 ppm	Nonattainment	0.075 ppm	Nonattainment
Respirable Particulate Matter (PM10)	24-hour	50 µg/m^3	Nonattainment	150 µg/m^3	Unclassified
	Annual Mean	20 µg/m^3	Nonattainment	—	
Fine Particulate Matter (PM2.5)	24-hour	—		35 µg/m^3	Nonattainment
	Annual Mean	12 µg/m^3	Nonattainment	15 µg/m^3	Attainment
Carbon Monoxide (CO)	1-hour	20 ppm	Attainment	35 ppm	Attainment
	8-hour	9.0 ppm	Attainment	9.0 ppm	Attainment
Nitrogen Dioxide (NO2)	1-hour	0.18 ppm	Attainment	0.100 ppm	Unclassified
	Annual Mean	0.030 ppm	Attainment	0.053 ppm	Attainment
Sulfur Dioxide (SO2)	1-hour	0.25 ppm	Attainment	0.075 ppm	Attainment
	24-hour	0.04 ppm	Attainment	0.14 ppm	Attainment
	Annual Mean	—		0.03 ppm	Attainment
Lead	30-day Average	1.5 µg/m^3	Unclassified	—	
	Calendar Quarter	—		1.5 µg/m^3	Attainment

Notes: ppm=parts per million; µg/m3= micrograms per cubic meter; "—" =no standard
Source: BAAQMD, 2012; http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm.

The BAAQMD has established standard measures to reduce impacts to air quality resulting from construction activities (BAAQMD, 2011). For PM10 and PM2.5 related to construction fugitive dust, BAAQMD specifies that projects include best management practices rather than achieve specific emissions thresholds. The BAAQMD thresholds for criteria air pollutant emissions specify that a project during construction may cause a significant impact if it would:

- Emit more than 54 pounds per day (lb/day) of reactive organic gases (ROG);
- Emit more than 54 lb/day of nitrogen oxides (NOx);
- Emit more than 82 lb/day of PM10 from exhaust; or
- Emit more than 52 lb/day of PM2.5 from exhaust.

The BAAQMD thresholds for community risk and hazards specify that a project may cause a significant impact if the emissions create:

- Increased incremental cancer risk greater than 10.0 in a million;
- Increased non-cancer hazard greater than 1.0 Hazard Index for chronic or acute hazards;

- Incremental increase of annual average PM2.5 concentration greater than 0.3 µg/m^3 from a single source.

The City's Mountain Lake Park is adjacent to the south side of the Project site. The Presidio Golf Course fence is 120 to 160 feet east and northeast of the Project site, with the nearest green approximately 300 feet from the lake. Residential apartments and houses are located on 5th through 12th Avenues, and Fulton Ave, which terminate at the Presidio boundary, and on Lake St, which parallels the boundary. Within the Presidio, residential houses are located on Wyman Ave, within approximately 250 feet west of Highway 1. Highway 1 forms the western boundary of the site. The distance between the southern part of the highway work and the nearest residential units is approximately 300 feet, at the end of Fulton St. If temporary ramps are used, residences south of Mountain Lake Park would be approximately 1,500 feet away from trucks entering and exiting the site; residents on Wyman Ave would be approximately 450 feet away, but would be separated by heavily travelled Park Presidio Blvd (Highway 1). If West Pacific Ave is used for site access (Alternative Access option), trucks hauling sediment on West Pacific Ave would pass within approximately 20 to 30 feet of residences located south of the Presidio's southern boundary wall. These residences are located at the termini of 5th, 6th, and 7th Avenues and on the north side of the Presidio Terrace circle. If the Park Blvd route is used, trucks would pass residences on Washington Blvd either to the west (en route to Lincoln Blvd) or to the east (en route to Arguello Blvd). The closest children's educational or care facility to the remediation site is the Lone Mountain Children's Center, located on the Presidio approximately 600 feet northwest of the lake. The Center is separated from the Project site by heavy traffic on Park Presidio Blvd (Highway 1), dense vegetation on the west side of Highway 1, and buildings in the Public Health Services Hospital district. The only other sensitive receptor within 0.25 mile of the lake is the SF Free Clinic. Two schools, Sutro Elementary School, and St. James Preschool are just over 0.25 mile from the site.

Sensitive facilities within 0.5 mile of the Project Site (lake) are listed below. Sediment dewatering and stockpiling site is about 1,000 feet farther from these facilities.

Lone Mountain Children's Center	0.11 mi	1806 Belles St (on Presidio)
San Francisco Free Clinic	0.21 mi	4900 California St
Sutro Elementary School	0.26 mi	235 12th Ave
St James Preschool	0.26 mi	4620 California
Presidio Preschool	0.37 mi	143 Clement St
St. Anne's Home (elder's residence)	0.38 mi	300 Lake St
George Peabody Elementary School	0.39 mi	251 6th Ave
Laurel School	0.42 mi	350 9th Ave
Purple Canyon Art Studio	0.46 mi	301 Cornwall St
Star of the Sea School	0.48 mi	360 9th Ave

Analysis as to whether or not project activities would:
a. Conflict with or obstruct implementation of the applicable air quality plan.

Less than significant. The planned highway construction and remedial actions would not conflict with applicable air quality plans or regulations. Highway stabilization activity would involve use of a crane, vibratory probe, and other equipment including generators, lights, loaders, and approximately 8 trucks daily to bring aggregate and remove spoils, over 90 active working days during an 18 week period. Remediation activity would result in use of the dredging and pumping equipment, along with approximately 25 heavy-duty truck round trips per day for removal of dewatered sediment. Measures to address potential air emissions and control dust and odors would be incorporated into the designs, consistent with BAAQMD standards and requirements. Dust control measures would be implemented wherever the soil or sediment is exposed (e.g., exposed surfaces watered two times per day). Best Available Control Technologies (BACTs) would be adopted to maintain the site and operate equipment in a manner that would minimize air emissions. Typical BACTs would include measures such as keeping equipment tuned and in good working order, limiting idling times to 5 minutes or less, using equipment that has lower emissions (e.g., electric-powered dredging motor, other off-road diesel equipment certified to achieve Tier 3 standards), providing gravel access ramps to paved roads, and not operating equipment at times that would exacerbate wind erosion (e.g., avoiding handling of dewatered materials when average wind speeds exceed 20 mph). Over the course of activity, the average daily emissions (see Appendix D) caused by the construction and remediation would be a fraction of thresholds recommended by BAAQMD for construction-phase emissions (BAAQMD, 2011). Table 3-2 summarizes the average daily emissions over the duration of the construction activity and the applicable BAAQMD thresholds. Due to the limited nature of the activities and the implementation of control measures into the construction and remediation design, this impact would be less than significant.

Table 3-2. Construction-Related Emissions of Criteria Air Pollutants (lb/day)

	NOx	PM10	PM2.5	CO	ROG	SOx
Off-Road Equipment	18.22	1.30	1.19	13.27	3.66	0.02
On-Road Crew and Workers	5.85	0.25	0.20	8.73	1.11	0.01
On-Road Diesel Trucks	25.07	1.21	1.05	8.28	2.05	0.03
Fugitive Dust	---	96.58	21.95	---	---	---
Total Exhaust Only	49.14	2.76	2.44	30.27	6.82	0.07
BAAQMD Significance Threshold	54	82	54	None	54	None

Notes: Thresholds for PM10 and PM2.5 apply to construction exhaust only, excluding fugitive dust.
Source: BAAQMD, 2012; also see detailed calculations in Appendix D.

b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

Less than significant. During the highway construction and remedial actions, dust (particulate matter) may become airborne from disturbed soil near the highway or lake and from vehicles transporting materials. However, only a small area would be disturbed by equipment. Trucks transporting sediment would travel on a ramp to Highway 1, or on West Pacific Ave or Park Blvd/Washington Blvd through the Presidio. Except for the staging area (dewatering site) vicinity, the route is paved in crushed rock, concrete, or asphalt. BACTs would be used to reduce dust emissions, including watering all exposed surfaces as required, covering materials during transport, and minimizing construction equipment usage at all times, including shutting off idle equipment, as appropriate. Construction equipment would be maintained and operated in a manner to minimize particulate emissions consistent with BACTs. The BAAQMD reports that these types of management practices are effective at reducing dust emissions to levels that would not be expected to violate or contribute substantially to an air quality violation, and the resulting impact would be less than significant.

Mountain Lake overlies the Colma formation, which is primarily composed of sand and silty sand with some clay. The Franciscan Formation bedrock containing serpentine underlies the Colma Formation. However, data and boring logs from samples of accumulated sediment in the Lake indicate contributions from serpentinite and other Presidio native formations. Also, the Lake was filled in 1939 with cuttings and materials during construction of Park Presidio Blvd and the associated MacArthur Tunnel. Therefore, sediment in the Lake appears to contain imported materials from nearby areas in the Presidio. The top layer of the imported fill would be removed from the lake. Because the sediment likely contains some serpentine, some asbestos may be encountered in the sediment. Even when dewatered, the sediment cake would retain moisture. No friable asbestos is expected to become airborne from the minor amount of serpentinite that may be present in the sediment. Dust would also be controlled by watering any spoils extracted from the shafts created by the vibratory equipment, if needed. With these measures, it is anticipated that the Project would not violate air quality standards.

c. Result in cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).

Less than significant. Roadbed stabilization, dredging, dewatering, and trucking of sediment would result in emissions from heavy equipment, trucks, and other vehicles for the duration of activities at the site. Highway work would require delivery of 5,900 cy of aggregate; however, delivery would be at a rate of 8 trucks per night. The crane supporting the vibratory probe and a front loader to move aggregate to the shafts would also create emissions. This highway work would not overlap with the remediation work. The lake remediation would require removal and off-site transport of approximately 9,850 cy of dewatered solids from the site. Equipment used to dredge the sediment from the lake bottom and deposit it at the dewatering site would complete this phase of the work prior to the hauling phase. However, dredging and some hauling may occur simultaneously, depending on the rate of dewatering. Hauling the dewatered sediment offsite would require approximately 25 truck round trips per 10-hour day, extending over a 4 to 8 week period. The number of personal worker vehicles is expected to result in a negligible increase to the remediation traffic totals. This level of on-road traffic activity is nominal when compared to traffic on the adjacent Highway 1 through the Presidio and on nearby roadways.

Pre-remediation construction on Highway 1 (stabilization and drainage) and on the Presidio (access ramps and vegetation removal) is scheduled for 2012. Remediation at Mountain Lake itself is scheduled for 2013. During both periods, other unrelated construction projects would also occur in the area. There are five known projects of substantial size that would occur during the 2012 that could overlap with the highway work. These are the Doyle Drive replacement project on the north side of the Presidio, the Presidio's Main Post upgrade project approximately 4,500 feet northeast of the remediation Project, remediation work at Baker Beach, remediation work at the CHP Range, and remediation work at Bernard Avenue Protected Range in the Main Post. These are shown in Figure 9.

- According to the Doyle Drive project Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) (FHWA & SFCTA, 2008), vehicles involved in Doyle Drive construction will include trucks hauling debris and delivering construction materials and supplies, commuter vehicles driven by construction workers, and vehicles used for construction such as graders and heavy earthmoving and paving equipment. Travel volumes would vary depending on the specific construction activity and scheduling.
- The Main Post upgrade project includes reconstruction of existing buildings, structural improvements and other seismic work, roadway and utility upgrades, and other infrastructure enhancements. The Final Supplemental EIS for the Main Post Update indicates that construction vehicle traffic will vary depending on the specific construction activity and schedule (Trust, 2010). Construction vehicles for the Main Post will generally enter the Presidio via Richardson Ave, Doyle Drive, or the Golden Gate bridge toll plaza (Trust, 2010).
- Baker Beach site BB1A work would occur in approximately the same period as the Caltrans work on Highway 1 adjacent to Mountain Lake. The Baker Beach site is approximately 7,000 feet north-northwest of Mountain Lake and only 400 feet south of the Golden Gate Bridge toll plaza. An estimated 3,800 cubic yards of fill would be removed from the site (MACTEC, 2011b). Access to the Baker Beach site is off Lincoln Blvd. Trucks would likely reach Highway 101 at the Golden Gate Bridge by way of Lincoln Blvd and Merchant Rd. Once on Highway 101, the Baker Beach trucks potentially would use similar off-Presidio routes as the Caltrans trucks if they are on Highway 101.
- The CHP Range work would occur in approximately the same period as the Caltrans work on Highway 1 adjacent to Mountain Lake. The CHP site is approximately 8,000 feet north-northwest of Mountain Lake and only 700 feet northwest of the Golden Gate Bridge toll plaza. An estimated 600 cy of fill would be removed from the site. Access to the CHP Range site is off Lincoln Blvd. Trucks would reach Highway 101 at the Golden Gate Bridge by way of Lincoln Blvd and Merchant Rd. Once on Highway 101, the CHP Range trucks potentially would use similar off-Presidio routes as the Caltrans trucks if they are on Highway 101 (EKI, 2009).
- The Bernard Avenue Protected Range (BAPR) site is south of Presidio Blvd, between Barnard Ave and Quarry Rd, south of Fernandez St. The range now is largely covered by Landfill E, which is a remediated site. However, a portion of BAPR is not covered by the landfill. It is estimated that 2,500 cu yds of material will be hauled from the site during remediation (Geosyntec, 2012). The likely haul route would be via Presidio Blvd to Lombard Gate and onto US 101 (Lombard St).

Mountain Lake remediation would occur in 2013 and would result in emissions from equipment and vehicles (see description in Section 3a). There are three known construction projects on or near the Presidio that would or may overlap with the Mountain Lake remediation in 2013. These are the ongoing 5-year Doyle Drive replacement project and the Presidio's Main Post update, discussed above for 2012, and another remediation project above Baker Beach (RAP 5C BB2). Their locations are shown in Figure 9.

The ongoing Doyle Drive and Main Post update projects are discussed above and are not repeated here. Baker Beach BB2 site is near the Baker Beach BB1A site that will be remediated in 2012. It is estimated that about 4,000 cy of fill material would be hauled from the BB2 site (MACTEC, 2011a). This is similar in volume to the BB1A work. This second Baker Beach project would likely use the same travel routes as the prior year's BB1A project. For purposes of understanding cumulative impacts, the two projects are very similar, with one occurring in 2012 and the other in 2013.

Measures to address emissions and control dust and odors would be incorporated into the remedial designs as BACTs. The Trust will coordinate with Caltrans and the local transportation agency to ensure compliance with state and local transportation requirements or ordinances. Based on these factors, the Project activities would not result in cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard (including emissions that exceed quantitative thresholds for ozone precursors).

d. Expose sensitive receptors to substantial pollutant concentrations.

Less than significant. Sensitive receptors, including residences and other sensitive facilities, are present, near, or in the general vicinity of the work site. The construction and remediation activities of the Project would occur adjacent to Highway 1, which is a source of traffic-related air pollutants. The dust control measures identified in item 3b above would be employed to control particulate dust. Dredged material would be wet and is not expected to emit any hazardous gas. Even when dewatered and loaded for offsite transport and disposal, the material would remain damp and cohesive. In addition, air quality monitoring would be performed at the site for dust. Dust-generating activities would be halted if particulate concentrations exceed action levels identified in the Health and Safety Plan (HSP) developed prior to construction. Due to the temporary nature of impacts and the implementation of air quality BACTs, Project activities are not anticipated to expose sensitive receptors to substantial pollutant concentrations that could lead to incremental cancer risk, non-cancer hazards, or concentrations of PM2.5 exceeding the BAAQMD thresholds.

e. Create objectionable odors affecting a substantial number of people.

Less than significant. The Project activities including dewatering the sediment may produce objectionable odors. The sediment is rich in organic matter, which is a typical usual source of odor. However, the dewatering site is nearly 1,000 feet from the nearest residence (on Wyman Ave) and is separated from the residences by Highway 1. The residents south of the site are over 1,300 feet from the dewatering site. If necessary, treatments could be applied to exposed wet sediment to reduce objectionable odors. These products would be subject to Trust approval. The contractor would be required to prepare an Odor and Dust Control Plan and comply with BAAQMD Best Management Practices (BMPs). Diesel vapors created by equipment onsite would be minimal and would not affect sensitive receptors due to the temporary nature of construction, the limited work area, and the limited number of daily truck trips necessary to transport equipment and materials including rock or dewatered sediment. All diesel equipment would use ultra-low sulfur diesel fuel as it is mandatory in California. Impacts related to odors would be less than significant. Because of the distance of residents to the dewatering site and Project controls to reduce odors, this impact would be less than significant.

f. Result in human exposure to Naturally Occurring Asbestos.

Less than significant. Mountain Lake overlies the Colma formation, which is primarily composed of sand and silty sand with some clay. The Franciscan Formation bedrock containing serpentine underlies the Colma Formation. However, data and boring logs from samples of accumulated sediment in the Lake indicate contributions from serpentinite and other Presidio native formations. Also, the Lake was filled in 1939 with cuttings and materials during construction of Park Presidio Blvd and the associated MacArthur Tunnel. Therefore, sediment in the Lake appears to contain imported materials from nearby areas in the Presidio. The top layer of imported fill would be removed from the lake. Also, the Franciscan Formation bedrock may be encountered during the roadway stabilization portion of the Project and could be generated in spoils from the Project. Because the sediment and any spoils likely contain some serpentine, some asbestos may be encountered in the material. Even when dewatered, the sediment cake would retain moisture. Likewise, any spoil related to the stabilization work will be wet. Therefore, no friable asbestos is expected to become airborne from the minor amount of serpentinite that may be present in the sediment. With these Project controls, significant human exposure to naturally occurring asbestos is not anticipated.

Specific References:

Bay Area Air Quality Management District (BAAQMD), 2011. *California Environmental Quality Act, Air Quality Guidelines*. May.

BAAQMD, 2012. *Air Quality standards and Attainment Status*. http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm.

EKI, 2009. *Final Remedial Action Plan for Landfills 8 and 10, PHSH Fill Site, and Four Small Arms Firing Ranges, Presidio of San Francisco, California*. February.

Federal Highway Administration (FHWA) and San Francisco County Transportation Authority (SFCTA), 2008. Final Environmental Impact Statement/Report and Section 4(f) Evaluation, South Access to the Golden Gate Bridge: Doyle Drive. September.

Geosyntec, 2012. *Draft Remedial Investigation Summary Report, Barnard Avenue Protected Range, Presidio of San Francisco, California*. February.

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

MACTEC, 2011a. *Field Sampling Plan, Data Gaps Investigation, Baker Beach Disturbed Area 2, Presidio of San Francisco, California*. July.

MACTEC, 2011b. *Draft Revised Remedial Investigation Report, Baker Beach Disturbed Area 1A, Presidio of San Francisco, California*. August.

State of California Air Resource Board, 2001. *Resolution 01-28*. July.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Final Environmental Impact Statement.* May.

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Trust, 2010. *Final Supplemental Environmental Impact Statement, Presidio Trust Management Plan, Main Post Update*. November.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

4. Biological Resources

Project activities likely to create an impact:

- Operation of equipment
- Dredging
- Transportation of dredged materials.

Description of Environmental Setting:

Mountain Lake and the surrounding area contain a mosaic of native and exotic plant and animal species. Within the lake, the only vertebrate species are non-native fish such as carp and spotted bass. Non-native bullfrogs and turtles predominate in the lake. Some native benthic invertebrates inhabit the lake.

Upland areas around the lake include remnant native wetland and riparian woodland. Native bird species frequent the upland habitats. These native habitats at Mountain Lake have been severely impacted by the spread of weeds and trees and weeds. The Mountain Lake Enhancement Plan, prepared in 2000, proposed the following enhancement work: remove the top few feet of nutrient-laden sediment from the Lake; deepen the Lake to prevent the rapid invasion of emergent vegetation and increase oxygen content; and increase the water volume to dilute nutrients and better regulate the temperature of the Lake. The Enhancement Plan also proposed habitat enhancement work, including removal of invasive exotic species, revegetation with appropriate native species, and public access improvements, such as trail development and the installation of benches. Some of the habitat enhancement and public access improvement work envisioned under the Enhancement Plan has been completed. Over 100 non-native trees have been removed in the lake area and over 11,500 native plants have been planted, generally along the eastern shore of the lake.

The Project area contains three vegetation management zones as specified in the Presidio VMP (Trust and NPS, 2001). The entire perimeter of the lake, including areas east of Highway 1 and west of the Mountain Lake trail, is a Native Plant Communities Zone. The northern part of the north arm of the Lake and the southern half of the dewatering site is a Historic Forest Management Zone. The northern half of the dewatering site is a Landscape Vegetation Management Zone.

Consistent with the VMP, some vegetation between Highway 1 and the lake and around portions of the lake was cleared during site investigations between November 2011 and January 2012 in advance of the road stabilization and sediment remediation work. Brush vegetation was cleared within a 15-foot wide corridor along the east side of Park Presidio Blvd. Vegetation and trees were cleared in the proposed dewatering site. Some clearing also was conducted in the northern arm of the Lake. Plants removed were primarily non-native species. No vegetation was removed from areas planted under the Enhancement Plan. The majority of vegetation on the site was unaffected, including the plantings on the east side of the lake, on both sides of Mountain Lake trail.

The potentially disturbed area for the Project includes the highway shoulder where stabilization would occur, the Lake bottom from which sediment would be dredged, the upland staging area adjacent to the Lake, and the upslope staging and dewatering area. Where feasible, the planted areas would be avoided and fenced to protect them. Dredging would temporarily disturb contaminant-laden sediment resting on the lake bottom, temporarily reintroducing some sediment into the water column.

Based on wildlife inventories, three species of bats have been documented in the Mountain Lake vicinity. All are identified as a “species of concern” by the U.S. Fish and Wildlife Service (USFWS) or CDFG. These are Yuma myotis, California myotis, and western red bat. Bats typically forage for insects near water bodies, but roost in treed areas. Based on past experience in the Presidio with tree removal, bats are expected to relocate to new roosts in the vicinity, if their roost tree is removed (Thomas, 2012a). Given this, it is unlikely that vegetation affected by the dredging would affect any roosting habitat for bats.

Table 4-1 lists special-status species protected under the Federal or California Endangered Species Act that have been recorded as casual visitors to the Presidio and vicinity, or have been identified at various locations at the Presidio. The table also shows whether the species have been documented at Mountain Lake in wildlife inventories.

Table 4-1: Special-Status Species Known to Occur at the Presidio

Species	Status	Documented at Mountain Lake in Inventories
Marbled murrulet (bird)	FT, CE	No
Snowy plover (bird)	FT	No
Bald eagle (bird)	CE	No
Willow flycatcher (bird)	CE	Casual visitor in summer and fall
Raven's Manzanita (plant)	FE, CE	No
Presidio clarkia (plant)	FE, CE	No
Marin dwarf flax (plant)	FT, CT	No
San Francisco Lessingia (plant)	FE, CE	No

FE – Federally endangered; FT – Federally threatened; CE – California endangered; CT – California threatened
Sources:
Species list: Mountain Lake RAP ARARs (Table 5-1 of the Draft FS/RAP)
Wildlife Inventories: Trust, NPS, and GGNPA, 2000; Pollak, 2010; Thomas, 2012b; California Natural Diversity Database (CNDDB) search (DTSC, 2011)

There are no known federally or state listed species that reside or nest at Mountain Lake. The California endangered willow flycatcher is a summer and fall migrant that may use the Mountain Lake area on a seasonal basis. Willow habitat at the edge of the lake is used for summer roosting. Removal of vegetation for the Project outside of bird nesting season would occur prior to the presence of flycatchers. The song sparrow and common yellowthroat, both California "species of concern," have been documented in inventories of Mountain Lake. Other birds that use the general Mountain Lake area (such as Anna's and Allen's hummingbirds) are on the Partner in Flight watch list. This is not a listing by any state or federal agency, but is maintained by a consortium of research groups (such as Point Reyes Bird Observatory Conservation Science) to indicate a species that may be losing habitat or experiencing a decline in numbers.

Although Mountain Lake once supported the endangered California red-legged frog, habitat alteration and predation by introduced bullfrogs is thought to have eliminated this species from the lake area. The Trust will coordinate with the CDFG, as applicable, to ensure state requirements are met.

Many bird species in the Presidio are protected under the Migratory Bird Treaty Act. It is possible that ground or tree nesting birds protected under the Migratory Bird Treaty Act could occur in the perimeter vegetation during nesting season (January 1st - July 31st for raptors and hummingbirds; March 1st - July 31st for songbirds).

Wetlands have been mapped around the perimeter of Mountain Lake (Buisson and Castellini, 2000; NPS and URS, 2003). Potential U.S. Army Corps of Engineers (USACE) jurisdictional wetlands cover 2.10 acres around the perimeter of the lake. At total of 3.13 acres around the perimeter of the Lake contains wetland habitat as defined by the U.S. Fish and Wildlife Service. Mountain Lake was identified as "waters of the U.S." in the Presidio Wetlands Report; however, although the site was once hydraulically connected to Lobos Creek, it is now an isolated water of the U.S. (NPS and URS, 2003). Refer to Page 10, *Site Preparation, Clearing, and Grubbing*

Analysis as to whether project activities would:

a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Less than significant. No threatened or endangered species protected under the U.S. Endangered Species Act or California Endangered Species Act reside at Mountain Lake (Pollak, 2010; Thomas, 2012b). The willow flycatcher, a state-endangered species roosts in willow habitat at the edge of the lake during summer months. Removal of vegetation outside of bird nesting season would occur prior to the presence of flycatchers. Removal of vegetation outside of bird nesting season is also unlikely to affect other sensitive bird species as the species would relocate to other nearby habitat for the project duration.

Three species of bats have been documented in the Mountain Lake vicinity. All are identified as a "species of concern" by USFWS or CDFG. These are Yuma myotis, California myotis, and western red bat. Bats typically forage for insects near water bodies, but roost in treed areas. As noted, past experience with tree removal in the Presidio suggests that bats relocate to new roosting trees in the vicinity. Given this, it is unlikely that vegetation removed for the remediation would have a significant impact on bats.

Some vegetation was removed from the site in late 2011-early 2012 to complete site investigation work, in compliance with the Presidio VMP and the Migratory Bird Treaty Act. Additional vegetation removal would be required for the Project to clear work areas and access routes. Approximately 50 to 100 trees would be removed from the staging and upland areas to clear work areas. Vegetation removals would be coordinated with natural resource staff to avoid potential disruption to nesting or migrating birds. Specifically, efforts would be made to schedule vegetation removal outside of bird nesting seasons (January 1st - July 31st for raptors and hummingbirds; March 1 - July 31st for songbirds). However, vegetation removal may occur during bird nesting season provided a nesting survey indicates no disruption to nesting birds (including ground nesting birds) and approval is obtained from Trust natural resource staff. Nest surveys are not 100% accurate, therefore activities requiring nest surveys during nesting season would be avoided whenever practicable.

Although no special status species are known to nest at the Mountain Lake site, it is possible that ground-nesting birds could occur during nesting season. If nesting birds are found near the Project site, a Trust natural resource specialist would be notified. If required, the specialist may require protection measures to be implemented, such as setting up a buffer zone around the nest and installation of fencing or other barriers. Because there are no listed species residing or nesting at the site and the site would be restored consistent with the VMP, proposed Project activities would not have a substantial direct or indirect adverse effect on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.

b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Less than significant. As described above in Section 4a, some site vegetation has been removed. Additional vegetation would be removed to clear work and site access areas. Vegetation removal would primarily consist of exotic plant species and contain no known habitat for special-status species. Areas planted under the Enhancement Plan (primarily along the eastern shore of the lake) would be fenced and avoided, to the extent practicable. Areas cleared for Project implementation would be restored consistent with the VMP and the Enhancement Plan.

As discussed above in 4a above, no special-status plant species or habitats occur on the Project site. Due to remedial goals at the site, some wetland habitat around the perimeter of the lake would be impacted by the Project. Wetland and shoreline habitat at the Project site would be enhanced overall through restoration of areas impacted by the Project as well as future lake enhancement work under the Enhancement Plan.

Therefore, Project activities would not substantially affect any sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFG or USFWS.

c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Less than significant. Due to remedial goals at the site, some wetland habitat around the perimeter of the Lake would be impacted by the Project. Wetland and shoreline habitat at the Project site would be enhanced overall through restoration of areas impacted by the Project as well as future lake enhancement work under the Enhancement Plan.

As a CERCLA project, remediation of Mountain Lake is exempt from acquiring a permit to dredge or fill waters of the United States under Section 404 of the Clean Water Act but substantive permit requirements would be followed. EPA's OSWER Directive 9355.7-03 states: "CERCLA response actions are exempted by law from the requirement to obtain Federal, State, or local permits related to any activities conducted completely on-site…. However, this does not remove the requirement to meet (or waive) the substantive provisions of permitting regulations that are applicable or relevant and appropriate requirements (ARARs)." As such, no certification or permits would be sought under Sections 401 and 404 of the Clean Water Act. However, the substantive standards for the statute would be met, as specified in the ARARs for the Project, listed in Table 5-1 of the Draft FS/RAP (Kennedy Jenks, 2012b).

As Federal property, Mountain Lake by definition is excluded from the coastal zone. Further, removal of sediment from Mountain Lake would not have effects on the coastal zone since the Lake is an isolated water of the U.S. and is located approximately 1 mile inland from the Pacific Ocean (ARARs, Table 5-1, Kennedy/Jenks 2012b). However, the project meets substantive provisions of the San Francisco Bay Conservation and Development Commission (BCDC)'s San Francisco Bay Plan (BCDC, 2008). The final remedial action would be consistent with park use. There would be no permanent impacts on public access to the Lake. The biological health of Mountain Lake would be enhanced, and the visitor experience improved, as a result of the Project by removing contaminants from the Lake and restricting pollutants from reaching the Lake in the future.

Therefore, the Project would not have substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Less than significant. Federal and state-listed bird species have been known to migrate through the Presidio. As stated in Section 4a, vegetation removals would be coordinated with natural resource staff to avoid potential disruption to nesting or migrating birds. Specifically, efforts would be made to schedule vegetation removal outside of bird nesting seasons (January 1st - July 31st for raptors and hummingbirds; March 1 - July 31st for songbirds). However, vegetation removal may occur during bird nesting season provided a nesting survey indicates no disruption to nesting birds (including ground nesting birds) and approval is obtained from Trust natural resource staff. Therefore, Project activities would not interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

e. Conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

No impact. The Project would not conflict with provisions of any local policies or ordinances regarding biological resources at the Presidio. Vegetation removal would occur in compliance with the objectives and practices outlined in the VMP, as approved by the Trust's Natural Resource staff, Landscape Management staff or Forestry Manager, as applicable. To address forest management concerns, the Forestry Manager would review all Project plans with regard to tree impacts and, if necessary, provide further measures to protect trees remaining around the site. Also, the biological health of Mountain Lake would be enhanced, and the visitor experience improved, as a result of the project by removing contaminants from the Lake and restricting pollutants from reaching the Lake in the future. Based on the implementation of these standards, the remedial action would not conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

No impact. The Project is consistent with the VMP, Enhancement Plan, and PTMP. With implementation of the Project measures, the remedial action would not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Specific References:

BCDC (San Francisco Bay Conservation and Development Commission), 2008. *San Francisco Bay Plan*. January.

Buisson, E. and L. Castellini, 2000. *Mountain Lake Wetlands Delineation, Presidio of San Francisco, California*. June.

DTSC, 2011. California Natural Diversity Database (CNDDB) Search, Mountain Lake, Presidio of San Francisco, California. December.

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

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Pollak T., 2010. Personal communication regarding Mountain Lake special-status species from Tania Pollak, Natural Resource Specialist, Presidio Trust to Genevieve Coyle, Environmental Remediation Project Manager, Presidio Trust. June 24.

Thomas, T. 2012a. Personal communication regarding bats from Terri Thomas, Director of Conservation and Stewardship, Presidio Trust to Fritts Golden, Aspen Environmental Group. January 12.

Thomas, T. 2012b. Personal communication regarding Mountain Lake species from Terri Thomas, Director of Conservation and Stewardship, Presidio Trust to Genevieve Coyle, Environmental Remediation Project Manager, Presidio Trust. February.

Trust, 2002a. Presidio Trust *Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan Final Environmental Impact Statement. May.*

Trust and NPS, 2001. *Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco.* December.

Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

U.S. Environmental Protection Agency (EPA), 1992. Permit and Permit "Equivalency" Processes for CERCLA On-Site Response Actions. OSWER Directive 9355.7-03. February 19, 1992.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

5. Cultural Resources

Project activities likely to create an impact:

- Tree removal
- Sediment removal.

Description of Environmental Setting:

Mountain Lake is historically significant and is a contributing feature to the Presidio of San Francisco National Historic Landmark District (NHLD) (NPS, 1993a,b). The period of historical significance extends from 1776 to 1945. As a federal agency, the Trust is required to comply with the National Historic Preservation Act (NHPA). The Trust has entered into a programmatic agreement (PA) with the NPS, the Advisory Council on Historic Preservation (ACHP), and the State Historic Preservation Officer (SHPO) (Trust, NPS, ACHP, and SHPO, 2002). The PA details how the Trust would comply with its obligations under Section 106 of the NHPA. Key to that process is identification of historic resources that may be affected by an action. As the PA recognizes, numerous surveys and evaluations have been conducted to identify National Register (NR) eligible and NHLD contributing properties for the entire Presidio landmark district.

The Lake itself is estimated to be approximately 2000 years old. Previous studies (Reidy, 2003) have shown that the incremental sedimentation of the lake over thousands of years has preserved a singular record of changes in the ecological system over a long period of time. The material preserved includes pollen, phytoliths, and possibly charcoal from Native American use of fire to control and influence vegetation in the area. The manner in which these materials were deposited over time in the lake bottom has a demonstrated chronology that is of particular scientific value. Refer to Page 2, *Background*

On December 27, 2011, the Native American Heritage Commission (NAHC) provided the results of the Sacred Land file search for the San Francisco Presidio area (NAHC, 2011). The NAHC did not locate resources in the Sacred Land file; however, the NAHC provided a list of Native American contacts who may have an interest in the Project. The tribal contacts will receive notice of the Initial Study and Negative Declaration for review during the public comment period for this Project.

On January 26, 2012, the California Historical Resources Information System (CHRIS) provided their results from a records search which specified there is no record of any formal cultural resource surveys that cover the Mountain Lake Project area and contained no recorded archaeological resources. But they recommended a qualified archaeologist conduct further archival and field studies (CHRIS, 2012).

Native people today referred to as Ohlone/Costanoans were the earliest human inhabitants of the area now know as the Presidio and likely used Mountain Lake as a freshwater resource. A 1776 diary entry of Father Pedro Font, a member of the de Anza expedition, contains the earliest written record of the Mountain Lake area. The lake is believed to be the site of March 1776 Spanish encampment. The Presidio was established as a military post in the same year. From 1821 to 1846, the Mexican government occupied the Presidio. When California became part of the U.S., the Presidio became an American military installation. Beginning in 1883, trees were planted in the upland areas of the Mountain Lake watershed as part of the forestation plan for the Presidio (Trust, NPS and GGNPA, 2000). In the 19th century, various plans to use the lake as a water supply for the City were either not implemented or were abandoned when it was determined the supply was insufficient. In 1897, the Army began to use the lake as a domestic water source. The most dramatic change at the lake came in 1939, when 40 percent of the lake was filled to accommodate construction of Park Presidio Blvd.

The southern half of the Project dewatering area and a portion of the area upslope of the lake is within a Historic Forest Management Zone (Trust and NPS, 2001). A historic pump (#316) was formerly located in a fenced enclosure east of the lake; this pump was removed as part of the Enhancement Plan (Trust, NPS and GGNPA, 2000).

Analysis as to whether or not project activities would:

a. Cause a substantial adverse change in the significance of a historical resource as defined in 15064.5.

Less than significant. The highway work would occur in existing disturbed fill. The remediation would involve dredging and transporting offsite sediment that has accumulated in the Lake. The Presidio Archeology Department has prepared an Archeological Monitoring Assessment (AMA) for the Project to describe procedures for treating and handling archeological features during Project activities (Trust, 2012). Prior to implementing a dredging remedy that would disturb the sediment, the Trust would take measures to ensure that the record of lake sediments are preserved for future scientific research by extracting cores through a direct push technique and submitting the preserved samples to the National Lacustrine Core

Facility (Trust, 2011). Also, the proposed remedial action would be conducted in accordance with the regulations governing cultural resources, including the National Historic Preservation Act, the Archaeological Resources Protection Act, the Archaeological and Historic Preservation Act, and the Native American Graves Protection and Repatriation Act. A Cultural Resource Specialist would review Project plans and, if necessary, approve a qualified historical/cultural monitor to be present on site during excavation activities that may encounter cultural artifacts. This would ensure that historical resource features are handled appropriately to minimize impacts. If a previously unknown historic resource is discovered, all work activities would be halted until a Cultural Resource Specialist can make a determination regarding the resource and the proper measures are implemented in accordance with the regulations governing cultural resources preservation and/or protection.

Trees within the Historic Forest would be cleared to make space for work areas (e.g., dewatering, staging, and pipeline transport). Approximately 50 to 100 trees are anticipated to be removed from the Historic Forest. Historic Forest impacted by the Project would be replanted consistent with the VMP (Trust and NPS, 2001).

If human skeletal remains are encountered during proposed activities, protocols under federal law would apply. All work would stop in the vicinity of the discovery, and the find would be secured and protected in place. The San Francisco County coroner and Trust Archaeologists would be notified immediately. If a determination finds that the remains are Native American, and that no further coroner investigation of the cause of death is required, the coroner would contact the NAHC (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs for informational purposes only. Disposition of the human remains would be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries).

Because the Project activities would be conducted in accordance with the regulations governing cultural resources, including the National Historic Preservation Act, the Archaeological Resources Protection Act, the Archaeological and Historic Preservation Act, and the Native American Graves Protection and Repatriation Act, they are not expected to cause a substantial adverse change in the significance of a historical resource.

b. Cause a substantial adverse change in the significance of an Archaeological resource pursuant to 15064.5.

Less than significant. The Presidio Archeology Department has prepared an Archeological Monitoring Assessment (AMA) for the Project to describe procedures for treating and handling archeological features during Project activities (Trust, 2012). Based on the extent of archaeological resources identified at the Presidio in the National Register of Historic Places document, the proposed remediation would not produce substantial adverse changes to Archaeological resources. The measures discussed above in Section 5a and in the AMA would be implemented to reduce the impact of the Project to less-than-significant.

c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Less than significant. Previous coring of the Lake (Reidy 2001) determined the first 6 feet of lake-bottom sediments to post-date 1776. The likelihood of dredging activities to intentionally disturb prehistoric deposits is, therefore, considered low. As required in the AMA, prior to implementing a dredging remedy that may disturb natural sediments, the Trust will take measures to ensure that the record of these lake sediments are preserved for future scientific research by extracting cores through a direct push technique and submitting the preserved samples to the National Lacustrine Core Facility. The measures discussed above in Section 5a and in the AMA would be implemented to reduce the impact of the Project on unique paleontological resources to less-than-significant.

d. Disturb any human remains, including those interred outside of formal cemeteries.

Less than significant. If human skeletal remains are encountered, protocols under federal law would apply. All work would stop in the vicinity of the discovery, and the find would be secured and protected in place. The San Francisco County coroner and Trust Archaeologists would be immediately notified. If a determination finds that the remains are Native American, and that no further coroner investigation of the cause of death is required, the coroner would contact the NAHC (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs for informational purposes only. Disposition of the human remains would be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries).

Because of the limited potential to encounter human remains or associated artifacts, and the degree of oversight being provided at these sites, it is unlikely that the proposed Project would disturb any human remains, including those interred outside of formal cemeteries.

Specific References:

Anthropological Studies Center, Sonoma State University (ASC), 2005. *Protocols for Archaeological Artifacts on Presidio Park Lands*. October 2005.

California Historical Resources Information System (CHRIS) 2012. *Record Search Results for the Proposed Mountain Lake Project/Remedial Action Plan*. January 26.

Feierabend, C., 2006. *Mountain Lake East Arm Cultural Landscape Assessment, Final Report, Presidio of San Francisco, California*. September.

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Reidy, L., 2001. *Evidence of Environmental Change Over the Last 20 Years at Mountain Lake, in the Northern San Francisco Peninsula*. Thesis for Master of Arts in Geography.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

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Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

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Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

6. Geology and Soils

Project activities likely to create an impact:

- Dredging and removal of sediment.

Description of Environmental Setting:

The Presidio lies in the western part of the Coast Ranges near the west edge of the North American crustal plate. The region is subject to a high degree of tectonic activity. Major faults within a 25-mile radius of the Presidio include the San Andreas Fault, the Hayward Fault, and the Calaveras Fault. The bedrock underlying the San Francisco peninsula consists of ocean-floor ultramafic basalts and sediments of the Mesozoic-age Franciscan Complex, which has been subjected to multiple episodes of shearing and faulting, resulting in intensive deformation and fracturing. The Franciscan bedrock at the Presidio is part of a major northwest-trending shear zone called the Fort Point-Potrero Hill-Hunters Point Shear Zone, which is part of the San Andreas Fault system. Quaternary age sediments, including sands of the Colma Formation, dune and beach sands, slope debris, bay mud, and artificial fill overlie the bedrock at the Presidio. In the Presidio, the older rocks are covered by younger deposits of the Colma Formation and more broadly by sand dune deposits of the late Pleistocene and Holocene.

Mountain Lake is located behind the foredunes of this coastal sand complex, with the sandy Colma Formation near the surface. The lake likely was formed by wind erosion of the dunes down to the water table, creating a dune hollow. The lake is probably 1,700 years old. The bedrock underlying the Presidio includes large percentages of serpentinite, a metamorphosed form of ultramafic rock (oceanic crust).

Mountain Lake is a natural lake with an original depth of approximately 30 feet. Large-scale filling during road construction has reduced the area of the lake to about 4 acres (a loss of about 40% of its original area). The various human activities around the lake and storm drainage to the lake have brought the lake bottom to within about 10 feet of the surface. The lake bottom is composed primarily of silt and clay to a depth of approximately 6 to 10 feet. Below this level, the subsurface is composed of a mixture of sands, silt, and clay (Trust, NPS, and GGNPA, 2000). Data and boring logs from samples of accumulated sediment in the Lake indicate contributions from serpentinite and other Presidio native formations.

Because the adjacent section of Highway 1 required filling part of the lake, the conditions described for the lake also apply to the highway, except that a substantial amount of fill now overlays the former lake bottom sediments under the road. Refer to Pages 3 to 10.

Analysis as to whether or not project activities would:
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- **Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. (Refer to Division of Mines and Geology Special Publication 42).**

  Less than significant. The proposed activities would be limited in scope and of relative short duration so that the geologic/seismic hazards at the sites or exposure of people and/or structures to adverse impacts related to geologic and seismic hazards would be less than significant. No known active faults cross through the Project site (Hart, 1999). Fault ground rupture is normally associated with zones of active faulting and/or planes of weakness adjacent to active fault zones. The closest active fault is the offshore section of the San Andreas Fault to the west. The highway stabilization work would serve to decrease future risk due to earthquakes. Because recognized active faults do not cross through and are not adjacent to the site, the fault rupture hazard at the sites is considered to be negligible and, therefore, less than significant.

- **Strong seismic ground shaking.**

  Less than significant. The proposed activities are unlikely to be affected by the geological and seismic conditions, including potential seismic ground shaking. The pre-remediation construction and remediation would be of relatively short duration, limited in nature, and involve few workers.

- **Seismic-related ground failure, including liquefaction.**

Less than significant. Liquefaction is the phenomenon in which loose, saturated, granular materials experience a sudden loss of shear strength due to seismic shaking. Soil liquefaction can induce sand boils, differential settlement, lateral spread, and ground failure. The Susceptibility Map of the San Francisco Bay Area shows the Project area to have a Moderate to Very Low potential for liquefaction (USGS, 2005). Installing the proposed highway stabilization features and rock columns along Highway 1 would reduce risk to this section of the highway.

- **Landslides.**

  Less than significant. Once remediation is underway, soil in the on-shore work area would be susceptible to limited disturbance. However, the areas adjacent to north, east, and south shore of the lake are flat, so landslides and unstable slopes would not occur. The Trust is conducting geotechnical studies of the western bank of the lake. This bank would be stabilized, as necessary, to prevent landslides during dredging operations. Caltrans is implementing stabilization work prior to dredging to prevent failure of the roadway. An erosion control plan would be developed as discussed below in Section 6b. The stabilization work proposed by Caltrans would not require cutting of slopes or other work that could trigger or increase the probability of landslides.

b. Result in substantial soil erosion or the loss of topsoil.

Less than significant. The Project involves dredging of a lake bottom and stabilizing the adjacent highway. The Caltrans column construction and runoff management work on Highway 1 is in the existing nearly level shoulder. These actions would not result in substantial soil erosion or loss of topsoil. In any dry land disturbed by equipment, erosion control measures would be implemented during and after construction for any work performed between October 15 and April 15 to minimize runoff from the site. The activities associated with remediation would not result in significant soil erosion or loss of topsoil, as erosion control measures would be implemented. Project activity would not be conducted during extreme wet weather and soil disturbance would be limited to work areas.

There are potential sources of surface water runoff from the work area during and after the work is performed. Project BMPs include stabilization practices such as wattles, silt fences, berms, and temporary outlet protection may be employed, if needed. The method chosen would depend on the planned activities and erosion potential of the area in question. By implementing the prescribed erosion and stabilization measures, the potential for substantial soil erosion or the loss of topsoil is considered less than significant.

c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

Less than significant. The stabilization work along the highway and western bank of the lake would reduce the potential for failure of the subsoil due to landslide, lateral spreading, subsidence, liquefaction, or collapse. Slopes created in the lake bottom as a result of dredging would be susceptible to downslope movement as disturbed material establishes its final angle of repose. This would be internal to the lake and any slope movement would be minor. This would not pose a risk to people or the environment. In addition, as part of the dredging activity, the bottom surface would be contoured to minimize unplanned slope movement.

d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

No Impact. Project activities would not place structures or require personnel to be located on expansive soils. Therefore the remedial activities would not create any risk to life or property as a result of being located on expansive soils.

e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of water.

No Impact. The Project would not involve the installation of septic tanks or alternative wastewater disposal systems. Portable toilets would be used during construction.

f. Be located in an area containing naturally occurring asbestos (see also Air Quality, f.).

Less than significant. The Franciscan Formation bedrock containing serpentine underlies the Colma Formation, which underlies the lake. Removal of sediment overlying older sediment would not result in reaching bedrock. However, data and boring logs from samples of accumulated sediment in the Lake indicate contributions from serpentinite and other Presidio native formations. Also, the Lake was filled in 1939 with cuttings and materials during construction of Park Presidio Blvd and the associated MacArthur Tunnel. Therefore, sediment in the Lake appears to contain imported

materials from nearby areas in the Presidio. Also, the Franciscan Formation bedrock may be encountered during the roadway stabilization portion of the Project and could be generated in spoils from the Project. Because the sediment and any spoils likely contain some serpentine, some asbestos may be encountered in the material. Even when dewatered, the sediment cake would retain moisture. Likewise, any spoil related to the stabilization work will be wet. Therefore, no friable asbestos is expected to become airborne from the minor amount of serpentinite that may be present in the sediment.

Specific References:

CDMG, 1988. *Major Faults and Earthquake Epicenters in the San Francisco Bay Area. International Conference of Building Officials*. February.

CDMG, 2000. *Seismic Hazards Zones, City and County of San Francisco*. CDMG Open File Report 2000-009. November.

CDMG, 2001. *Seismic Hazard Report for the City and County of San Francisco. SHZR 043.* By Wilson, R.I., Wiegers, M.O., and McCrink, T.P.

Hart, E.W., 1999. Fault Rupture Hazard Zones in California, California Division of Mines and Geology Special Publication 42, (1997 revision).

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

USGS, 1978. *Historic Ground Failures in Northern California Associated with Earthquakes*. Geological Survey Professional Paper 993.

USGS, 2000. *Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California*.

USGS, 2005. Susceptibility Map of the San Francisco Bay Area. Website: http://geomaps.wr.usgs.gov/sfgeo/liquefaction/susceptibility.html. Accessed December 12, 2011.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

7. Greenhouse Gas Emissions

Project activities likely to create an impact:

- Emissions from use of heavy equipment, trucks, and other vehicles for roadbed stabilization, dredging, dewatering, and transportation.

Description of Environmental Setting:

The setting for climate change and the analysis of greenhouse gas (GHG) emissions is defined by world-wide emissions and their global effects. The baseline conditions include the natural and anthropogenic drivers of global climate change, such as world-wide GHG emissions from human activities that have grown more than 70 percent between 1970 and 2004 (IPCC, 2007). The State of California is leading the nation in managing GHG emissions. Accordingly, the impact analysis relies on guidelines, analyses, policy, and plans for reducing GHG emissions established by the California Air Resources Board (CARB). This is a cumulative impact assessment because, by their nature, any GHG emissions contribute to the adverse environmental impacts of global climate change on a cumulative basis.

Globally, temperatures, precipitation, sea levels, ocean currents, wind patterns, and storm activity are all affected by the presence of GHGs. The global climate depends on the presence of GHGs to naturally provide the “greenhouse effect.” The greenhouse effect is driven mainly by water vapor, aerosols, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and other GHGs that trap heat radiated from the Earth's surface. The global surface temperature would be about 34°C (61°F) colder than it is now if it were not for the natural heat trapping effect of natural climate change pollutants (CAT, 2006).

California currently emits approximately 500 million metric tonnes of CO_2 equivalent (500 MMTCO2e) each year, or between one and two percent of about 49,000 MMTCO2e emitted globally (CARB, 2007). The California Global Warming Solutions Act of 2006, Assembly Bill 32 (AB 32), requires that California’s GHG emissions be reduced to 1990 levels by 2020. The reduction will be accomplished through an enforceable statewide cap on global warming emissions to be phased in beginning in 2012. AB 32 directs the CARB to develop regulations and a mandatory reporting system to track and monitor global warming emissions levels (AB 32, Chapter 488, Statutes of 2006). The CARB Climate Change Scoping Plan, approved December 2008, provides the framework for achieving California’s goals.

In passing AB 32, the California Legislature found that:

“Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.”

The regulations implementing AB 32 are being developed in phases. Implementation of the AB 32 Climate Change Scoping Plan requires careful coordination of the State’s energy and transportation policies. The Scoping Plan provides strong support for reducing emissions from all manners of vehicle and air travel, because travel is a large portion of California GHG emissions.

Determining significance of GHG emissions relies upon available guidelines from State or local air quality management agencies, where available. The effects of Project-related direct and indirect GHG emissions are characterized against a GHG emissions level of 10,000 metric tons per year (10,000 MTCO2e/yr) for stationary sources, with construction activities not being subject to a quantitative threshold (BAAQMD, 2011). At a level of less than 10,000 MTCO2e/yr, an industrial project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions. Global climate change is a cumulative impact that would be affected by GHG emissions. However, relatively small scale projects, if found to be less than significant, would not be anticipated to result in cumulatively considerable GHG emissions. Refer to Pages 3 – 14.

Analysis as to whether or not project activities would:

a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.

Less than significant. The construction and remediation would generate GHG emissions through the use of vehicles and equipment during construction and remediation. The period of construction and remedial action would be short-term and

would occur over two years. Construction-phase GHG emissions would occur directly from the off-road heavy-duty equipment and the on-road trucks and motor vehicles needed to transport materials, including aggregate and dewatered sediment, mobilize crews, and bring equipment to and from the site. Highway stabilization activity would involve use of a crane, vibratory probe, and other equipment including generators, lights, loaders, and 8 trucks daily to bring aggregate to the site and remove spoils, over an approximately 18 week period.

The remediation activity would approximately 25 heavy-duty truck round trips per day over 4 to 8 weeks with other equipment and vehicle activity. Construction-related air quality BACTs would minimize unnecessary equipment use and reduce GHG emissions. Emissions caused by the construction and remediation would be a fraction of 10,000 MTCO2e (see Appendix D), although the BAAQMD has determined that construction activities are not subject to any quantitative threshold (BAAQMD, 2011). Table 7-1 summarizes the total GHG emissions over the duration of the construction activity and the applicable BAAQMD thresholds. In summary, levels of GHG emissions caused by construction equipment use would not occur in significant quantities. The GHG emissions due to construction and remedial action would be less than significant.

Table 7-1. Construction-Related Emissions of GHG, Duration of Construction

	Carbon Dioxide (ton CO_2)	CO2-equivalent (ton CO2e)	CO2-equivalent (MTCO2e)
Off-Road Equipment	200.92	211.50	191.87
On-Road Crew and Workers	142.65	150.16	136.23
On-Road Diesel Trucks	341.74	359.73	326.34
Total Construction-Related GHG	685.32	721.39	654.44
BAAQMD Significance Threshold	None	None	10,000 MT/yr (for stationary sources)

Notes: Motor vehicle emissions of CO2-equivalent are approximately 95 percent CO2.
One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.
Source: BAAQMD, 2011; also see detailed calculations in Appendix D.

b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Less than significant. The Project would be consistent with the CARB Climate Change Scoping Plan. The Climate Change Scoping Plan depends on coordinating energy and transportation policies, with a focus on reducing emissions from all manners of motor vehicle travel. The planned construction and remedial action would include air quality BACTs to minimize unnecessary equipment use. As such, the Project activities would not conflict with plans, policies, or regulations adopted for the purpose of reducing GHG emissions.

Specific References:

Bay Area Air Quality Management District (BAAQMD), 2011. *California Environmental Quality Act, Air Quality Guidelines*. May.

CARB (California Air Resources Board). 2008. Climate Change Scoping Plan, Framework for Change, as Approved December 2008, Pursuant to AB32.

CARB. 2007. California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit. November.

CAT (Climate Action Team). 2009. Draft Biennial Report. March.

CAT. 2006. Climate Action Team and California Environmental Protection Agency. Climate Action Team Report to Governor Schwarzenegger and the Legislature. March.

IPCC (Intergovernmental Panel on Climate Change). 2007. Climate Change 2007: Synthesis Report, the Fourth IPCC Assessment Report. May.

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

8. Hazards and Hazardous Materials

Project activities likely to create an impact:

- Transportation and disposal of contaminated sediment.

Description of Environmental Setting:

Over 185 samples of sediment have been collected from the lake during remedial investigations conducted between 1990 and 2011. Four samples have also been collected from sediment in Park Presidio storm drains that feed into the lake. Twelve surface water and seven sediment elutriate (liquid expressed during dewatering) samples have also been collected and analyzed. Metals, pesticides, and total petroleum hydrocarbons (TPH) have been detected above ecological cleanup levels in lake sediment. No chemicals have been detected above water quality criteria for aquatic life and drinking water standards (e.g., maximum contaminant levels) in lake water. A human health and ecological risk evaluation was completed for Mountain Lake (Kennedy/Jenks 2012b). The current and planned future use of Mountain Lake is wildlife habitat. Fishing and swimming are not permitted in the Lake. Visitors to Mountain Lake typically engage in activities where there is no exposure to sediment. Wading may occur occasionally at the southern beach area; however, human exposure to sediments during wading is expected to be infrequent and of limited duration. Furthermore, concentrations of contaminants in sediment samples collected from the southern beach area are below human health cleanup levels (Kennedy/Jenks, 2012a).

Previous evaluations of water concentrations in Mountain Lake concluded that surface water data meet for aquatic life criteria and drinking water standards (e.g., maximum contaminant levels). Therefore, ecological risk from surface water exposure and domestic use of surface water in Mountain Lake are not exposure pathways of concern

Ecological receptors could be exposed to chemicals in sediment at Mountain Lake. Common species of fish, amphibians, waterfowl, and mammals that occupy the Lake and surrounding area may be exposed to sediment at Mountain Lake. Complete exposure pathways for aquatic species living in the water column or sediment are direct contact with or uptake of chemicals in sediment and dietary exposure to chemicals. For aquatic-dependent wildlife, the primary exposure pathway of concern is dietary exposure to chemicals. There are no sensitive species (i.e., species on federal or state lists of threatened and endangered species) residing at the Lake but these species could occupy the area after future lake enhancement activities.

Risks to ecological receptors were evaluated for baseline conditions at Mountain Lake, which assumed no remediation of sediments. To evaluate risk, the 95 percent upper confidence limit on the arithmetic mean (95 percent UCL) concentrations in sediment were estimated for each of the PCOCs and compared with cleanup levels. The risk evaluation concluded that baseline conditions present an unacceptable risk to the ecosystem in and around Mountain Lake (URS 2011).

The chemicals of concern (COCs) in lake sediment that pose an ecological risk are lead and TPHmo (motor oil). The COCs are those chemicals in lake sediment with concentrations that exceed an ecological cleanup level, pose a potential risk to ecological receptors, and are not assumed to be associated with native fill material. Lead is the primary COC in Mountain Lake sediment due to the high number and widespread distribution of sediment samples containing lead at concentrations exceeding its cleanup level.

Table 8-1: Summary of COC Concentrations and Cleanup Levels in Sediment

	Maximum Detected Concentration in Soil (mg/kg)	Cleanup Level – Freshwater Sediment (mg/kg)[(a)]
Lead	2,000	82
TPH as motor oil	1,500	144

(a) Cleanup levels are based upon ecological freshwater sediment criteria and background metals concentrations for the Colma and Serpentinite formations. Colma formation and serpentinite formations are considered likely, based upon previous sediment sampling, to be encountered during sediment remediation of Mountain Lake. Other soil types, such as greenstone, are also expected to be encountered during remediation.

There is a low probability of encoutnering unexploded ordnance (UXO) or chemical warfare agents at the site. The site is not within an area of concern identified in the U.S. Army's Draft Chemical Warfare Investigation Work Plan (U.S. Army, 2006).

For work conducted along Park Presidio Blvd, there is a potential for Caltrans to encounter lead-contaminated soils from aerially-deposited lead from vehicle exaust emissions. These lead-contaminated soils would be managed and handled in accordance with DTSC's Variance to Caltrans for waste considered to be hazardous (DTSC, 2009). Refer to Pages 4 – 6.

Analysis as to whether or not project activities would:

a. Create a significant hazard to the public or the environment throughout the routine transport, use or disposal of hazardous materials.

Less than significant. The proposed remedial action is designed to protect the public and environment from existing hazards. These activities include dredging bottom sediment from Mountain Lake, dewatering the sediment, transporting it to an appropriate disposal site, and testing water quality before the water is released back into the lake. Project implementation would not require the transport, use, or disposal of hazardous materials, except for dewatered sediment material that would be hauled offsite.

The remediation would be conducted in accordance with the RAP and the federal and State regulations identified in the RAP, as well as Trust Management Policies, as applicable. During remediation activities, access to the site would be restricted to prevent potential public exposure to health or safety risks. Further, potential exposure of workers and public to contaminated materials during dredging and dewatering activities would be controlled through the air quality, dust, and runoff control measures. Workers implementing the remedial activities would have appropriate training and would use personal protective equipment as necessary to minimize exposure to contaminants.

If required, transport of hazardous materials would occur along authorized haul routes within the Presidio and along major thoroughfares outside the Presidio. No approval is required from the City and County of San Francisco or other agency for transport along major thoroughfares and signed truck routes.

For work conducted along Park Presidio Blvd, Caltrans would manage and handle lead-contaminated soils from aerially-deposited lead from vehicle exaust emissions in accordance with DTSC's Variance to Caltrans for waste considered to be hazardous (DTSC, 2009).

Based on the implementation of the Project measures identified above, the Project would not create a significant hazard to the public.

b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

Less than significant. Sediment removed during dredging would be limited to material that has been identified as being contaminated and requiring remediation. Such material would be semi-liquid, non-flammable, non-corrosive and non-explosive and would not present a significant health risk or environmental threat. It would be temporarily stored until sufficiently dewatered to transport to a landfill licensed to receive the material. For work conducted along Park Presidio Blvd, Caltrans would manage and handle lead-contaminated soils from aerially-deposited lead from vehicle exaust emissions in accordance with DTSC's Variance to Caltrans for waste considered to be hazardous (DTSC, 2009). Therefore, the Project would not create a significant hazard to the public due to foreseeable upset or accident conditions resulting in a release of hazardous substances.

c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school.

Less than significant. The nearest children's educational or care facility is the Lone Mountain Children's Center, located on the Presidio, approximately 600 feet northwest of the Project site. The Center is separated from the Project site by heavily traveled Park Presidio Blvd, dense vegetation along the highway, and buildings. The only other sensitive receptor within 0.25 mile is the SF Free Clinic. Two schools, Sutro Elementary School and St. James Preschool, are just over 0.25 mile from the site. Dredged material and any spoils from the stabilization work would be wet and is not expected to emit any hazardous gas. Even when dewatered and loaded for offsite transport and disposal, the material would remain damp and cohesive. The engineering and dust control measures identified above in 6a would be employed to ensure that hazardous emissions do not impact the schools. For work conducted along Park Presidio Blvd, Caltrans would manage and handle lead-contaminated soils from aerially-deposited lead from vehicle exaust emissions in accordance with DTSC's Variance to Caltrans for waste considered to be hazardous (DTSC, 2009). The Project is not expected to release significant quantities of hazardous emissions.

d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to public or the environment.

Less than significant. The Presidio of San Francisco is not on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 because it is owned by the Federal government.[1] However, the proposed remedial action is designed to reduce long-term hazards to human health and the environment and would not create a significant hazard to the public or the environment. Short-term hazards during construction would be controlled by the engineering and dust control measures identified above in 7a.

e. Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.

Less than significant. Execution of the RAP, including intermittent hauling of sediment from the site along established truck routes, would not impair implementation of or physically interfere with emergency response or evacuation plans. To ensure safety, a site-specific Health and Safety Plan (HSP) would be prepared. The HSP describes the controls and procedures to be implemented to minimize the incidents, injury, and health risks associated with the activities to be conducted at the site. The HSP would be prepared according to the applicable requirements of 29 CFR 1910.120 (Federal workers and contractors), and CCR Title 8 General Industrial Safety Order (GISO) 5192 (contractors), for work at hazardous waste sites. The HSP would contain, at a minimum, the following elements:

- A hazard evaluation;
- Names of key personnel and the site safety coordinator;
- A statement that personnel have completed required training;
- Medical surveillance requirements and personal protective equipment to be used by site personnel;
- The types and frequency of personal and area air monitoring, instrumentation and sampling techniques for monitoring of health and safety;
- Site control measures, including the designation of work zones (e.g., exclusion, contamination-reduction and support zones) and safe work procedures for work near structures or topographic breaks, slopes, wall, etc;
- Management of wastes and decontamination procedures for personnel and equipment;
- Noise and dust control procedures and action levels;
- Site transportation procedures;
- Contingency plans including telephone numbers and contact names; and
- Location and routes to the nearest emergency and non-emergency medical care facilities.

Specific References:

DTSC, 2009. Variance V09HQSCD006 to Caltrans. July 1.

Kennedy/Jenks, 2012a. *Letter Report – Sediment Sampling at Mountain Lake.* January.

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement*. May.

URS, 2011. *Remedial Investigation Summary and Risk Evaluation, Mountain Lake, Presidio of San Francisco, California*. October.

U.S. Army (Corps of Engineers, Sacramento District), 2006. *Chemical Warfare Investigation Work Plan.* March.

[1] DTSC's sites listed pursuant to HSC § 25356 are subject to listing under the Government Code Section 65962.5. However, sites owned by the Federal Government are excluded from listing. The implementing regulations provide that sites may be listed pursuant to HSC § 25356 if (a) they are not owned by the Federal Government and (b) a release or threatened release of hazardous substances has been confirmed by on-site sampling. (California Code of Regulations, Title 22, Section 67400.1). The Mountain Lake remediation site also does not meet other requirements for listing under Government Code Section 65962.5.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

9. Hydrology and Water Quality

Project activities likely to create an impact:

- Installation of stone columns for roadway stabilization
- Suspension of sediment during dredging
- Return of dewatering water to lake.

Description of Environmental Setting:

Mountain Lake has a drainage area of approximately 192 acres. Natural inflow to Mountain Lake is primarily by way of groundwater, with some overland flow from adjacent areas including West Pacific Avenue and the East Arm to the east of the lake. The primary sources of artificial inflow are from three storm drains on Park Presidio Blvd (Highway 1) that empty into the lake and a pipe that empties groundwater from the MacArthur Tunnel dewatering system and a portion of Highway 1 runoff into the lake on the north side. Mountain Lake has no surface outlet. It is above the headwaters of Lobos Creek but has no outlet to the creek. Except when the lake overflows its basin into a pipe under Highway 1, water leaves the lake by way of groundwater flow (likely to Lobos Creek) and through evaporation. Water no longer is withdrawn from the lake for domestic or other uses.

The dynamics and function of the lake has been substantially altered by the loss of 40 percent of its area to filling and the raising of the remaining lake bottom from 30 feet to about 10 feet. Sunlight now penetrates to the lake bottom and the lake water is warmer than it was in the past.

Trees planted in the previously barren uplands around the lake have contributed organic matter to the lake in excess of what occurred previously. With no outlet, material introduced to the lake remains in the lake -- silt settles to the bottom and organic matter decays, releasing nutrients. As a consequence of these changes, the lake suffers algae blooms, periodic fish kills, eutrophication (where a high nutrient content results in low dissolved oxygen levels) (Trust, NPS and GGNPA, 2000). In a eutrophic lake, suspended algae and humic acids from decaying plants reduce the clarity of the water.

Sedimentation rates have increased over the past century, from and estimated 'normal' sedimentation rate of 0.1 mm/year to 19 mm/year. A 1902 record indicates that the slopes between the Lake and the golf course and Public Health Services Hospital were eroding, washing sediment into the lake. The 1939 filling of 40 percent of the lake for Park Presidio Blvd construction likely contributed sediment to the rest of the lake (Trust, NPS and GGNPA, 2000).

Since construction of Highway 1, road runoff has discharged to Mountain Lake from the roadway, carrying sediment and chemicals with it. This is the major source of contaminated sediment to be removed. Investigations of surface water in Mountain Lake have shown that there are no chemicals in surface water above water quality criteria for aquatic life and drinking water standards (e.g., maximum contaminant levels). Refer to Pages 1 – 6.

Analysis as to whether or not project activities would:
a. Violate any water quality standards or waste discharge requirements.

Less than significant. The proposed new inlets and sediment/pollution control devices be installed to treat roadway runoff entering the lake. This would not result in violation of water quality standards or any waste discharge requirements.

The proposed remediation would not violate water quality standards or waste discharge requirements. For disturbed areas greater than one acre, the Water Board has prepared a National Pollution Discharge Elimination System (NPDES) General Permit for Construction Activity. Terrestrial disturbance would be less than one acre. Disturbance of the lake bottom during dredging would re-suspend some sediment, temporarily lowering water quality. However, the re-suspended material would settle after dredging is completed. If necessary, a treatment would be applied to the lake water following dredging to increase water clarity. As a CERCLA project, the Project is exempt from acquiring a permit from the Water Board (EPA OSWER Directive 9355.7-03). However, the work would be conducted pursuant to the substantive requirements of the General Permit for Construction Activity. The Project would include implementation of BMPs for construction site planning and management, erosion and sediment control, and pollution prevention, which would be contained in the SWPPP document. The SWPPP would include Project specific measures to reduce surface runoff and erosion. To uphold water quality standards that are presented in the Clean Water Act and administered by the Water Board, the remedial design plans for the Project would include an erosion control plan to address onsite erosion, sedimentation, and pollution control concerns for work performed between October 15 and April 15. As a CERCLA project, remediation of Mountain Lake, including disturbance of shoreline wetlands, is exempt from acquiring a permit to fill waters of the United States under Section 404 of the Clean Water Act (EPA OSWER Directive 9355.7-03).

With the implementation and maintenance of the sedimentation and pollution control measures described above, the Project would not violate any water quality standards.

b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficient in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

Less than significant. The vibratory equipment would compact the walls of the shaft, reducing groundwater inflow to the shaft. However, some groundwater likely would be extracted during the construction of the rock columns along Highway 1, either as water or as saturated soil. This groundwater extraction would be minimal, and would consist of any water that may accumulate in the shaft and be displaced by the aggregate. One temporary piezometer recently installed to measure groundwater levels underneath the roadway would be removed. Any water extracted would be from a shallow depth (no more than 60 feet below the surface). The rock columns would not prevent groundwater recharge.

No groundwater would be extracted by the proposed Project. The Project would be limited to removal of accumulated sediment, there would be a less than significant impact to groundwater resources and the Project activities would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficient in aquifer volume or a lowering of the local groundwater table level.

c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site.

Less than significant. The construction of the stone columns would stabilize the road by reinforcing the soil under the road. However, water would be able to pass through and around the columns. There would be no change in groundwater flow that may contribute to nearby Lobos Creek.

The Project would remove sediment from the lake bottom. No existing drainage pattern would be affected. No erosion or siltation would occur. In accordance with the erosion control plans to be developed during remedial design, lakeside areas potentially disturbed by equipment would be stabilized and protected from erosion and sediment transport. Upon completion of dredging, the disturbed bottom of the lake would be left in a stable state. The upland dewatering area would be configured to prevent erosion or siltation. Stabilization measures might include: installation of wattles, stabilization matting, fabric, and blankets on exposed soil. With the implementation of these controls, the proposed remedial action would not alter the existing drainage pattern of the site and would not result in substantial erosion or siltation on or off-site.

d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site.

Less than significant. The rate or amount of surface runoff would be unaffected by the Project. During construction, the temporary drainage conditions would be managed with engineering controls included in the remedial design and described above in 9.c. The proposed remedial action would not alter the existing drainage pattern of the site in a manner which would result in flooding on or off site.

e. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

Less than significant. The Caltrans runoff control aspect of the Project would add and improve existing drainage facilities but would not increase the volume of water managed. The Project remediation work would not require use of storm water drainage systems. Water from the dewatering process would be captured, tested, and returned to the lake. The Project would not exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

f. Otherwise substantially degrade water quality.

Less than significant. Levels of chemicals detected in water samples from the Lake are less than water quality criteria for aquatic organisms and drinking water standards (e.g., maximum contaminant levels). However, water quality of the lake has deteriorated over time from sediment deposition, increased nutrient flow to the lake, lowered oxygen levels, and growth of emergent vegetation. Treating the continued introduction of sediment and chemical laden runoff would improve water quality. Removal of contaminated sediment would have a long-term positive effect on water quality by removing a source of contaminants. During dredging, bottom sediments may be re-suspended, but would settle. If necessary, a treatment would be added to the lake water to increase water clarity. By deepening the lake, the volume of water would

be increased and water quality related to water temperature and algae blooms is expected to improve. Therefore, the proposed activities would not substantially degrade water quality.

g. Place within a 100-year flood hazard area structures which would impede or redirect flood flows.

No impact. The site is not within a 100-year flood hazard area and would not install structures that would impede or redirect flood flows.

h. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

Less than significant. There are no levees or dams as part of the Project. None of the proposed activities would expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

i. Inundation by sieche, tsunami or mudflow.

Less than significant. Based on the geographic location and elevation of the Project site, the Project would not be inundated by the occurrence of a sieche or tsunami. Upslope areas from the sites are vegetated; these areas would be unaffected by the Project and mudflows from these areas onto the site are unlikely. Any disturbed area in the Project area would be appropriately mulched or otherwise stabilized to prevent erosion and control runoff pending final replanting. Sediment slurry loss from any holding tank or pond would not be of sufficient quantity to reach Mountain Lake Trail or the lake. There are no structures downslope of this area and trail users are mobile and passing through.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement*. May.

Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

U.S. Environmental Protection Agency (EPA), 1992. Permit and Permit “Equivalency” Processes for CERCLA On-Site Response Actions. OSWER Directive 9355.7-03. February 19, 1992.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

10. Land Use and Planning

Project activities likely to create an impact:

- Temporary site fencing to redirect public access away from work zone.

Description of Environmental Setting:

Mountain Lake is on the southern edge of the Presidio. Immediately west of the Lake is Park Presidio Blvd (Highway 1). The Presidio Golf Course is to the immediate east and north of the lake and is separated by an existing trail/road and fence. South of the lake are private residences and apartments on Lake St, which runs parallel to the Presidio boundary, and at the termini of 9th, 10th, 11th, 12th Avenues, and Funston St, which deadend at the Presidio boundary. These residences are separated from the lake and the Presidio by Mountain Lake Park,a small City-owned park. To the casual observer, the boundary between the park and the Presidio is indistinguishable. Swimming is not permitted, but passive recreation such as bird watching and feeding occurs. Picnic and tennis facilities are located within the park, which has paths that merge with Presidio trails.

The stabilazition and runoff control work on Highway 1 would require nighttime closure of a traffic lane on the northbound side of the highway; however, traffic volume is low at night and a lane would remain open for northbound vehicles. The southbound lanes would be unaffected, except if there is a need to temporarily close one during installation of water management devices on the west side of the highway.

The primary staging area for the Project would be at the area to be used for dewatering. The site would be fenced and closed to public access. The dredge would be on the lake and would not result in closure of any area once it is afloat. The dredged sediment/water slurry would be pumped by temporary pipe from the dredge to the shore and continue across Mountain Lake Trail at the north end of the lake to the upslope sediment dewatering site. At the trail, the pipe could be covered or trenched so as to not impeded trail users. During the hauling of dewatered sediment off site, access would be restricted or controlled to ensure that equipment was not operated so as to put pedestrians and cyclists at risk. Refer to Page 3.

Analysis as to whether or not project activities would:

a. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

No impact. Neither the pre-remediation highway work nor the remediation would conflict with any applicable land use plan, policy, or regulation, including those related to land use and habitat/community conservation. Public access to the highway work area would be restricted at night for 90 active work days over a 18 week period. Access to the area required for remediation would be restricted or controlled for 28 weeks during remediation and subsequent restoration. The remediated site and upland areas affected would be restored for future use consistent with the VMP (Trust and NPS, 2001), PTMP (Trust 2002a,b), and the Enhancement Plan (Trust, NPS and GGNPA, 2000). The proposed remedial action at Mountain Lake would improve the environmental conditions in lake and would be in keeping with long-term plans for the area.

As Federal property, Mountain Lake by definition is excluded from the coastal zone. Further, removal of sediment from Mountain Lake would not have effects on the coastal zone since the lake is an isolated water of the U.S. and is located approximately 1 mile inland from the Pacific Ocean (ARARs, Table 5-1, Kennedy/Jenks 2012b). However, the project meets substantive provisions of the San Francisco Bay Conservation and Development Commission (BCDC)'s San Francisco Bay Plan (BCDC, 2008). The final remedial action would be consistent with park use. There would be no permanent impacts on public access to the lake. The biological health of Mountain Lake would be enhanced, and the visitor experience improved, as a result of the project by removing contaminants from the lake and restricting pollutants from reaching the lake in the future.

Therefore, the Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

b. Conflict with any applicable habitat conservation plan or natural community conservation plan.

No impact. None of the proposed highway or remediation activities would conflict with any habitat conservation plan or natural community conservation plan.

Specific References:

BCDC (San Francisco Bay Conservation and Development Commission), 2008. *San Francisco Bay Plan*. January.

City and County of San Francisco, 2012. San Francisco Zoning Map, http://sfplanning.org/index.aspx?page=1569. February.

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

NPS and Trust, 2003. *Presidio Trails and Bikeways Master Plan and Environmental Assessment*. July.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement.* May.

Trust and NPS, 2001. *Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco*. December.

Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

U.S. Environmental Protection Agency (EPA), 1992. Permit and Permit "Equivalency" Processes for CERCLA On-Site Response Actions. OSWER Directive 9355.7-03. February 19, 1992.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ No Impact

11. Mineral Resources

Project activities likely to create an impact:

None. There are no known significant occurrences of mineral resources at the Presidio. Therefore, no impacts would occur. For this reason, no further analysis of impacts to this resource category is necessary.

Description of Environmental Setting:

Analysis as to whether or not project activities would:
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement.* May.

Trust and NPS, 2001. *Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco*. December.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☐ No Impact

12. Noise

Project activities likely to create an impact:

- Noise from heavy equipment, trucks, and other vehicles for roadbed stabilization, installation of drainage pipe, lake dredging and slurry pumping, dewatering, and transportation of excavated sediment.

Description of Environmental Setting:

The noise environment within and outside the Presidio is largely a function of the proximity to motor vehicle traffic, with the quietest areas located farthest from major transportation corridors such as Doyle Drive (US 101) and Park Presidio Blvd (Highway 1). In the vicinity of Highway 1 and U.S. Highway 101 (including Doyle Drive and Richardson Ave), existing traffic noise levels commonly are above 67 dBA (A-weighted decibels), which is the Federal Highway Administration (FHWA) Noise Abatement Criterion (NAC) for recreation areas, parks, and residences. Noise-sensitive areas within the Presidio that could be affected by the planned construction and remediation include the Mountain Lake and De Anza National Historic trails, Mountain Lake Park, the Presidio Golf Course, and residences near the site and along the site access routes.

As a matter of policy, the Presidio endeavors to meet local standards when feasible. The San Francisco Noise Ordinance (Article 29 of the San Francisco Police Code, 1994) addresses noise in the community. The noise ordinance regulates construction noise, fixed-source noise, and unnecessary, excessive, or offensive noise disturbances within the City. The construction noise regulations in Sections 2907 and 2908 of the San Francisco Police Code provide that:

1. Construction noise is limited to 80 A-weighted decibels (dBA) at 100 feet from the equipment during daytime hours (7 a.m. to 8 p.m.). Impact tools are exempt provided that they are equipped with intake and exhaust mufflers, and
2. Nighttime construction (8 p.m. to 7 a.m.) that would increase ambient noise levels by 5 dBA or more at the Presidio of San Francisco property line is prohibited unless a permit is granted by the Director of Public Works.

Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. For comparison, levels around 75 dBA are common in busy urban areas and levels up to 85 dBA occur near major freeways and airports.

Analysis as to whether or not project activities would:
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Less than significant. Noise generated by the planned construction and remediation activities would be intermittent and spread over two years. Noise impacts would be generally limited to nearby sensitive receptors (residents), intermittent users, such as trail hikers and park users, and other visitors.

The principal noise from the Caltrans night work would be the generators needed to power lights, up to 8 trucks delivering aggregate, the engine on the vibratory rig, and a front loader deposing aggregate into shafts. If mechanical (belt press) dewatering were to occur at night, the noise would be a steady sound of the belt in operation. If instituted, nighttime dewatering would comply with the San Francisco ordinance on nighttime noise levels.

The proposed Project would temporarily increase daytime noise levels from use of equipment and vehicles for site preparation, the dredge and pump, the dewatering press, and the off-hauling of dewatered sediment.

Most construction activities are capable of causing routine noise levels of approximately 79 to 84 dBA measured 100 feet from the activity if noise control is not used, or 69 to 74 dBA with noise control.

Table12-1 shows typical noise levels of typical construction equipment, based on the Federal Highway Administration (FHWA) Roadway Construction Noise Model. Noise levels in this inventory are expressed in terms of maximum instantaneous levels (Lmax) with a usage factor for the intermittent nature of construction. The acoustical usage factor estimates the fraction of time each piece of construction equipment might operate at full power (i.e., its loudest condition) while in use.

Table 12-1: Noise Levels and Usage Factors for Construction Equipment

Equipment	Acoustical Usage Factor (%)	Measured Lmax (dBA at 50 feet)
Auger Drill Rig	20	84
Backhoe	40	78
Compactor (ground)	20	83
Compressor (air)	40	78
Concrete Mixer Truck	40	79
Concrete Pump Truck	20	81
Crane	16	81
Dozer	40	82
Drill Rig Truck	20	79
Drum Mixer	50	80
Dump Truck	40	76
Excavator	40	81
Flat Bed Truck	40	74
Front End Loader	40	79
Generator	50	81
Grader	40	85
Pickup Truck	40	75
Pneumatic Tools	50	85
Pump	50	81
Welder/Torch	40	74

Source: FHWA, 2006.
Notes: Lmax – maximum A-weighted sound level

Noise would be generated by equipment for highway stabilization, dredging equipment, generators, pumps, loaders, and trucks hauling materials including aggregate and dewatered sediment to and from the site. Noise for installing highway stabilization and rock columns would occur at night. At its closest, the work would be approximately 200 feet from the nearest residences. Dredging would occur in the daytime and at its closest would be about 400 feet from the nearest residences.

Because the proposed pre-remediation roadway stabilization activities would occur primarily at night, to avoid potential noise impacts, the activities for highway stabilization and runoff management would include reasonable and feasible noise abatement features to ensure that nighttime noise levels do not substantially increase. However, sound walls or acoustic panels may not be feasible due to the steep grade between the highway shoulder and residences.

During dredging and hauling, noise levels for receptors near the remediation site or along roads providing access to the site could be considerable. Hydraulic dredging equipment and pumps for moving dredged material to the dewatering area would be likely to cause between 70 and 80 dBA at the dredging barge. At the dewatering site, sediment dewatering equipment would be less noisy, operating at levels under 70 dBA, and a backhoe or loader generates about 80 dBA. The large dump trucks used to transport the sediment would be the primary source of noise. The site-specific Health and Safety Plan (HSP) would describe the controls and procedures to be implemented to minimize the incidents, injury, and risks for workers associated with excessive noise.

If ramp access between the site and Highway 1 is constructed, trucks hauling sediment would not pass near local residences. However, they likely would operate at night between the dewatering area and the entrance to Highway 1. This would be because of the need for a temporary lane closure for safe movement of trucks onto and off the highway. A lane closure for daytime hauling would create congestion and backups on this busy roadway. The dewatering area would be approximately 1,000 feet from the nearest residences on Wyman Ave and the Highway 1 exit ramp would be approximately 450 feet from Wyman Ave. residents. Both the dewatering site and ramps would be separated from the residents by Highway 1. The dewatering site is approximately 1,300 feet from the nearest residences to the south of the lake. These distances would provide sufficient attenuation of noise levels to ensure that nighttime noise levels do not substantially increase.

If trucks travel to and from the site along West Pacific Ave, they would operate in the daytime and pass within approximately 20 to 30 feet of residences having side yards or rear yards along the Presidio's southern boundary. These residences are located at the termini of 5th, 6th and 7th Avenues and on Presidio Terrace. If used for ingress and egress, approximately 25 loaded trucks, and the same number of returning empty trucks, would pass near the residences during a work day as they transit between the site and Arguello Blvd. For a period of 4 to 8 weeks during the overall 28-week remediation portion of the Project, about 6 heavy-duty haul truck passes per hour would occur. Construction trucks generate peak noise levels of about 80 dBA, and for locations beyond 100 feet, distance would attenuate the level to less than 74 dBA. Inside buildings, noise from outside sources is reduced by about 15 to 20 dBA due to the attenuating effect

of the structural components of the dwelling. Trucks passing along West Pacific Ave could result in indoor sound levels for the nearest residences of about 60 dBA during each pass-by. The threshold for speech interference indoors is 55 dBA for fluctuating noise. As a result, trucks along West Pacific Ave would briefly disturb the nearest residences. Noise along this route would occur only during the day, when people are less sensitive to noise (as compared to night), and would be intermittent rather than constant. If trucks use the Park Blvd route, they would pass residences located on Washington Blvd either eastbound or west bound. The distance between the curb and the residences varies from approximately 40 to 50 feet. As with West Pacific Ave, trucks passing along Washington Blvd would briefly disturb the nearest residences with resulting indoor sound levels of about 60 dBA.

During construction, contractors and other equipment operators would comply with the San Francisco noise ordinance, which requires that each piece of powered equipment, other than impact tools, emit noise levels no higher than 80 dBA measured at 100 feet from the equipment during daytime hours (7 a.m. to 8 p.m.). Trucks used for on-highway transport and other motor vehicles are not subject to this limitation.

PTMP Mitigation Measure NR-23 for General Construction/Demolition Noise, requires that "During construction, construction contractors and other equipment operators would be required to comply with the San Francisco Noise Ordinance (San Francisco Municipal Code, Section 2907b), which requires that each piece of powered equipment, other than impact tools, emit noise levels of not more than 80 A-weighted decibels (dBA) at 100 feet. To reduce noise impacts, barriers would be erected around construction sites and stationary such as compressors; this would reduce noise by as much as 5 dBA. To further reduce noise impacts on visitors, some construction sites would be temporarily closed, and appropriate barriers placed at a distance of 250 feet from the sites" (Trust, 2002a,b). This measure is incorporated into the Project, as required by the PTMP.

Reasonable and feasible noise abatement features measures would be implemented to manage construction noise. Control measures would include, but not be limited to, proper maintenance and tuning of equipment, placement of noisy equipment away from sensitive receptors as practicable, noise-control mufflers, and scheduling noisier operations during periods of low visitor use (weekdays), to the extent feasible. In addition, construction would be scheduled to limit impacts on wildlife and bird nesting activity in consultation with Trust natural resource specialists. Within the Presidio, transport of equipment and sediment would occur along routes approved by the Trust (see Section 15). Outside of the Presidio, haul routes would follow major thoroughfares and signed routes approved for truck traffic. Because of these controls, the activities would not result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

Less than significant. Vibration from equipment would be perceptible in the immediate vicinity of the equipment or activity. Tamping of ground surfaces and the passing of heavy trucks on uneven surfaces would create perceptible vibration in the immediate vicinity of the activity. The level of groundborne vibration that could reach sensitive receptors depends on the distance to the receptor, the equipment creating vibration, and the soil conditions surrounding the construction site. The impact from construction-related groundborne vibration would be short-term and confined to only the immediate area around the activity (within about 25 feet). Because construction of roadbed stabilization would occur approximately 200 feet away from residences, no excessive groundborne vibration or noise level would occur at the residences. Because vibration related to remediation and transportation of sediment would be temporary, intermittent, and far from residences, impacts related to groundborne vibration and noise would be less than significant. If trucks use the West Pacific Ave route, they would be travelling at a reduced speed and are not likely to create vibration in the houses.

c. A substantial permanent increase in ambient noise levels in the vicinity above levels existing without the project.

No Impact. Activity and increased ambient noise levels would occur intermittently over two years for the highway stabilization and subsequent lake remediation. Upon completing the work, no permanent noise source would remain. Because the noise would be limited to the duration of activity, the Project would not result in a permanent increase in noise levels in the vicinity.

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Less than significant. Temporary and periodic increases in ambient noise levels in the Project vicinity would occur above levels existing without the Project. Construction of the highway stabilization and highway runoff features would occur 200 feet away from noise-sensitive residences, at the closest. Construction would include reasonable and feasible noise abatement features to ensure that nighttime noise levels do not substantially increase.

Dredging would be limited to during daylight hours, when receptors are less sensitive. With the exception of ramp use for ingress and egress and, potentially, night dewatering operations, noise would occur during daylight hours and would be perceived, at worst, as a temporary passing impact. If ramps are used, the nighttime noise of trucks operating between

Highway 1 and the dewatering site would occur 450 feet or more from the nearest residences and would be separated from the residents by heavily travelled Park Presidio Blvd. This is a distance that would provide sufficient attenuation. All activity would employ noise control measures to ensure that the increase in noise would not be substantial (described in Section 12a), such as placement of noisy equipment away from sensitive receptors as practicable and using noise-control mufflers. As a consequence, temporary increases in the ambient noise levels would not be substantial and would be less than significant.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

FHWA (Federal Highway Administration). 2006. FHWA Highway Construction Noise Handbook. (FHWA-HEP 06 015; DOT VNTSC FHWA 06 02). August. http://www.fhwa.dot.gov/environment/noise/handbook/index.htm.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement*. May.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

13. Population and Housing

Project activities likely to create an impact:

None. The Presidio currently has over 1,000 occupied multifamily and single-family housing units and a residential population of just under 3,000 persons. The Project would not create a demand for housing nor increase local population. Construction workers, equipment operators, and truck drivers would be from the local labor pool and would maintain their current residences. Therefore, no impacts would occur. For this reason, no further analysis of impacts to this resource category is necessary.

Description of Environmental Setting:

Analysis as to whether or not project activities would:

a. Induce substantial population growth in area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

Specific References:

Trust, 2002a. *Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Trust Management Plan: Final Environmental Impact Statement*. May.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☐ No Impact

14. Public Services

Project activities likely to create an impact:

- Stabilization of Highway 1
- Dredging of lake
- Sediment processing.

Description of baseline environmental conditions:

During Highway 1 stabilization work, a northbound lane would be closed. This would occur at night.

The Presidio is jointly administered by the NPS and the Trust. The Project would be located within the area of the Presidio administered by the Trust. Police services are provided by the Park Service Police. Fire and emergency response services are provided by the San Francisco Fire Department. Project dredging would occur in an area where there are no public roads. West Pacific Ave west of 5th Ave is closed to private vehicles, but if required would be available for use in hauling sediment from the site, and would remain available for emergency access, as it is now. The Project would not increase population or the use of public services.

Analysis as to whether or not project activities would:
a. Result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the following public services:

- **Fire protection**
  No impact. The Project would not require new or altered fire protection facilities. The Trust would coordinate with the San Francisco Fire Department who would respond in emergencies. The proposed activities would not block access of routes used for emergency access vehicles. No additional fire protection facilities would be required as a result of Project implementation.

- **Police protection**
  No impact. The Project would not require new or altered police protection facilities. The Trust would coordinate with Park Service Police who would continue to patrol the general areas throughout the Presidio and respond to on-site emergencies. No additional services would be required as a result of the Project. Fencing and signage would be provided as needed to restrict public access to the site.

- **Schools**
  No impact. The Project would not require new or altered school facilities.

- **Parks**
  No impact. The Project would not require new or altered park facilities.

- **Other public facilities**
  No impact. The Project would not require new or altered public facilities.

Specific References:

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement*. May.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ No Impact

15. Recreation

Project activities likely to create an impact:

- Temporary site fencing to redirect public access away from work zones.

Description of Environmental Setting:

There would be no recreational facility affected by the Caltrans highway work.

The Presidio is a National Park. The Project would be located within the area of the Presidio administered by the Trust. The PTMP (Trust 2002a and 2002b) is the land use guidance document. Recreational uses of the Presidio vary from passive activities, such as walking and bird watching, to active sports such as baseball, tennis, and bicycling. Activities associated with Mountain Lake are primarily trail walking and nature observation. A portion of the south shore of the lake, as well as land immediately outside the Presidio boundary is a City park. This area supports active recreation, including picnicking, a playground, and tennis courts. During remediation, these facilities would be unaffected. The construction area for the remediation work would be fenced. The staging area would be at the north end of the lake and would require either period or complete closure of the trail at the end of the lake. This would preclude through pedestrian and bicycle traffic. If trucks need to use West Pacific Ave for site access, the route would have to be closed during hauling.

Analysis as to whether or not project activities would:
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

Less than significant. The highway work would not affect any park or recreational facility. It would occur at night. During implementation of the remediation portion of the Project, the site would be fenced to restrict and redirect public access. This is standard practice at all Presidio remediation sites during construction. The remedial design would include pedestrian detours designed to keep visitors out of active work areas while permitting full use of other park areas and facilities to the extent feasible and safe. Use of most of the City's Mountain Lake Park would be unaffected. Following remediation, site restoration would be conducted consistent with the VMP (Trust and NPS, 2001) and Mountain Lake Enhancement Plan (Trust, NPS and GGNPA, 2000). Revegetation of the shore and near shore would include use of native plant species, historic or native tree species, and landscape vegetation appropriate to its future uses.

The Project action would be consistent with park use. There would be no permanent impacts on public access to the lake. The biological health of Mountain Lake would be enhanced, and the visitor experience improved, as a result of the project by removing contaminants from the lake and restricting pollutants from reaching the lake in the future.

Temporary and permanent effects on recreational facilities would be less than significant, and would be enhanced in the long term by post-remediation restoration. Although some passive recreational use of the Presidio would be diverted during the construction period, the proposed remedial action would not increase the use of existing parks or recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

b. Include recreational facilities or require construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

Less than significant. Site restoration would be conducted to facilitate habitat and recreational development. Ultimately, the site vicinity would be landscaped consistent with the VMP Trust and NPS, 2001) and Mountain Lake Enhancement Plan (Trust, NPS and GGNPA, 2000). The proposed remediation activities would not require construction of additional recreation facilities, and thus, it would not have an adverse physical effect on the environment.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

NPS and Trust, 2003. *Presidio Trails and Bikeways Master Plan and Environmental Assessment*. July.

Trust, 2002a. *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Presidio Trust Management Plan: Environmental Impact Statement*. May.

Trust and NPS, 2001. *Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco.* December.

Trust, NPS and Golden Gate National Parks Association (GGNPA), 2000. *Mountain Lake Enhancement Plan and Environmental Assessment.* October.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

16. Transportation and Traffic

Project activities likely to create an impact:

- Delivering aggregate and equipment to the highway stabilization site
- Delivering equipment to the remediation site
- Hauling dewatered sediment to an offsite permitted facility.

Description of Environmental Setting:

With the exception U.S. 101 and Highway 1 passing through the Presidio, roads on the Presidio serve mostly local traffic heading to and from on-Presidio destinations or passing through the Presidio to nearby City districts. Traffic speeds are low, and congestion occurs intermittently at principal (four-way stop sign controlled) intersections. Traffic in city neighborhoods surrounding the Presidio varies from very light (in residential neighborhoods), to heavy (along Park Presidio Blvd, for example). The nearest elementary schools are just over 1,320 feet (0.25 mile) from the site. A preschool and care facility is approximately 600 feet northwest of the site, but is separated from the site by Park Presidio Blvd. There is no public vehicle access to Mountain Lake. Access can be achieved by use of West Pacific Ave, a wide paved road from Arguello Blvd to approximately 800 feet west of the Presidio Golf Club, where a locked gate and bollards prevent vehicles from continuing. Between the bollards and the Lake, the right of way continues at the same width as the road. Only 15-foot width of the north side of the right of way is a paved path; the right side is a crush stone roadbed. The overall right of way is approximately 40 feet wide. It is sufficiently wide to allow equipment and truck access to the lake. The Mountain Lake Trail makes use of the West Pacific Ave right of way for part of its length. On the east side of Mountain Lake, the De Anza National Historic Trail and the Mountain Lake Trail share a common path. This path is paved around the Lake up to the staging area (dewatering site). Given the location of the trails relative to the Lake and to the dewatering site, the trails adjacent to the Lake would need to be restricted or closed during certain construction activities.

The proposed pre-remediation work and highway stabilization would generate the following truck trips during approximately 90 active work days over 18 weeks:

- Approximately 8 truck round trips per shift for delivering aggregate and a similar or lesser number for removing spoils.
- Approximately 200 truck round trips to deliver fill for ramp construction
- Additional truck trips for mobilizing and demobilizing highway construction equipment and delivering pipe and other material.

The proposed remediation would generate the following truck trips during approximately 28 weeks of activity:

- Approximately 550 to 990 truck round trips to transport dewatered sediment from the site for disposal over a 4 to 8 week period.
- A small number of additional truck round trips to deliver equipment, fencing, and other materials to the site and to haul vegetation offsite. (Logs and branches may be chipped and left on site as erosion control mulch.)
- A small number of additional truck round trips to deliver plants, mulch, erosion control, and irrigation tubing.

Sediment removal would require off-site transport of approximately 9,850 cy of dewatered solids, which would generate approximately 25 truck round-trips per day during a 4 to 8 week period. This would average 6 trips per hour (3 outbound, 3 inbound); however, there may be more per hour earlier in the day if the material is hauled to landfills at a considerable distance, such as Buttonwillow landfill, 265 miles away. The number of personal vehicles from Project workers would be negligible compared to the existing traffic levels in the Presidio and nearby streets. The Trust will coordinate with Caltrans and the local transportation agency to ensure compliance with state and local transportation requirements or ordinances.

Analysis as to whether or not project activities would:

a. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

Less than significant. For safety, the Project may require closure of the trails on the north side of the lake for the duration of construction and intermittent closures of trails on the south and east sides of the lake. If ramp access to the site is used, vehicles entering the site would approach from the south, on Highway 1. Exiting vehicles would leave the site heading north on Highway 1, toward the MacArthur Tunnel under the golf course. Trucks would continuing north on Highway 1 to U.S. Highway 101, then proceed either north across the Golden Gate Bridge or south on U.S. 101, depending on the location of the disposal site. Vehicles entering the site would approach from the south on Highway 1 and travel down the temporary ramp into the site. Alternatively, traffic to and from the site would be along West Pacific Ave, between the lake and Arguello Blvd. Arguello Blvd is moderately used during the day, and can be somewhat heavily used during morning and evening rush hours and weekends, when it is used as a short-cut between the Marina/Cow Hollow and Presidio

Heights areas or to avoid Highway 1. Congestion can occur at stop signs, but does not generally result in long queuing times. However, during a 10-hour work day, a maximum of 25 truck round-trips per day would use the Arguello-Presidio Blvd route between West Pacific Ave and the eastern gates to the Presidio (i.e., Lombard Gate, Gorgas Gate, and Marina Gate). This would result in about 3 trucks per hour in each direction. This low volume would have a less than significant impact on local traffic within the Presidio and on designated truck routes outside the Presidio en route to the disposal site(s). The Park Blvd to Washington Blvd routes to either Lincoln Blvd or Arguello Blvd would have similar conditions and outcomes as the West Pacific Ave to Arguello Blvd route.

Cumulative Impacts:

CEQA requires consideration of the cumulative impacts of a proposed project in combination of impacts of other projects or activities that have the potential to combine with impacts of the proposed project. Although impacts of each project may be less than significant, the cumulative effect of all projects may be significant.

America's Cup: Major sailing regatta events are planned on San Francisco Bay for the summer of 2012 and 2013. These events are planned to take place in August and September 2012 and from July through September 2013. The events culminate with the America's Cup final in September 2013. Most events are planned for Thursday through Sunday each week, with the greatest attendance expected on Saturday and Sunday. Because of local wind conditions, events are planned primarily for afternoons. As with any major regional event, such as New Year's Eve, 4th of July, and Fleet Week, roadways may become highly congested, particularly main arteries and streets near the waterfront. Based on the sailing schedule and the Project construction schedule, both the Caltrans pre-remediation work and the Trust remediation work have the potential to overlap with the Thursday and Friday events. However, the 2012 Caltrans work would occur primarily at night and, therefore, would not coincide with daytime traffic. The 2013 Trust remediation work anticipates a 4 to 8 week period of hauling sediment from the site. Depending on when this hauling occurs and how it is scheduled, it would be possible to avoid the race-related heavy congestion periods. In particular, given that trucks would be traveling up to 265 miles to a disposal site, they would leave early in the day, before traffic associated with the afternoon events began to arrive. In addition, a contractor typically schedules hauling to make the most efficient use of drivers and trucks. Therefore, it is reasonable that a contractor would schedule around congested periods, when trucks could be caught in traffic. Given that there is no overlap of 2012 construction with race events, and that the 2013 hauling schedule can be adjusted to minimize contributing to congestion, the America's Cup events were not considered in the cumulative analysis.

2012 Cumulative Scenario: There are five known construction projects on or near the Presidio that would or may overlap with Project work in 2012. These are the ongoing 5-year Doyle Drive replacement project, the Presidio's Main Post update projects, a remediation project above Baker Beach (RAP BB1A), a remediation project northeast of the Golden Gate bridge toll plaza at the CHP Range, and a remediation project in the Main Post at the Bernard Avenue Protected Range (RAP 6C). Their locations are shown in Figure 9.

The Doyle Drive project is on the north side of the Presidio; the Mountain Lake remediation Project is on the south side, over a mile away. Detours and road closures would be required during the duration of the complex Doyle Drive work, and would change from time to time as the work progresses. The Doyle Drive project EIS concluded that implementation of the Transportation Management Plan for that project would ensure that there are no significant transportation/traffic related impacts (FHWA & SFCTA, 2008).

The Main Post update project is within the Main Post of the Presidio, approximately 4,500 feet northeast of the Mountain Lake site. The Main Post upgrade project includes reconstruction of existing buildings, structural improvements and other seismic work, roadway and utility upgrades, and other infrastructure enhancements. The Main Post work is ongoing and does not occur all at once. Specific projects are fairly small and would involve only nominal amounts of material delivery or hauling. The Supplemental EIS for the Main Post Update indicates that construction vehicle traffic will vary depending on the specific construction activity and schedule. Construction vehicles for the Main Post will generally enter the Presidio via Richardson Ave, Doyle Drive, or the Golden Gate bridge toll plaza (Trust, 2010).

Baker Beach site BB1A work would occur in approximately the same period as the Caltrans work on Highway 1 adjacent to Mountain Lake. The Baker Beach site is approximately 7,000 feet north-northwest of Mountain Lake and only 400 feet south of the Golden Gate Bridge toll plaza. An estimated 3,800 cy of fill would be removed from the site (MACTEC, 2011b), and clean material would be imported, resulting in approximately 500 round-trip truck trips. Access to the Baker Beach site is likely off Lincoln Blvd. Trucks would reach Highway 101 at the Golden Gate Bridge by way of Lincoln Blvd and Merchant Rd. Once on Highway 101, the Baker Beach trucks potentially would use similar off-Presidio routes as the Caltrans trucks if they are on Highway 101.

The CHP Range work would occur in approximately the same period as the Caltrans work on Highway 1 adjacent to Mountain Lake. The CHP site is approximately 8,000 feet north-northwest of Mountain Lake and only 700 feet northwest of the Golden Gate Bridge toll plaza. An estimated 600 cy of fill would be removed from the site and clean material would be imported, resulting in approximately 160 round-trip truck trips. Access to the CHP Range site is likely off Lincoln Blvd. Trucks would reach Highway 101 at the Golden Gate Bridge by way of Lincoln Blvd and Merchant Rd. Once on Highway 101, the CHP Range trucks potentially would use similar off-Presidio routes as the Caltrans trucks if they are on Highway 101 (EKI, 2009).

The Bernard Avenue Protected Range (BAPR) site is south of Presidio Blvd, between Barnard Ave and Quarry Rd, south of Fernandez St. The range now is largely covered by Landfill E, which is a remediated site. However, a portion of BAPR is not covered by the landfill. It is estimated that 2,500 cy of material will be hauled from the site during remediation (Geosynec, 2011), and clean material would be imported, resulting in approximately 340 round-trip truck trips. The haul route is likely to be via Presidio Blvd to Lombard Gate and onto US 101 (Lombard St).

The projects are a considerable distance from each other. In most respects the Mountain Lake site is isolated from the other projects in terms of the potential to contribute to cumulative effects. The only area in which the 2012 Project work near Mountain Lake could contribute to a cumulative effect is in its use of trucks and equipment during construction and when hauling aggregate and material. This part of the construction activity has the potential to contribute to a cumulative impact on traffic congestion.

Level of Service (LOS) is used to describe delay at intersections due to traffic volume and other conditions. Table 6-1 shows existing LOS at intersections along the haul route in the City of San Francisco before trucks merge with traffic on major highways.

Table 16-1: Haul Route Intersection Level of Service

Existing (2011) Intersection Level of Service	Traffic Control	Level of Service (LOS)
Lombard St./Divisadero St.	Signal	C
Lombard St./Fillmore St.	Signal	C
Lombard St./Van Ness Ave.	Signal	D

Source: San Francisco Planning Department, 2011

The levels shown in Table 16-1 include any Doyle Drive related construction traffic. LOS C is described by traffic engineers as “acceptable delays”; LOS D as “tolerable delays”. It is assumed that the contribution of construction-related traffic from the Doyle Drive project would remain similar in 2012 and 2013 to what is was in 2011. The cumulative impact of Project-related truck traffic in 2012 would not change the existing LOS.

All other potential impacts identified for the Caltrans work are specific to the site or the immediate vicinity. Most of this work would occur at night. The other projects identified as occurring in 2012 would occur primarily during the day. In addition, all impacts from the projects are short-term impacts that are associated with construction. There are no ongoing impacts once construction is finished. Consequently, the only resource topics for which cumulative impacts are considered in detail are Air Quality and Traffic/Transportation.

2013 Cumulative Scenario: There are three known construction projects on or near the Presidio that would or may overlap with the Trust’s Mountain Lake remediation work in 2013. These are the ongoing 5-year Doyle Drive replacement project and the Presidio’s Main Post update, discussed above for 2012, and another remediation project above Baker Beach (RAP 5C BB2). Their locations are shown in Figure 9.

The ongoing Doyle Drive and Main Post update projects are discussed above and are not repeated here. Baker Beach BB2 site is near the Baker Beach BB1A site that will be remediated in 2012. It is estimated that about 4,000 cy of fill material would be hauled from the BB2 site (MACTEC, 2011a), and clean material would be imported, resulting in approximately 530 truck trips. This is similar in volume to the BB1A work. This second Baker Beach project would use the same travel routes as the prior year’s BB1A project. For purposes of understanding cumulative impacts, the two projects are very similar, with one occurring in 2012 and the other in 2013.

Based on existing LOS estimates in Table 6-1 above, the cumulative impact of Project-related truck traffic in 2012 would not change the existing LOS.

b. Conflict with an applicable congestion management plan, including but not limited to level of service standards and travel demand measures, or other standards established by the country congestion management agency for designated roads or highway.

Less than significant. The level of traffic generated by the Project would be low. For the nighttime work on Highway 1, there would be up to 8 trucks per night. Hauling dewatered sediment would require about 25 trucks per day. During rush hours, when the level of service (LOS) on roads at its lowest, the Project would add about 6 heavy-duty trucks to traffic on Lombard St and Van Ness St (i.e., US 101). Truck operators would tend to avoid travel during morning and evening peak hours, or across the Golden Gate Bridge on northbound US 101. This level of travel demand would not cause the current LOS to change, would not conflict with any applicable congestion management plan, and would be less than significant.

c. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Less than significant. The Caltrans staging area would be on the shoulder of the highway. Ample warning will be provided to drivers regarding the nighttime lane closure. During the day no material or equipment would be in the roadway. During the day, equipment will be staged and protected on the shoulder. The staging area for the Project would be onsite and would not increase any hazard due to a design feature or incompatible uses. The designated truck routes are designed to minimize traffic hazards (no sharp curves or dangerous intersections). If West Pacific Ave is the truck route, it would be restricted during truck hauling. This may involve closure or, possibly, demarking the truck lane with construction fencing to separate it from the portion of the ROW remaining open to pedestrians and cyclists. Traffic control would be in place on Highway 1 when trucks are entering or exiting the site by way of the temporary ramp. If trucks are required to use the West Pacific Ave route, traffic would be controlled and signed, as necessary, along the haul route to minimize hazards.

d. Result in inadequate emergency access.

Less than significant. The proposed Project would not result in inadequate emergency access. Project equipment would be stored onsite and would not obstruct any transportation route used for emergency access vehicles. Emergency access to the Project site via either Highway 1 or West Pacific Ave would be unimpeded. The site also is readily accessible by foot from Lake St at Funston, 8th, and 9th Avenues.

e. Result in inadequate parking capacity.

Less than significant. Haul trucks would travel to the job site from remote locations and would not require parking. If necessary, trucks may park onsite within a fenced construction area. Personnel private vehicles and some equipment would require parking. These vehicles and equipment would be staged at the Project site and along West Pacific Ave or in the golf course parking lots. A limited number of contractor employees are expected to be working at the Project site and would park in the vicinity of the site. Given City street parking restrictions, it is assumed that parking would be within the construction area, along West Pacific Ave, or in the golf course parking lot. There would be adequate space on the Presidio to accommodate parked vehicles. Impacts on parking capacity would not be considered significant due to the temporary nature of the activities and the availability of adequate parking.

e. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance of safety of such facilities.

Less than significant. The Project would not significantly alter local traffic patterns in ways conflicting with adopted policies, plans, or programs that support alternative transportation. Because work areas would be temporarily closed during construction, pedestrians (hikers), birdwatchers, and bicyclists would be temporarily detoured. However, the effects are not considered significant because of the relatively short duration of the Project and the availability of alternate trails within the Presidio.

Specific References:

City and County of San Francisco Planning Department,2011. *Draft Environmental Impact Report: The 34th America's Cup and James R Herman Cruise Terminal and Northeast Wharf Plaza.* July.

City and County of San Francisco Planning Department, 1995*. Transportation: An Element of the General Plan of the City and County of San Francisco.*

EKI, 2009. *Final Remedial Action Plan for Landfills 8 and 10, PHSH Fill Site, and Four Small Arms Firing Ranges, Presidio of San Francisco, California*. February.

FHWA and SFCTA, 2008. Final Environmental Impact Statement/Report and Section 4(f) Evaluation, South Access to the Golden Gate Bridge: Doyle Drive. September.

Geosyntec, 2012. *Draft Remedial Investigation Summary Report, Barnard Avenue Protected Range, Presidio of San Francisco, California*. February.

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

MACTEC, 2011a. *Field Sampling Plan, Data Gaps Investigation, Baker Beach Disturbed Area 2, Presidio of San Francisco, California*. July.

MACTEC, 2011b. *Draft Revised Remedial Investigation Report, Baker Beach Disturbed Area 1A, Presidio of San Francisco, California*. August.

NPS and Trust, 2003. *Presidio Trails and Bikeways Master Plan and Environmental Assessment*. July.

Trust, 2002a. *Presidio Trust Management Plan, Land Use Policies for Area B of the Presidio of San Francisco.* May.

Trust, 2002b. *Presidio Trust Management Plan: Final Environmental Impact Statement*. May.

Trust, 2010. *Supplemental Environmental Impact Statement, Presidio Trust Management Plan, Main Post Update*. November.

Findings of Significance:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

17. Utilities and Service Systems

Project activities likely to create an impact:

- Highway stabilization, dredging of lake
- Sediment processing
- Expansion of electrical lines to the staging area (dewatering site) and lake.

Description of Environmental Setting:

Electric, water supply, and communications are provided by the Trust. Electrical lines would be expanded to bring power to the dewatering site and lake for operations. Caltrans would use existing electrical facilities on the highway or from the City. Gas is provided by PG&E. The Trust's Permit No. 05-0246 from the San Francisco Public Utilities Commission allows water to be tested and discharged to the sanitary sewer. Water for dust control would be obtained from an existing hydrant, a water truck, or the lake.

Analysis as to whether or not project activities would:

a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board.

No impact. The Project would have no wastewater treatment needs.

b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

No impact. The proposed activities would not require new wastewater treatment facilities. The Project would not increase or significantly change the amount of rainwater or runoff entering or leaving the Project site.

c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Less than significant. For lake remediation, temporary pipelines or other transport would be constructed from the lake to the dewatering area for transport of sediment and water. These pipelines are temporary and would be disabled at the end of the Project. Caltrans would perform work to the existing drainage system to manage, control and treat roadway runoff prior to entering the lake. The existing facilities would still be in use. Existing culverts and drainage inlets between the MacArthur Tunnel and the Mountain Lake overflow pipe would be upgraded by installing storm water treatment devices that remove pollutants and particulates. In addition, 3 manholes and 3 new inlets would be installed. Approximately 685 linear feet (LF) of 18-inch reinforced concrete drainage pipe and 475 LF of 36-inch reinforced concrete pipe would be installed underground along the highway. Approximately 100 feet of 15-inch ductile iron pipe would be installed on the West Pacific Ave Bridge. Existing culverts and drainage inlets between the MacArthur Tunnel and the Mountain Lake overflow pipe would be upgraded by installing storm water treatment devices that remove pollutants and particulates. Three existing 18-inch cross culverts would be spiral lined. In addition, 3 manholes and 3 new inlets will be installed and 2 existing inlets would be removed and replaced. Approximately 18 Storm water treatment devices would be installed in all new and existing inlets from the MacArthur Tunnel to the Mt. Lake Overflow Pipeline. Approximately 1,000 linear feet of chain link fence would be installed between the highway and lake and 1,000 LF of asphalt concrete dike 6-inches high would be installed along the shoulder between the highway and lake. This dike would prevent runoff to the lake and direct flow to the drainage inlets. These Project activities would not significantly alter or expand storm water drainage facilities. Also, erosion control measures would be used to minimize onsite runoff. Refer to Section 9.

d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed.

No impact. No new or expanded water services would be required during or following remediation. Only minor amounts of water would be used for dust control during Project implementation.

e. Result in determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the providers existing commitments.

No impact. The Project would have no wastewater treatment needs.

f. Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs.

Less than significant. Dewatered contaminated sediment would be transported off site to an appropriately permitted facility designed to manage the solid waste. Approximately 15,600 cubic yards of in situ sediment would be removed, resulting in approximately 9,850 cy of dewatered solids to be hauled away. In addition, Caltrans would have a limited amount of spoils from the column installation work. The landfills selected would have sufficient permitted capacity to accommodate the sediment and spoils.

g. Comply with federal, state, and local statutes and regulations related to solid waste.

No impact. The Project activities would be conducted in accordance with federal, State, and local statutes and regulations related to solid waste.

Specific References:

Kennedy/Jenks, 2012b. *Draft Feasibility Study/Remedial Action Plan, Mountain Lake, Presidio of San Francisco, California*. March.

Trust, 2002a. *Trust Management Plan, Land Use Policies for Area B of the Presidio of San Francisco*. May.

Trust, 2002b. *Trust Management Plan: Final Environmental Impact Statement*. May.

Findings of Significance:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ No Impact

18. Mandatory Findings of Significance

Based on evidence provided in this Initial Study, DTSC makes the following findings:

a. The Project ☐ has ☒ does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.

b. The Project ☐ has ☒ does not have impacts that are individually limited but cumulatively considerable. ("Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

c. The Project ☐ has ☒ does not have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly.

Determination of Appropriate Environmental Document:
Based on evidence provided in this Initial Study, DTSC makes the following determination:

☒ The proposed Project COULD NOT HAVE a significant effect on the environment. A **Negative Declaration** would be prepared.

☐ The proposed Project COULD HAVE a significant effect on the environment. However, there would not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **Mitigated Negative Declaration** would be prepared.

☐ The proposed Project MAY HAVE a significant effect on the environment. An **Environmental Impact Report** is required.

☐ The proposed Project MAY HAVE a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **Environmental Impact Report** is required, but it must analyze only the effects that remain to be addressed.

☐ The proposed Project COULD HAVE a significant effect on the environment. However, all potentially significant effects (a) have been analyzed adequately in an earlier Environmental Impact Report or Negative Declaration pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier Environmental Impact Report or Negative Declaration, including revisions or mitigation measures that are imposed upon the proposed project. Therefore, nothing further is required.

Certification:

I hereby certify that the statements furnished above and in the attached exhibits, present the data and information required for this initial study evaluation to the best of my ability and that the facts, statements and information presented are true and correct to the best of my knowledge and belief.

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Appendix A: Acronyms and Abbreviations

µg	microgram
AB	Assembly Bill
ACHP	Advisory Council on Historic Preservation
AMA	Archeological Monitoring Assessment
ARARs	applicable or relevant and appropriate requirements
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BAPR	Bernard Avenue Protected Range
BBDA	Baker Beach Disturbed Area
BCDC	Bay Conservation and Development Commission
BMP	best management practice
bss	below sediment surface
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH4	methane
CHP	California Highway Patrol
CO	carbon monoxide
CO_2	carbon dioxide
CO2e	carbon dioxide equivalent
COC	Chemicals of Concern
cy	cubic yard
dBA	A-weighted decibels
DTSC	Department of Toxic Substances Control
FHWA	Federal Highway Administration
FS/RAP	Feasibility Study/Remedial Action Plan
GGNRA	Golden Gate National Recreation Area
GHG	greenhouse gas
HSC	Health and Safety Code (California)
HSP	Health and Safety Plan
IS	Initial Study
LF	linear feet
Lmax	maximum instantaneous level [noise]
LOS	level of service [road intersections]

m^3	cubic meters
mi	mile
MMT	million metric tonnes
N2O	nitrous oxide
NAC	Noise Abatement Criterion
NAHC	Native American Heritage Commission
NHLD	National Historic Landmark District
NHPA	National Historic Preservation Act
NO2	nitrogen dioxide
NOx	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NR	National Register
PA	Programmatic Agreement
PCOC	Potential Chemical of Concern
PM10	particulate matter 10 microns or less in diameter
PM2.5	particulate matter less than 2.5 microns in diameter
ppm	parts per million
PT	Presidio Trust
PTMP	Presidio Trust Management Plan
RAO	Remedial action objective
ROG	reactive organic gas
ROW	right of way
SHPO	State Historic Preservation Office
SO2	sulfur dioxide
SOx	sulfur oxides
SWPPP	Storm Water Pollution Prevention Plan
THP	total petroleum hydrocarbons
TMP	Transportation Management Plan
TPHd	Total petroleum hydrocarbons as diesel
TPHmo	Total petroleum hydrocarbons as motor oil
UCL	Upper confidence limit
USFWS	US Fish and Wildlife Service
UXO	unexploded ordnance
VMP	Vegetation Management Plan
yr	year

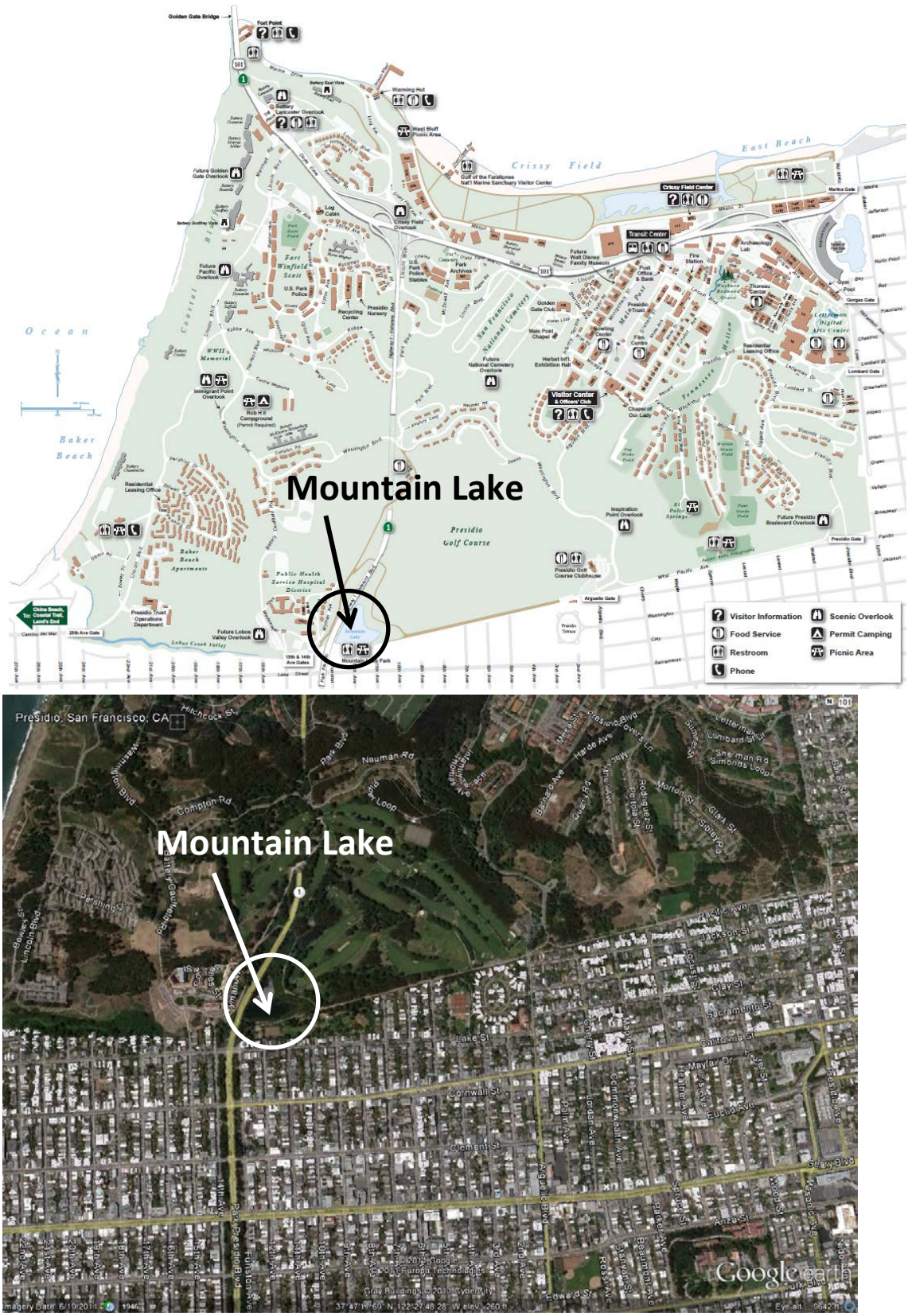


Figure 1: Project Location in the Presidio and Relative to the City

Figure 2: Adjacent Land Uses and Roads

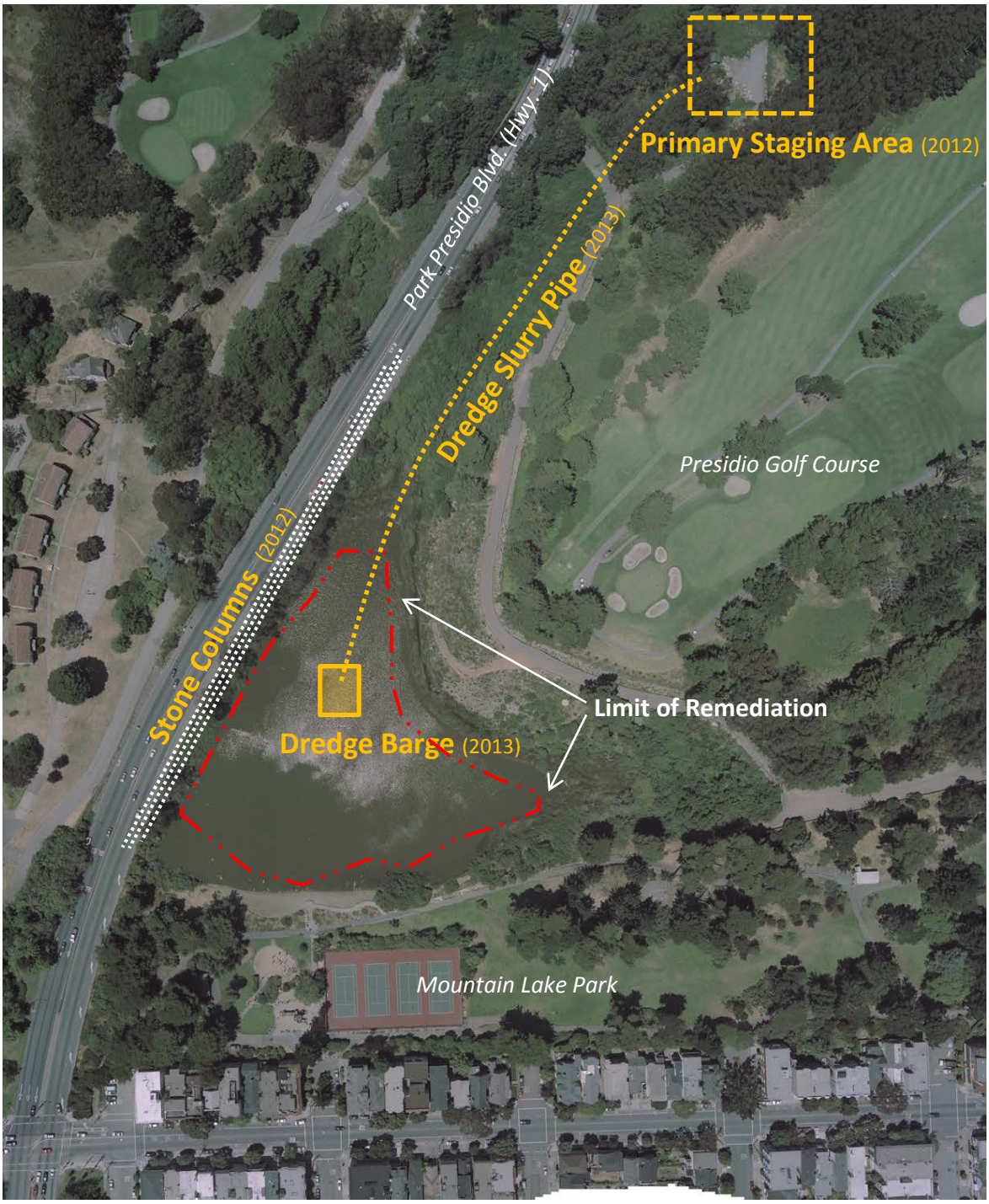


Figure 3: Primary Construction Elements – 2012 & 2013

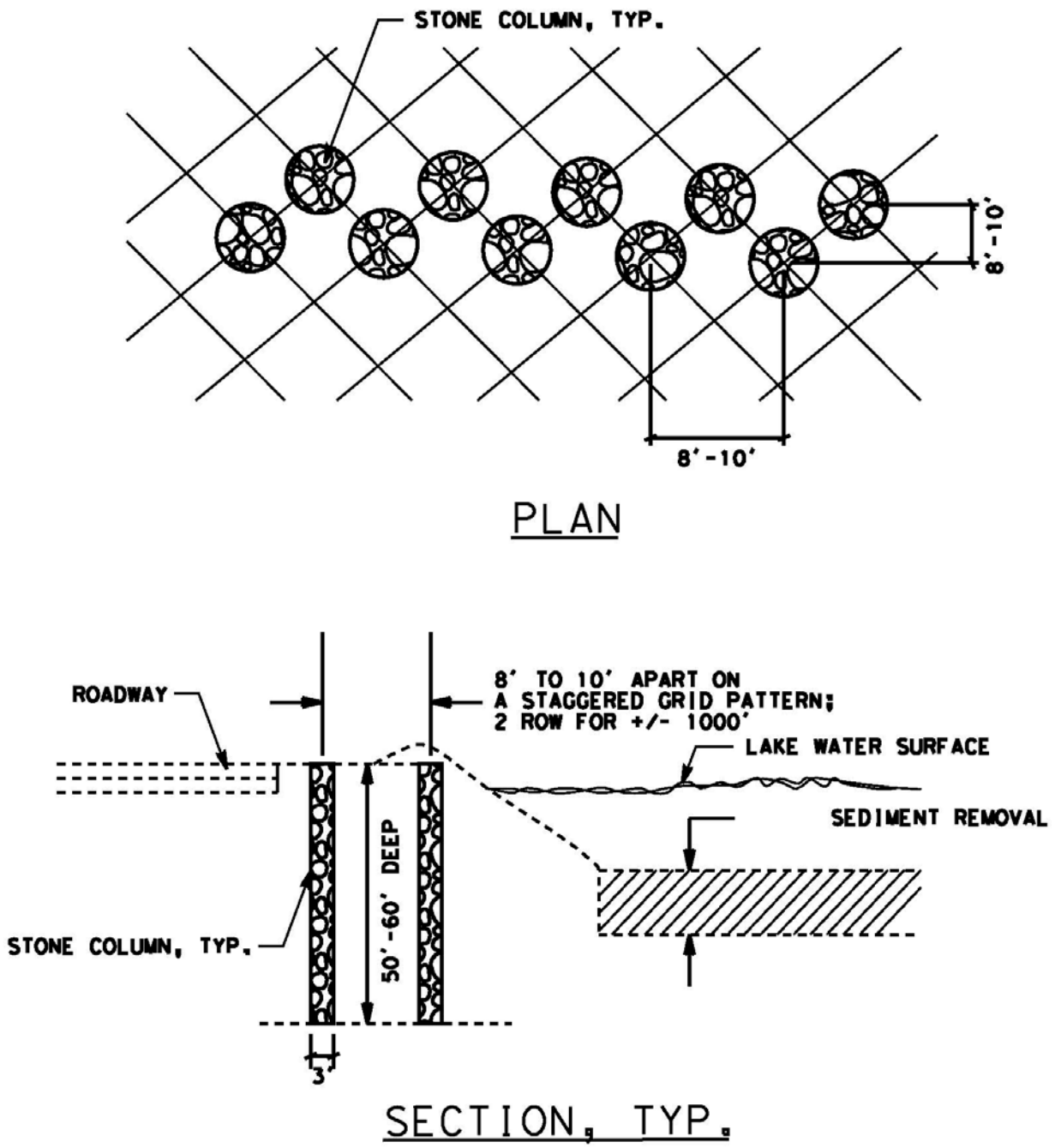
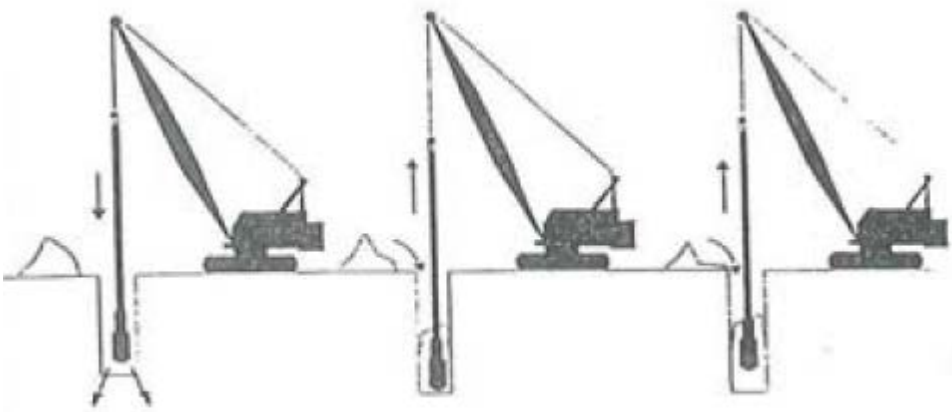


Figure 4: Illustration of Stabilization Using Stone Columns
(Note: Dimensions are illustrative only. Final dimensions and arrangement to be determined.)

Top Feed Vibro Displacement



Bottom Feed Vibro Displacement

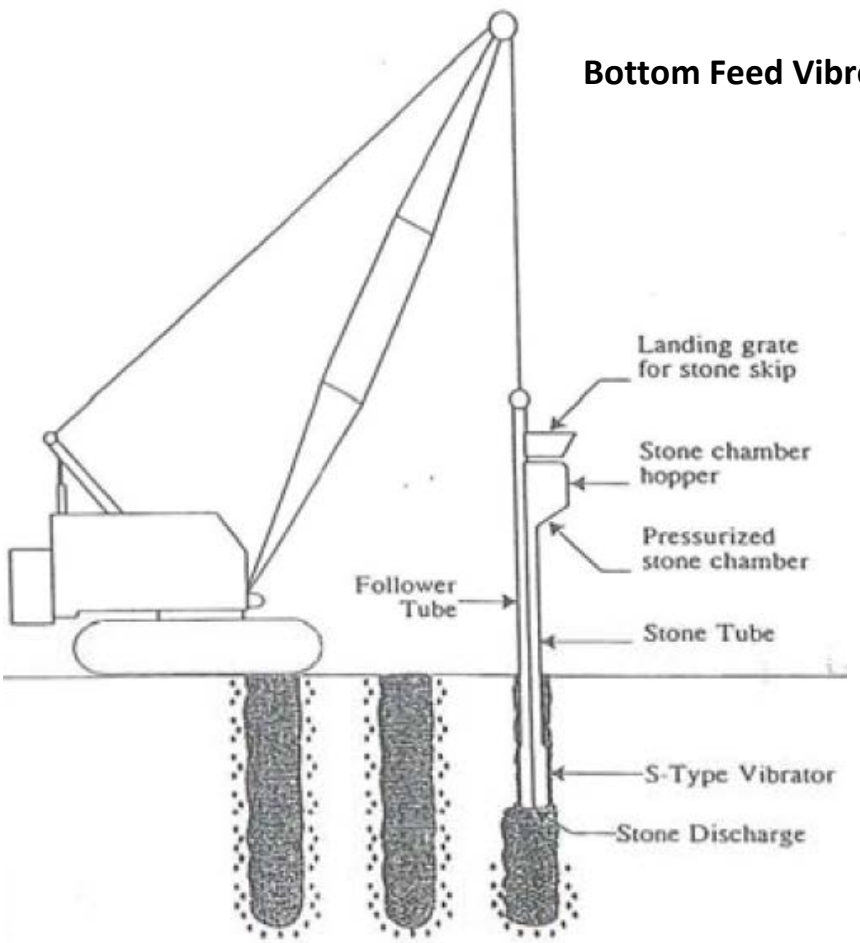


Figure 5: Vibro Soil Displacement Followed by Stone Placement in Column Construction
(See Appendix B for description of construction process)

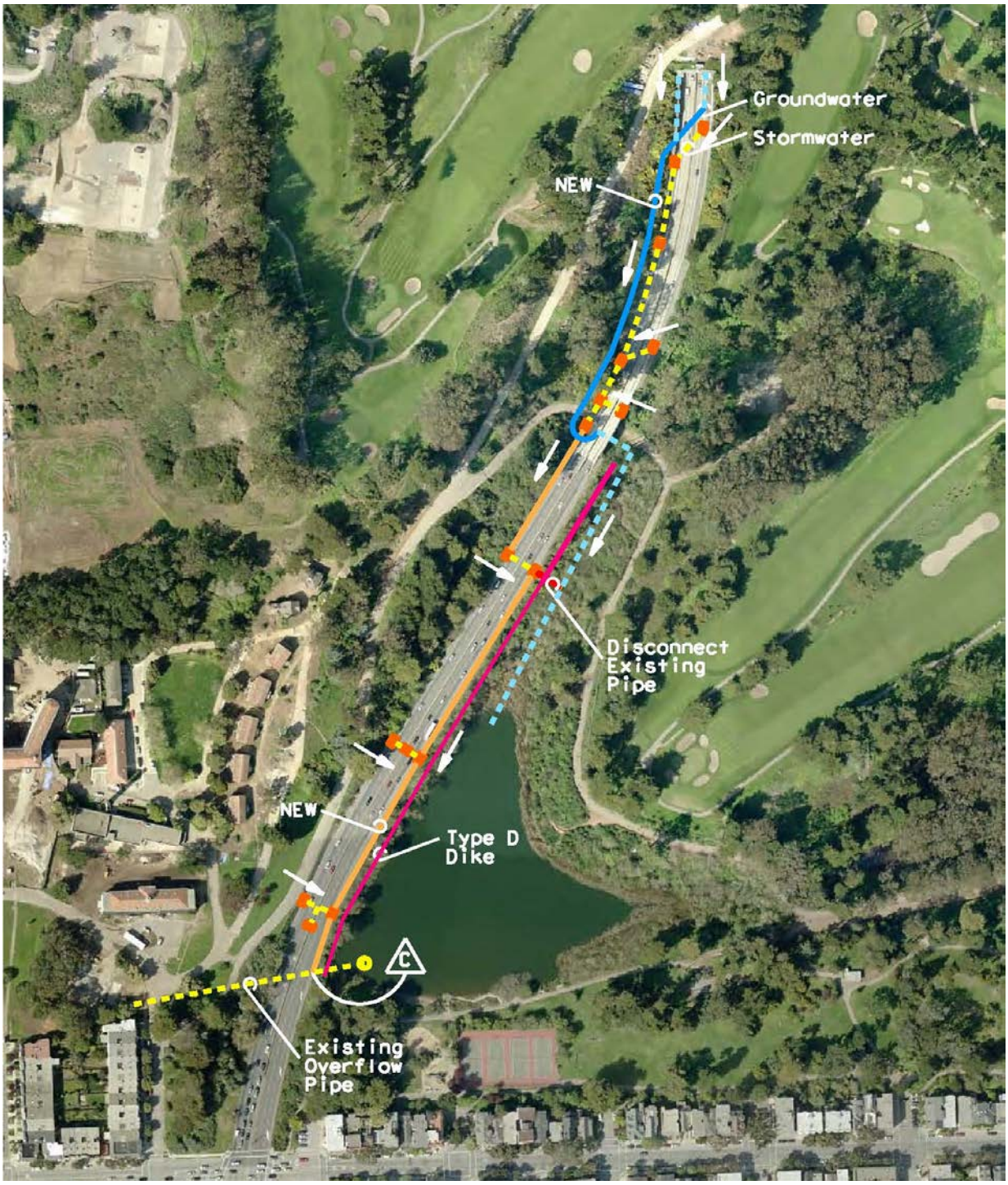


Figure 6: Highway 1 Stormwater Management Elements

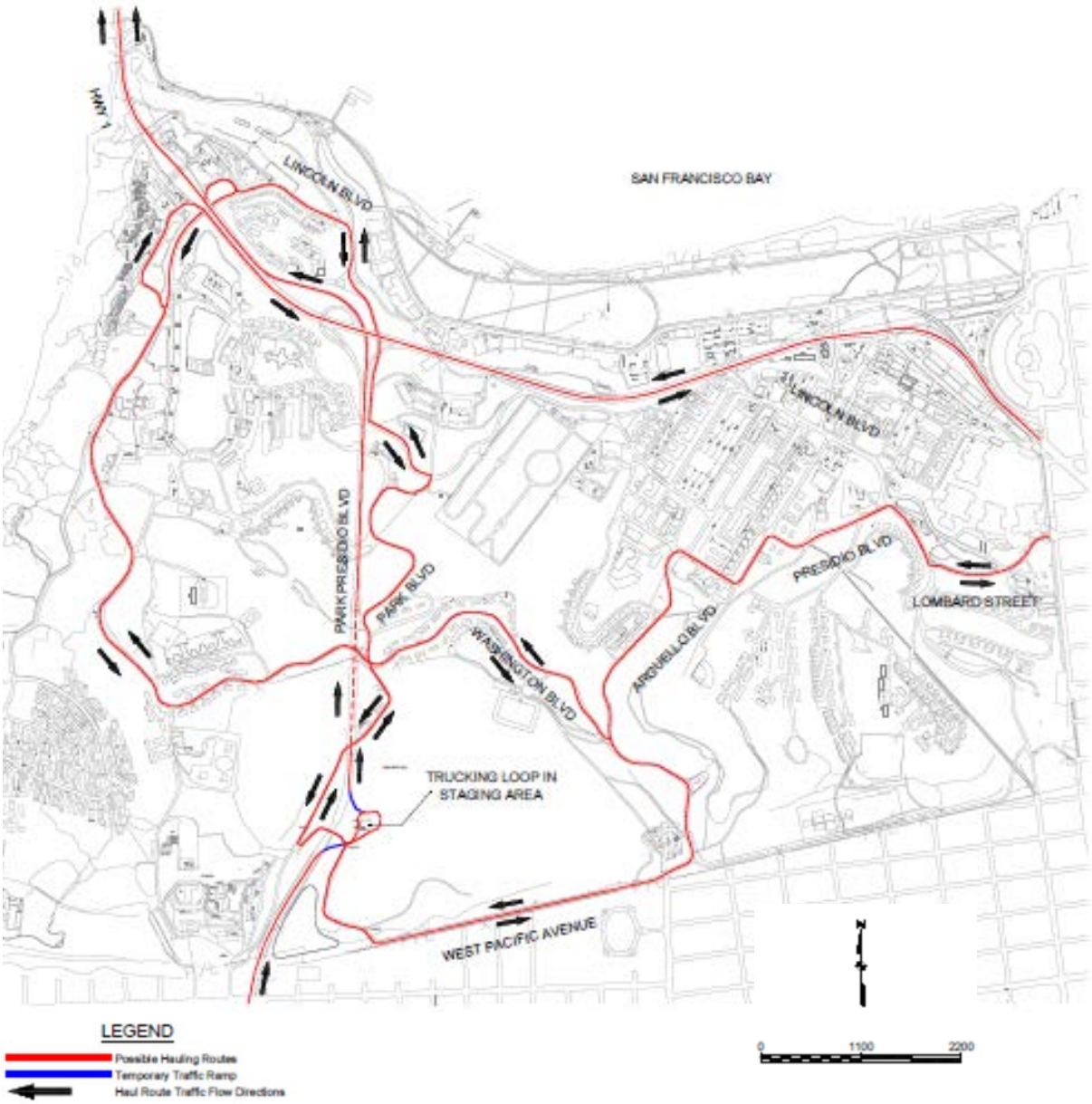


Figure 7: Possible Haul Routes within the Presidio

Figure 8: Distances Between Dewatering Site and Nearest Residences

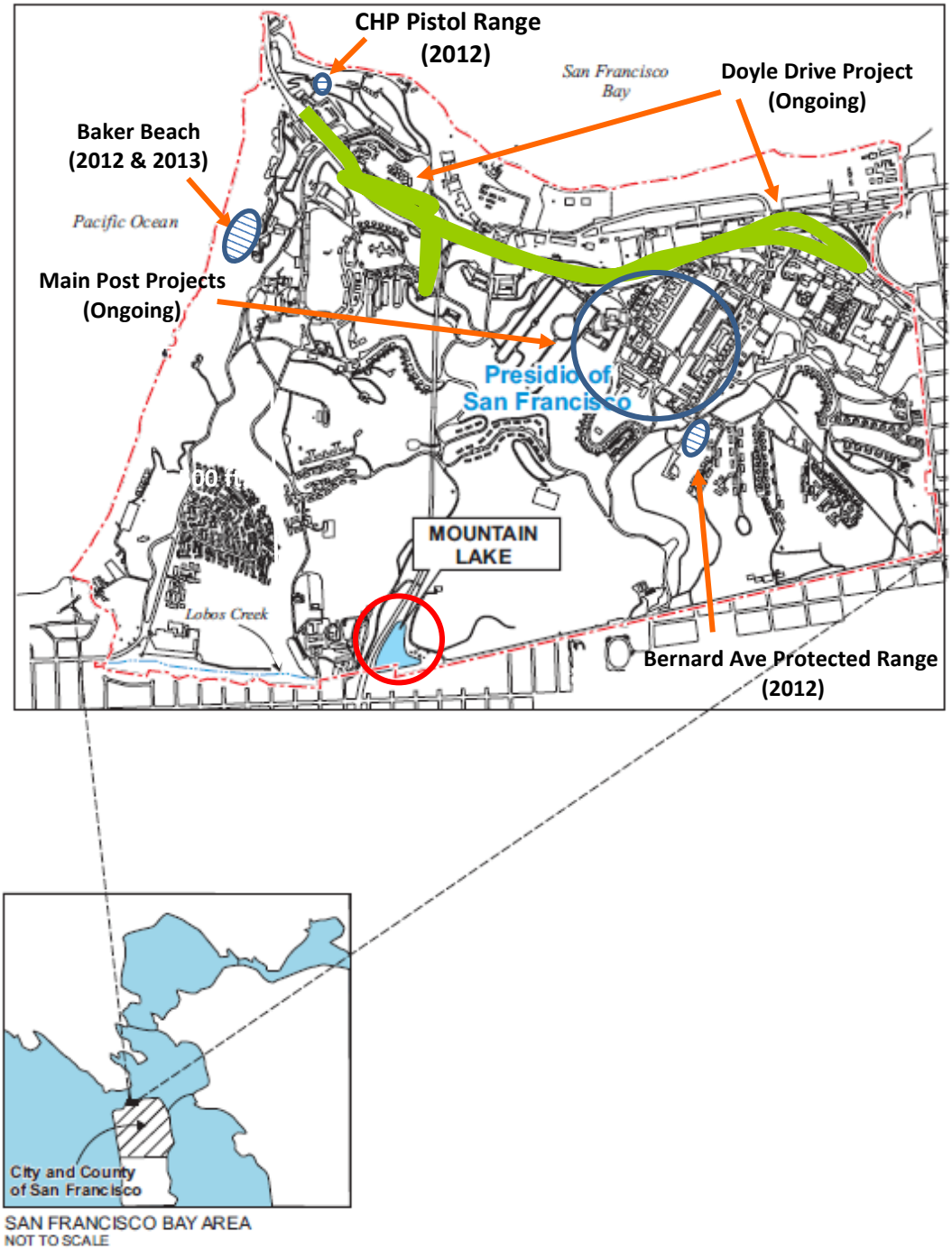


Figure 9. Locations of Projects in Presidio for Cumulative Analysis

Stone Column Installation

The Vibro Stone Column Installation Process

Vibro Stone Columns (VSCs) are installed using a high-energy vibratory poker (called a vibroflot) to penetrate the ground, displacing the soil laterally as it is advanced. This technique is called vibro-displacement. Aggregate is added to the bottom of the hole in lifts (layers that are worked before the next layer is added). The stone can be added by being pushed into the whole or by use of a hopper. The vibroflot compacts each lift with high-frequency vibration and down pressure, resulting in very stiff, high density stone columns. In some situations, the hole is augured before the vibroflot is employed.

Vibro stone columns are applicable for use in many different weak ground conditions, including soft, cohesive in-situ soils, poorly compacted fills, and loose granular soils in which seismic liquefaction is a concern. VSCs used in cohesive soils result in increased soil stiffness, reduced drainage paths, and reduction in pore water pressure. Typical design bearing pressures range from 4,000 to 6,000 pounds per square foot.

Dry Top Feed Vibro Stone Columns

In predominantly cohesive soils, a hydraulically-powered vibroflot is advanced into the ground with significant down pressure, laterally displacing the soil and creating an open hole down to the design depth. Aggregate material is dumped from the ground surface into the hole in approximately one to two foot lifts. The lifts are compacted with vibration and down pressure from the vibroflot. This is called the Dry Top Feed Method.

Dry Bottom Feed Vibro Stone Columns

When soil conditions consists of unstable, fine-grained soils such as silts and clays that may be below the water table, it may be necessary to bottom-feed the aggregate material, alleviating the possibility of hole collapse. With this technique, a rig-mounted hopper is used to carry aggregate to the bottom of the hole. As the vibroflot is raised, stone empties into the hole below the vibroflot. The stone compacts in lifts in a continuous process until the vibro stone column is complete.

Illustrations

Videos of the construction process are on the web (the sites were available 12/13/2011). For examples, see:

http://www.youtube.com/watch?v=F_kI6vQ5_gE&feature=related

http://www.youtube.com/watch?v=quQWt1Ft_kE&feature=related

http://www.youtube.com/watch?NR=1&v=5zt50aOM84A&feature=endscreen

http://www.youtube.com/watch?feature=endscreen&NR=1&v=JgY7FJRTbe4

Reference to a website is not an endorsement of a particular vendor or product shown. It is strictly to aid the reader in better understanding the process of column construction.

Lake Dredging

Hydraulic Dredging

Most hydraulic dredges have a cutting head to dislodge the contaminated sediment, which is immediately suctioned into a pipe, much like a vacuum cleaner. This slurry of diluted sediment is pumped through a flexible, floating pipe to a covered floating barge or directly to an on-land dewatering facility.

With a hydraulic dredge, the dredge discharge line (and possibly a water return line) is the only disturbance to the area. These lines can easily be run to the shore and across the land to a dewatering facility or site. If needed, the pipe can be put in a trench on the shore to allow passage over it. The hydraulic dredge, which is not much larger than a boat, is the only piece of equipment visible. This dredging method does not require disturbing the shoreline and requires one trip in to put the dredge in the water and one trip to remove the dredge when the project is completed.

Mechanical Dredging from Barge

An excavator can be mounted on a barge to give it access to the entire water body to be dredged. In the case of Mountain Lake, which is 10 feet deep at most, a barge-mounted mechanical dredge would be able to reach all areas needing dredging. Sediment excavated from the lake bottom would be deposited in a second barge, which would be hauled to the shore where the collected saturated sediment water would be pumped (or trucked) to the upland dewatering site.

Mechanical Dredging from Shore

Mechanical dredging from the shore would employ a dragline or long reach excavator. Most mechanical excavators have a reach of 40 to 50 feet, limiting the size of water body they can excavate from shore. In this type of dredging, heavy excavation equipment is hauled to the shoreline and trees and other obstructions are removed and leveled for the equipment to work safely.

Illustrations

Videos and other information on dredging processes are on the web (the sites were available 12/13/2011). The examples illustrate dredging in general and do not necessarily show the process that will be used at Mountain Lake. These examples of dredging were selected at random:

http://www.youtube.com/watch?v=tBvlsAjsaUk

http://www.lakeservices.com/LakeSevicesMovie.php

http://www.epa.gov/hudson/dredge_truth.htm

http://www.clearwater.org/news/dredging.html

http://www.youtube.com/watch?v=5NcZ-77uul4

Reference to a website is not an endorsement of a particular vendor or product shown. It is strictly to aid the reader in better understanding the process of dredging.

Appendix D: Air Quality Calculations

AIR QUALITY ATTACHMENT

Mountain Lake Project - Highway Improvements + Remediation

SUMMARY (Total Daily Emissions shown, but not all activity would overlap)

	NOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO (lb/day)	ROG (lb/day)	SOx (lb/day)	CO2 (lb/day)
Off-Road Equipment	45.95	2.65	2.43	27.56	7.10	0.06	5,301.46
On-Road Crew and Workers	7.40	0.31	0.25	10.78	1.37	0.02	1,767.43
On-Road Diesel Trucks	100.50	4.86	4.20	33.20	8.21	0.13	13,701.70
Fugitive Dust	---	201.04	44.71	---	---	---	---
Total Exhaust Only	153.85	7.82	6.89	71.53	16.69	0.21	20,770.58

SUMMARY (Total Emissions for Duration of Construction Activity)

	NOx (ton)	PM10 (ton)	PM2.5 (ton)	CO (ton)	ROG (ton)	SOx (ton)	CO2 (ton)
Off-Road Equipment	1.82	0.13	0.12	1.33	0.37	0.00	200.92
On-Road Crew and Workers	0.58	0.02	0.02	0.87	0.11	0.00	142.65
On-Road Diesel Trucks	2.51	0.12	0.10	0.83	0.20	0.00	341.74
Fugitive Dust	---	9.66	2.20	---	---	---	---
Total Exhaust Only	4.91	0.28	0.24	3.03	0.68	0.01	685.32

SUMMARY (Average Daily Emissions for Duration of Construction Activity)

200	days duration

	NOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO (lb/day)	ROG (lb/day)	SOx (lb/day)	CO2 (lb/day)
Off-Road Equipment	18.22	1.30	1.19	13.27	3.66	0.02	2,009.24
On-Road Crew and Workers	5.85	0.25	0.20	8.73	1.11	0.01	1,426.55
On-Road Diesel Trucks	25.07	1.21	1.05	8.28	2.05	0.03	3,417.41
Fugitive Dust	---	96.58	21.95	---	---	---	---
Total Exhaust Only	49.14	2.76	2.44	30.27	6.82	0.07	6,853.20

AIR QUALITY ATTACHMENT - 1091.007

: Highway Improvements + Remediation

CONSTRUCTION Mobile Source, Equipment and Vehicles

Appendix C: Air Quality Calculations

OFF-ROAD Equipment

Parameter	Units	Drill Rig	Aerial Lift	Crane	Loader	Skid Steer Loader	Generator	Dredge	Pump	Compressor
Number of Equipment Units		1	2	1	2	2	2	1	1	1
Operating sched.	(hr/day)	6	6	6	4	4	6	12	6	6
Months active (21 workdays)		3	8	4	8	8	6	1	6	6
Typical Rated Horsepower	(hp)	209	43	194	79	48	72	210	99	43
Emission Factor	(lb/hr)									
NOx		0.804245	0.164769	0.888059	0.380915	0.230497	0.457910	1.512915	0.676670	0.203729
PM10		0.032172	0.013706	0.045639	0.033519	0.017133	0.037593	0.058796	0.055793	0.019617
CO		0.567783	0.145625	0.439835	0.340930	0.219623	0.343249	0.599075	0.449379	0.212328
ROG		0.079016	0.051673	0.109217	0.090402	0.056537	0.103662	0.143218	0.122161	0.080709
SOx		0.001827	0.000221	0.000995	0.000481	0.000318	0.000559	0.001898	0.000773	0.000259
CO2		162.394612	17.190000	88.404213	39.204907	24.581148	45.497008	168.704832	64.865044	20.080252
Daily Emissions	(lb/day)									
NOx		4.83	1.98	5.33	3.05	1.84	5.49	18.15	4.06	1.22
PM10		0.19	0.16	0.27	0.27	0.14	0.45	0.71	0.33	0.12
CO		3.41	1.75	2.64	2.73	1.76	4.12	7.19	2.70	1.27
ROG		0.47	0.62	0.66	0.72	0.45	1.24	1.72	0.73	0.48
SOx		0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.00
CO2		974.37	206.28	530.43	313.64	196.65	545.96	2024.46	389.19	120.48
Total Emissions, Duration	(ton)									
NOx		0.152	0.166	0.224	0.256	0.155	0.346	0.191	0.256	0.077
PM10		0.006	0.014	0.012	0.023	0.012	0.028	0.007	0.021	0.007
CO		0.107	0.147	0.111	0.229	0.148	0.259	0.075	0.170	0.080
ROG		0.015	0.052	0.028	0.061	0.038	0.078	0.018	0.046	0.031
SOx		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO2		30.693	17.328	22.278	26.346	16.519	34.396	21.257	24.519	7.590

ON-ROAD Vehicles

Parameter	Units	Crew - Commuter	3/4 ton Pickup Trucks	Material Delivery / Removal		Material Delivery / Removal	Water Trucks	Haul Trucks, Rock	Haul Trucks, Sediment	Flatbed Trucks
Class		**Passenger**	**Delivery**	**Delivery**		**HHDT**	**HHDT**	**HHDT**	**HHDT**	**HHDT**
Miles per day	(mi/day)	50	50	50		50	10	50	100	20
Vehicles per day		12	6	2		6	1	8	25	2
Months active		8	8	6		4	8	3	2	6
Paved Miles per vehicle trip	(mi)	49.5	49.5	49.5		49.5	9.5	49.5	99.5	19.5
Total Miles per day	(mi/day)	594	297	99		297	9.5	396	2487.5	39
Total Miles, Duration	(mi)	99,792	49,896	12,474		24,948	1,596	24,948	104,475	4,914
Unpaved Miles per vehicle trip	(mi)	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5
Total Miles per day	(mi/day)	6	3	1		3	0.5	4	12.5	1
Total Miles, Duration	(mi)	1008	504	126		252	84	252	525	126
Emission Factor	(lb/mile)									
NOx		0.00078	0.01732	0.01732		0.03092	0.03092	0.03092	0.03092	0.03092
PM10		0.00009	0.00065	0.00065		0.00150	0.00150	0.00150	0.00150	0.00150
PM2.5		0.00006	0.00055	0.00055		0.00129	0.00129	0.00129	0.00129	0.00129
CO		0.00765	0.01546	0.01546		0.01022	0.01022	0.01022	0.01022	0.01022
ROG		0.00080	0.00224	0.00224		0.00253	0.00253	0.00253	0.00253	0.00253
SOx		0.00001	0.00003	0.00003		0.00004	0.00004	0.00004	0.00004	0.00004
CO2		1.10153	2.76628	2.76628		4.21591	4.21591	4.21591	4.21591	4.21591

Daily Emissions (lb/day)									
NOx	0.47	5.20	1.73		9.28	0.31	12.37	77.31	1.24
PM10	0.05	0.19	0.06		0.45	0.01	0.60	3.74	0.06
PM2.5	0.03	0.16	0.05		0.39	0.01	0.52	3.23	0.05
CO	4.59	4.64	1.55		3.06	0.10	4.09	25.54	0.41
ROG	0.48	0.67	0.22		0.76	0.03	1.01	6.32	0.10
SOx	0.01	0.01	0.00		0.01	0.00	0.02	0.10	0.00
CO2	660.92	829.89	276.63		1264.77	42.16	1686.36	10539.77	168.64
Total Emissions, Duration (ton)									
NOx	0.039	0.437	0.109		0.390	0.026	0.390	1.623	0.078
PM10	0.005	0.016	0.004		0.019	0.001	0.019	0.079	0.004
PM2.5	0.003	0.014	0.003		0.016	0.001	0.016	0.068	0.003
CO	0.386	0.390	0.097		0.129	0.009	0.129	0.536	0.026
ROG	0.040	0.056	0.014		0.032	0.002	0.032	0.133	0.006
SOx	0.001	0.001	0.000		0.001	0.000	0.001	0.002	0.000
CO2	55.517	69.710	17.428		53.120	3.541	53.120	221.335	10.624

SUMMARY OF MOBILE SOURCE EMISSIONS (Total Daily Emissions shown, but not all activity would overlap)

Sources	NOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO (lb/day)	ROG (lb/day)	SOx (lb/day)	CO2 (lb/day)
Off-Road Equipment	45.95	2.65	2.43	27.56	7.10	0.06	5,301.46
On-Road Crew and Workers	7.40	0.31	0.25	10.78	1.37	0.02	1,767.43
On-Road Diesel Trucks	100.50	4.86	4.20	33.20	8.21	0.13	13,701.70

SUMMARY OF MOBILE SOURCE EMISSIONS (Total Emissions for Duration of Construction Activity)

Sources	NOx (ton)	PM10 (ton)	PM2.5 (ton)	CO (ton)	ROG (ton)	SOx (ton)	CO2 (ton)
Off-Road Equipment	1.82	0.13	0.12	1.33	0.37	0.00	200.92
On-Road Crew and Workers	0.58	0.02	0.02	0.87	0.11	0.00	142.65
On-Road Diesel Trucks	2.51	0.12	0.10	0.83	0.20	0.00	341.74

Activity Estimates: based on Caltrans 12/15/2011 email & KennedyJenks 12/13/2011 email.

: Highway Improvements + Remediation

CONSTRUCTION Fugitive Dust Emissions

Emission Categories

1) Earthmoving

2) Road Dust Paved/Unpaved

1) Earthmoving

1.1) Material Loading/Handling

$E = (k)(0.0032)[(U/5)^{1.3}]/[(M/2)^{1.4}]$

Ref: USEPA AP-42, p. 13.2.4-4 (11/06 version)

E = lb/ton

k = Particle Size Constant (0.35 for PM10 and 0.053 for PM2.5)

U = average wind speed = 25 MPH worst day, 10 MPH avg

M = moisture content = 4.8% (standard dust control)

Approximately 5900 cy hwy rock, 4800 cy hwy drainage, 4000 cy hwy access, 9900 cy dewatered solids.

Daily max (dewatered solids) = 25 truck/day x 18 cy/truck x 1 ton/cy x 2 drops = 900 tons

Duration (aggregate, spoils, other) = 24000 cy x 1.4 ton/cy x 2 drops = 67200 tons

daily rate	900	tons of material loading/handling
duration	67,200	tons of material loading/handling

Emission Factors and Emissions

Emission Factor (lb/ton)

PM10 Daily	PM2.5 Daily
0.00287	0.00044

PM10 Annual	PM2.5 Annual
0.00081	0.00012

Emissions (lb/day)

Material Handling	PM10	PM2.5
daily rate	2.59	0.39

Emissions (ton)

Material Handling	PM10	PM2.5
duration	0.109	0.016

CONSTRUCTION Fugitive Dust Emissions

2) Road Dust

2.1) Paved Road Dust

$E = [k \times (sL/2)^{0.65} \times (W/3)^{1.5} - C] \times (1-P/4N)$

Ref: USEPA AP-42 Section 13.2.1, p. 6 (11/06 version)

k = Constant (0.016 for PM10 and 0.0040 for PM2.5)

sL = Silt Loading (assumed to be 0.1 g/m2 for high ADT of Table 13.2.1-3 average for all traffic)

W = Average weight of vehicles in tons (calculated below)

C = Correction for exhaust, break wear, tire wear (0.00047 lb/VMT for PM10, 0.00036 lb/VMT for PM2.5)

No correction for number of wet days due to assumption of working in dry season

Average Vehicle Weight Calculation

Assumptions

Passenger Vehicles = 2 tons average

Midsize "Delivery" Vehicles = 8 ton average

Heavy-Heavy Duty Trucks = 30 tons average (loaded 40 tons, unloaded 20 tons)

(VMT/day)

594	Passenger Vehicles
396	Delivery/Work Vehicles
3229	Heavy-Heavy Duty Vehicles
4219	Daily Paved VMT

Daily Avg Weight = 24.0 ton/veh

Duration Paved (VMT)	Passenger Vehicles	Delivery/Work Vehicles	Heavy-Heavy Duty Vehicles	Total Paved VMT	Duration Avg Weight (ton/veh)
duration	99,792	62,370	160,881	323,043	17.1

Emission Factor (lb/VMT)

PM10 Daily	PM2.5 Daily
0.03657	0.00890

PM10 Annual	PM2.5 Annual
0.0483	0.0118

Emissions (lb/day)

Paved Roads	PM10	PM2.5
daily rate	154.30	37.55

Emissions (ton)

Paved Roads	PM10	PM2.5
duration	7.799	1.911

CONSTRUCTION Fugitive Dust Emissions

2.2) Unpaved Road Dust

$E = (k)*[(s/12)^{0.9}][(W/3)^{0.45}]*[(365-P)/365]$

Ref: USEPA AP-42 Section 13.2.2, p. 4-5, 7 (11/06 version)

k = constant = 1.5 lb/VMT for PM10 and 0.23 lb/VMT for PM2.5

s = Silt Content (assumed to be 16% - SCAQMD Handbook for Farm Roads)

W = avg. vehicle weight = calculated below

No correction for number of wet days due to assumption of working in dry season

Average Vehicle Weight Calculation

Assumptions

Personal/Professionals/inspection Vehicles = 2 tons average

Midsize "Delivery" Vehicles = 8 ton average

Heavy-Heavy Duty Trucks = 30 tons average (loaded 40 tons, unloaded 20 tons)

Worst Case Day VMT

6	Passenger Vehicles
4	Delivery/Work Vehicles
21	Heavy-Heavy Duty Vehicles
31	Daily Unpaved VMT

Daily Avg Weight = 21.8 ton/veh

Duration Paved (VMT)	Passenger Vehicles	Delivery/Work Vehicles	Heavy-Heavy Duty Vehicles	Total Unpaved VMT	Duration Avg Weight (ton/veh)
duration	1,008	630	1,239	2,877	15.4

Emission Factor (lb/VMT)

PM10 Daily	PM2.5 Daily
4.75	0.73

PM10 Annual	PM2.5 Annual
4.05	0.62

Emissions (lb/day)

Unpaved Roads	PM10	PM2.5
daily rate	147.18	22.57

Emissions (ton)

Unpaved Roads	PM10	PM2.5
duration	5.831	0.894

Controlled Emissions

standard dust control
70%

Emissions (lb/day)

Unpaved Roads	PM10	PM2.5
daily rate	44.15	6.77

Emissions (ton)

Unpaved Roads	PM10	PM2.5
duration	1.749	0.268

CONSTRUCTION Fugitive Dust Emissions

SUMMARY OF FUGITIVE DUST EMISSIONS (Total Daily Emissions shown, but not all activity would overlap)

Emissions (lb/day)

	PM10	PM2.5
Material Handling	2.59	0.39
Paved Roads	154.30	37.55
Unpaved Roads	44.15	6.77
daily rate	201.04	44.71

SUMMARY OF FUGITIVE DUST EMISSIONS (Total Emissions for Duration of Construction Activity)

Emissions (ton)

	PM10	PM2.5
Material Handling	0.11	0.02
Paved Roads	7.80	1.91
Unpaved Roads	1.75	0.27
duration	9.66	2.20

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Passenger Vehicles & Delivery Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)

Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:

Passenger Vehicles (<8500 pounds) & Delivery Trucks (>8500 pounds)

Scenario Year: **2011**

All model years in the range 1967 to 2011

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00826276	CO	0.01693242
NOx	0.00084460	NOx	0.01893366
ROG	0.00085233	ROG	0.00241868
SOx	0.00001077	SOx	0.00002728
PM10	0.00008879	PM10	0.00070097
PM2.5	0.00005653	PM2.5	0.00059682
CO2	1.10235154	CO2	2.75180822
CH4	0.00007678	CH4	0.00011655

Scenario Year: **2012**

All model years in the range 1968 to 2012

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00765475	CO	0.01545741
NOx	0.00077583	NOx	0.01732423
ROG	0.00079628	ROG	0.00223776
SOx	0.00001073	SOx	0.00002667
PM10	0.00008979	PM10	0.00064975
PM2.5	0.00005750	PM2.5	0.00054954
CO2	1.10152540	CO2	2.76628414
CH4	0.00007169	CH4	0.00010668

Scenario Year: **2013**

All model years in the range 1969 to 2013

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00709228	CO	0.01407778
NOx	0.00071158	NOx	0.01577311
ROG	0.00074567	ROG	0.00206295
SOx	0.00001072	SOx	0.00002682
PM10	0.00009067	PM10	0.00059956
PM2.5	0.00005834	PM2.5	0.00050174
CO2	1.10087435	CO2	2.78163459
CH4	0.00006707	CH4	0.00009703

Scenario Year: **2014**

All model years in the range 1970 to 2014

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00660353	CO	0.01284321
NOx	0.00065484	NOx	0.01425162
ROG	0.00070227	ROG	0.00189649
SOx	0.00001069	SOx	0.00002754
PM10	0.00009185	PM10	0.00054929
PM2.5	0.00005939	PM2.5	0.00045519
CO2	1.10257205	CO2	2.79845465
CH4	0.00006312	CH4	0.00008798

Scenario Year: **2015**

All model years in the range 1971 to 2015

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00614108	CO	0.01169445
NOx	0.00060188	NOx	0.01285026
ROG	0.00066355	ROG	0.00173890
SOx	0.00001070	SOx	0.00002741
PM10	0.00009259	PM10	0.00050307
PM2.5	0.00006015	PM2.5	0.00041268
CO2	1.10192837	CO2	2.81247685
CH4	0.00005923	CH4	0.00008076

Scenario Year: **2016**

All model years in the range 1972 to 2016

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00575800	CO	0.01080542
NOx	0.00055658	NOx	0.01172881
ROG	0.00063254	ROG	0.00161521
SOx	0.00001071	SOx	0.00002767
PM10	0.00009392	PM10	0.00046606
PM2.5	0.00006131	PM2.5	0.00037868
CO2	1.10677664	CO2	2.83134285
CH4	0.00005623	CH4	0.00007355

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)

Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:

Heavy-Heavy-Duty Diesel Trucks (33,001 to 60,000 pounds)

Scenario Year: **2011**

All model years in the range 1967 to 2011

(pounds/mile)	
CO	0.01112463
NOx	0.03455809
ROG	0.00279543
SOx	0.00003972
PM10	0.00166087
PM2.5	0.00144489
CO2	4.22045680
CH4	0.00012910

(pounds/mile)	
PM10	0.00151936
PM2.5	0.00139772

Scenario Year: **2012**

All model years in the range 1968 to 2012

(pounds/mile)	
CO	0.01021519
NOx	0.03092379
ROG	0.00252764
SOx	0.00004042
PM10	0.00149566
PM2.5	0.00129354
CO2	4.21590774
CH4	0.00011651

(pounds/mile)	
PM10	0.00135537
PM2.5	0.00124837

Scenario Year: **2013**

All model years in the range 1969 to 2013

(pounds/mile)	
CO	0.00931790
NOx	0.02742935
ROG	0.00226308
SOx	0.00004086
PM10	0.00133697
PM2.5	0.00114629
CO2	4.21518556
CH4	0.00010441

(pounds/mile)	
PM10	0.00119623
PM2.5	0.00109863

Scenario Year: **2014**

All model years in the range 1970 to 2014

(pounds/mile)	
CO	0.00846435
NOx	0.02418049
ROG	0.00201594
SOx	0.00004092
PM10	0.00118458
PM2.5	0.00100582
CO2	4.21279345
CH4	0.00009261

(pounds/mile)	
PM10	0.00104243
PM2.5	0.00096059

Scenario Year: **2015**

All model years in the range 1971 to 2015

(pounds/mile)	
CO	0.00766891
NOx	0.02122678
ROG	0.00178608
SOx	0.00004082
PM10	0.00104715
PM2.5	0.00087977
CO2	4.20902225
CH4	0.00008369

(pounds/mile)	
PM10	0.00090631
PM2.5	0.00083282

Scenario Year: **2016**

All model years in the range 1972 to 2016

(pounds/mile)	
CO	0.00704604
NOx	0.01887374
ROG	0.00161035
SOx	0.00003952
PM10	0.00094448
PM2.5	0.00078443
CO2	4.21063031
CH4	0.00007508

(pounds/mile)	
PM10	0.00080419
PM2.5	0.00073898

SCAB Fleet Average Emission Factors (Diesel)

2012

Air Basin	SC

Equipment	MaxHP	ROG (lb/hr)	CO (lb/hr)	NOX (lb/hr)	SOX (lb/hr)	PM (lb/hr)	CO2 (lb/hr)	CH4 (lb/hr)
Aerial Lifts	15	0.0102	0.0528	0.0642	0.0001	0.0030	8.7	0.0009
	25	0.0175	0.0517	0.0957	0.0001	0.0055	11.0	0.0016
	50	0.0650	0.1822	0.1916	0.0003	0.0169	19.6	0.0059
	120	0.0607	0.2451	0.4012	0.0004	0.0324	38.1	0.0055
	500	0.1276	0.4941	1.6553	0.0021	0.0491	213	0.0115
	750	0.2379	0.8930	3.0795	0.0039	0.0903	385	0.0215
Aerial Lifts Composite		0.0576	0.1976	0.3249	0.0004	0.0219	34.7	0.0052
Air Compressors	15	0.0129	0.0494	0.0768	0.0001	0.0052	7.2	0.0012
	25	0.0286	0.0779	0.1337	0.0002	0.0087	14.4	0.0026
	50	0.1010	0.2646	0.2310	0.0003	0.0239	22.3	0.0091
	120	0.0891	0.3287	0.5333	0.0006	0.0492	47.0	0.0080
	175	0.1135	0.5074	0.8954	0.0010	0.0512	88.5	0.0102
	250	0.1066	0.3052	1.2194	0.0015	0.0379	131	0.0096
	500	0.1709	0.5726	1.9077	0.0023	0.0623	232	0.0154
	750	0.2681	0.8849	3.0371	0.0036	0.0980	358	0.0242
	1000	0.4533	1.5617	5.4098	0.0049	0.1589	486	0.0409
Air Compressors Composite		0.0984	0.3445	0.6494	0.0007	0.0469	63.6	0.0089
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3	0.0011
	25	0.0194	0.0658	0.1233	0.0002	0.0054	16.0	0.0017
	50	0.0351	0.2335	0.2768	0.0004	0.0149	31.0	0.0032
	120	0.0514	0.4724	0.5026	0.0009	0.0328	77.1	0.0046
	175	0.0750	0.7538	0.7479	0.0016	0.0366	141	0.0068
	250	0.0838	0.3435	0.8722	0.0021	0.0268	188	0.0076
	500	0.1354	0.5526	1.3152	0.0031	0.0437	311	0.0122
	750	0.2685	1.0916	2.6320	0.0062	0.0865	615	0.0242
	1000	0.4491	1.6773	6.6123	0.0093	0.1699	928	0.0405
Bore/Drill Rigs Composite		0.0854	0.5068	0.9013	0.0017	0.0367	165	0.0077
Cement and Morta	15	0.0075	0.0386	0.0475	0.0001	0.0023	6.3	0.0007
	25	0.0293	0.0852	0.1548	0.0002	0.0091	17.6	0.0026
Cement and Mortar Mixers Compo		0.0093	0.0425	0.0564	0.0001	0.0029	7.2	0.0008
Concrete/Industria	25	0.0199	0.0678	0.1261	0.0002	0.0050	16.5	0.0018
	50	0.1047	0.3015	0.2972	0.0004	0.0268	30.2	0.0094
	120	0.1155	0.4880	0.7625	0.0009	0.0639	74.1	0.0104
	175	0.1685	0.8723	1.4507	0.0018	0.0767	160	0.0152
Concrete/Industrial Saws Compos		0.1090	0.4148	0.5910	0.0007	0.0491	58.5	0.0098
Cranes	50	0.1101	0.2979	0.2478	0.0003	0.0258	23.2	0.0099
	120	0.0982	0.3650	0.5844	0.0006	0.0533	50.1	0.0089
	175	0.1089	0.4838	0.8259	0.0009	0.0479	80.3	0.0098
	250	0.1103	0.3103	1.0712	0.0013	0.0388	112	0.0100
	500	0.1635	0.5691	1.5327	0.0018	0.0571	180	0.0148
	750	0.2767	0.9554	2.6486	0.0030	0.0974	303	0.0250
	9999	0.9905	3.5715	10.9484	0.0098	0.3384	971	0.0894
Cranes Composite		0.1425	0.4946	1.2753	0.0014	0.0553	129	0.0129
Crawler Tractors	50	0.1262	0.3333	0.2713	0.0003	0.0289	24.9	0.0114
	120	0.1374	0.4906	0.8120	0.0008	0.0729	65.8	0.0124
	175	0.1758	0.7491	1.3245	0.0014	0.0765	121	0.0159
	250	0.1854	0.5225	1.7044	0.0019	0.0667	166	0.0167
	500	0.2659	1.0217	2.3914	0.0025	0.0942	259	0.0240
	750	0.4784	1.8248	4.3817	0.0047	0.1705	465	0.0432
	1000	0.7229	2.8959	7.7626	0.0066	0.2503	658	0.0652
Crawler Tractors Composite		0.1671	0.6051	1.2309	0.0013	0.0752	114	0.0151
Crushing/Proc. Eq	50	0.1927	0.5215	0.4545	0.0006	0.0462	44.0	0.0174
	120	0.1525	0.5829	0.9172	0.0010	0.0851	83.1	0.0138
	175	0.2088	0.9654	1.6343	0.0019	0.0946	167	0.0188
	250	0.1953	0.5592	2.1896	0.0028	0.0682	245	0.0176
	500	0.2733	0.8961	2.9457	0.0037	0.0972	374	0.0247
	750	0.4361	1.3892	4.8387	0.0059	0.1560	589	0.0394
	9999	1.2112	4.0327	14.2648	0.0131	0.4203	1,308	0.1093
Crushing/Proc. Equipment Compo		0.1872	0.6911	1.2633	0.0015	0.0819	132	0.0169

Dumpers/Tenders	25	0.0100	0.0324	0.0614	0.0001	0.0031	7.6	0.0009
Dumpers/Tenders Composite		0.0100	0.0324	0.0614	0.0001	0.0031	7.6	0.0009
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0048	16.4	0.0018
	50	0.0912	0.2933	0.2568	0.0003	0.0237	25.0	0.0082
	120	0.1183	0.5220	0.7300	0.0009	0.0657	73.6	0.0107
	175	0.1288	0.6678	0.9613	0.0013	0.0569	112	0.0116
	250	0.1301	0.3630	1.2438	0.0018	0.0415	159	0.0117
	500	0.1805	0.5493	1.6112	0.0023	0.0574	234	0.0163
	750	0.3013	0.9096	2.7605	0.0039	0.0969	387	0.0272
Excavators Composite		0.1300	0.5401	0.9817	0.0013	0.0536	120	0.0117
Forklifts	50	0.0514	0.1682	0.1488	0.0002	0.0136	14.7	0.0046
	120	0.0489	0.2195	0.3017	0.0004	0.0277	31.2	0.0044
	175	0.0624	0.3304	0.4664	0.0006	0.0278	56.1	0.0056
	250	0.0595	0.1638	0.5872	0.0009	0.0187	77.1	0.0054
	500	0.0806	0.2241	0.7257	0.0011	0.0252	111	0.0073
Forklifts Composite		0.0585	0.2257	0.4330	0.0006	0.0231	54.4	0.0053
Generator Sets	15	0.0157	0.0698	0.1063	0.0002	0.0061	10.2	0.0014
	25	0.0276	0.0951	0.1632	0.0002	0.0096	17.6	0.0025
	50	0.0959	0.2734	0.2966	0.0004	0.0255	30.6	0.0087
	120	0.1206	0.4956	0.8099	0.0009	0.0640	77.9	0.0109
	175	0.1460	0.7413	1.3131	0.0016	0.0644	142	0.0132
	250	0.1372	0.4502	1.8047	0.0024	0.0508	213	0.0124
	500	0.1952	0.7617	2.5896	0.0033	0.0756	337	0.0176
	750	0.3257	1.2296	4.3019	0.0055	0.1241	544	0.0294
	9999	0.8673	3.0642	10.8871	0.0105	0.3104	1,049	0.0783
Generator Sets Composite		0.0832	0.3121	0.5779	0.0007	0.0351	61.0	0.0075
Graders	50	0.1182	0.3365	0.2882	0.0004	0.0286	27.5	0.0107
	120	0.1348	0.5355	0.8223	0.0009	0.0740	75.0	0.0122
	175	0.1554	0.7363	1.1931	0.0014	0.0688	124	0.0140
	250	0.1575	0.4508	1.5344	0.0019	0.0547	172	0.0142
	500	0.1947	0.6639	1.8193	0.0023	0.0671	229	0.0176
	750	0.4147	1.4022	3.9602	0.0049	0.1439	486	0.0374
Graders Composite		0.1533	0.6129	1.2503	0.0015	0.0649	133	0.0138
Off-Highway Tract	120	0.2224	0.7269	1.2964	0.0011	0.1143	93.7	0.0201
	175	0.2135	0.8404	1.6085	0.0015	0.0923	130	0.0193
	250	0.1718	0.4896	1.5282	0.0015	0.0644	130	0.0155
	750	0.6814	3.0883	6.1417	0.0057	0.2515	568	0.0615
	1000	1.0246	4.8137	10.5080	0.0082	0.3620	814	0.0924
Off-Highway Tractors Composite		0.2170	0.7878	1.7969	0.0017	0.0871	151	0.0196
Off-Highway Truck	175	0.1533	0.7593	1.1072	0.0014	0.0666	125	0.0138
	250	0.1469	0.3944	1.3513	0.0019	0.0461	167	0.0133
	500	0.2263	0.6661	1.9463	0.0027	0.0705	272	0.0204
	750	0.3695	1.0792	3.2612	0.0044	0.1164	442	0.0333
	1000	0.5790	1.7854	6.4025	0.0063	0.1933	625	0.0522
Off-Highway Trucks Composite		0.2241	0.6635	2.0158	0.0027	0.0715	260	0.0202
Other Constructior	15	0.0118	0.0617	0.0737	0.0002	0.0028	10.1	0.0011
	25	0.0160	0.0544	0.1019	0.0002	0.0044	13.2	0.0014
	50	0.0842	0.2740	0.2707	0.0004	0.0228	28.0	0.0076
	120	0.1104	0.5320	0.7540	0.0009	0.0633	80.9	0.0100
	175	0.1008	0.5880	0.8599	0.0012	0.0467	107	0.0091
	500	0.1517	0.5426	1.6573	0.0025	0.0545	254	0.0137
Other Construction Equipment Co		0.0925	0.3847	0.8599	0.0013	0.0366	123	0.0083
Other General Indu	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4	0.0006
	25	0.0185	0.0632	0.1170	0.0002	0.0045	15.3	0.0017
	50	0.1085	0.2856	0.2332	0.0003	0.0253	21.7	0.0098
	120	0.1274	0.4542	0.7277	0.0007	0.0703	62.0	0.0115
	175	0.1349	0.5757	1.0001	0.0011	0.0599	95.9	0.0122
	250	0.1235	0.3281	1.2983	0.0015	0.0417	136	0.0111
	500	0.2232	0.6772	2.2367	0.0026	0.0758	265	0.0201
	750	0.3707	1.1162	3.8016	0.0044	0.1273	437	0.0334
	1000	0.5621	1.8453	6.4018	0.0056	0.1947	560	0.0507
Other General Industrial Equipmer		0.1635	0.5362	1.4520	0.0016	0.0632	152	0.0148
Other Material Har	50	0.1506	0.3950	0.3243	0.0004	0.0352	30.3	0.0136
	120	0.1239	0.4423	0.7103	0.0007	0.0684	60.7	0.0112
	175	0.1703	0.7292	1.2706	0.0014	0.0759	122	0.0154
	250	0.1305	0.3496	1.3863	0.0016	0.0443	145	0.0118
	500	0.1590	0.4876	1.6124	0.0019	0.0545	192	0.0143
	9999	0.7467	2.4395	8.4619	0.0073	0.2565	741	0.0674

Other Material Handling Equipmer		0.1566	0.5108	1.4125	0.0015	0.0613	141	0.0141
Pavers	25	0.0255	0.0811	0.1531	0.0002	0.0080	18.7	0.0023
	50	0.1451	0.3680	0.3038	0.0004	0.0327	28.0	0.0131
	120	0.1467	0.5107	0.8788	0.0008	0.0776	69.2	0.0132
	175	0.1864	0.7833	1.4495	0.0014	0.0819	128	0.0168
	250	0.2182	0.6365	2.0698	0.0022	0.0818	194	0.0197
	500	0.2383	0.9957	2.2418	0.0023	0.0883	233	0.0215
Pavers Composite		0.1596	0.5445	0.8980	0.0009	0.0642	77.9	0.0144
Paving Equipment	25	0.0153	0.0520	0.0974	0.0002	0.0042	12.6	0.0014
	50	0.1239	0.3124	0.2591	0.0003	0.0279	23.9	0.0112
	120	0.1150	0.3997	0.6897	0.0006	0.0610	54.5	0.0104
	175	0.1455	0.6114	1.1384	0.0011	0.0640	101	0.0131
	250	0.1349	0.3946	1.2976	0.0014	0.0507	122	0.0122
Paving Equipment Composite		0.1204	0.4365	0.8114	0.0008	0.0570	68.9	0.0109
Plate Compactors	15	0.0050	0.0263	0.0314	0.0001	0.0013	4.3	0.0005
Plate Compactors Composite		0.0050	0.0263	0.0314	0.0001	0.0013	4.3	0.0005
Pressure Washers	15	0.0075	0.0334	0.0509	0.0001	0.0029	4.9	0.0007
	25	0.0112	0.0385	0.0662	0.0001	0.0039	7.1	0.0010
	50	0.0349	0.1074	0.1339	0.0002	0.0102	14.3	0.0032
	120	0.0332	0.1458	0.2385	0.0003	0.0172	24.1	0.0030
Pressure Washers Composite		0.0173	0.0635	0.0921	0.0001	0.0063	9.4	0.0016
Pumps	15	0.0133	0.0508	0.0790	0.0001	0.0054	7.4	0.0012
	25	0.0386	0.1051	0.1803	0.0002	0.0117	19.5	0.0035
	50	0.1155	0.3229	0.3362	0.0004	0.0299	34.3	0.0104
	120	0.1250	0.5036	0.8226	0.0009	0.0669	77.9	0.0113
	175	0.1498	0.7431	1.3164	0.0016	0.0664	140	0.0135
	250	0.1357	0.4345	1.7375	0.0023	0.0501	201	0.0122
	500	0.2089	0.8032	2.6861	0.0034	0.0803	345	0.0188
	750	0.3557	1.3279	4.5700	0.0057	0.1350	571	0.0321
	9999	1.1456	4.0641	14.2305	0.0136	0.4081	1,355	0.1034
Pumps Composite		0.0813	0.2983	0.4999	0.0006	0.0351	49.6	0.0073
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3	0.0007
	25	0.0162	0.0549	0.1029	0.0002	0.0045	13.3	0.0015
	50	0.1105	0.2994	0.2677	0.0003	0.0263	26.0	0.0100
	120	0.1054	0.4098	0.6619	0.0007	0.0574	59.0	0.0095
	175	0.1320	0.6220	1.0725	0.0012	0.0591	108	0.0119
	250	0.1347	0.4083	1.4103	0.0017	0.0498	153	0.0122
	500	0.1755	0.6752	1.8093	0.0022	0.0652	219	0.0158
Rollers Composite		0.1038	0.4107	0.6936	0.0008	0.0488	67.1	0.0094
Rough Terrain For	50	0.1315	0.3910	0.3455	0.0004	0.0330	33.9	0.0119
	120	0.1038	0.4364	0.6425	0.0007	0.0585	62.4	0.0094
	175	0.1444	0.7268	1.1204	0.0014	0.0652	125	0.0130
	250	0.1353	0.3896	1.4082	0.0019	0.0458	171	0.0122
	500	0.1894	0.5985	1.8577	0.0025	0.0642	257	0.0171
Rough Terrain Forklifts Composite		0.1093	0.4680	0.6995	0.0008	0.0587	70.3	0.0099
Rubber Tired Doze	175	0.2209	0.8528	1.6304	0.0015	0.0945	129	0.0199
	250	0.2545	0.7124	2.1985	0.0021	0.0942	183	0.0230
	500	0.3345	1.5220	2.8822	0.0026	0.1210	265	0.0302
	750	0.5042	2.2809	4.4100	0.0040	0.1832	399	0.0455
	1000	0.7807	3.6654	7.7816	0.0060	0.2729	592	0.0704
Rubber Tired Dozers Composite		0.3114	1.2491	2.6866	0.0025	0.1137	239	0.0281
Rubber Tired Load	25	0.0205	0.0697	0.1295	0.0002	0.0052	16.9	0.0018
	50	0.1315	0.3756	0.3242	0.0004	0.0319	31.1	0.0119
	120	0.1045	0.4187	0.6404	0.0007	0.0576	58.9	0.0094
	175	0.1312	0.6288	1.0135	0.0012	0.0583	106	0.0118
	250	0.1330	0.3838	1.3129	0.0017	0.0462	149	0.0120
	500	0.1961	0.6755	1.8555	0.0023	0.0677	237	0.0177
	750	0.4044	1.3812	3.9115	0.0049	0.1408	486	0.0365
	1000	0.5480	1.9543	6.3337	0.0060	0.1909	594	0.0494
Rubber Tired Loaders Composite		0.1272	0.4855	1.0034	0.0012	0.0558	109	0.0115
Scrapers	120	0.1990	0.7011	1.1749	0.0011	0.1054	93.9	0.0180
	175	0.2172	0.9158	1.6429	0.0017	0.0945	148	0.0196
	250	0.2367	0.6699	2.1849	0.0024	0.0859	209	0.0214
	500	0.3333	1.3000	3.0162	0.0032	0.1190	321	0.0301
	750	0.5779	2.2380	5.3231	0.0056	0.2075	555	0.0521
Scrapers Composite		0.2916	1.0984	2.5680	0.0027	0.1087	262	0.0263
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0017	6.2	0.0006
	50	0.1270	0.3587	0.3564	0.0005	0.0324	36.2	0.0115

	120	0.1284	0.5269	0.8360	0.0009	0.0703	80.2	0.0116
	175	0.1661	0.8370	1.4268	0.0017	0.0750	155	0.0150
	250	0.1746	0.5516	2.1599	0.0029	0.0639	255	0.0158
Signal Boards Composite		0.0203	0.0940	0.1470	0.0002	0.0083	16.7	0.0018
Skid Steer Loaders	25	0.0211	0.0635	0.1189	0.0002	0.0067	13.8	0.0019
	50	0.0596	0.2332	0.2402	0.0003	0.0180	25.5	0.0054
	120	0.0482	0.2769	0.3536	0.0005	0.0286	42.8	0.0043
Skid Steer Loaders Composite		0.0534	0.2360	0.2686	0.0004	0.0207	30.3	0.0048
Surfacing Equipme	50	0.0513	0.1441	0.1411	0.0002	0.0128	14.1	0.0046
	120	0.1040	0.4251	0.6895	0.0007	0.0557	63.8	0.0094
	175	0.0950	0.4745	0.8195	0.0010	0.0422	85.8	0.0086
	250	0.1095	0.3526	1.1993	0.0015	0.0413	135	0.0099
	500	0.1631	0.6813	1.7819	0.0022	0.0622	221	0.0147
	750	0.2601	1.0660	2.8642	0.0035	0.0986	347	0.0235
Surfacing Equipment Composite		0.1362	0.5467	1.3678	0.0017	0.0512	166	0.0123
Sweepers/Scrubbe	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9	0.0011
	25	0.0237	0.0808	0.1501	0.0002	0.0060	19.6	0.0021
	50	0.1195	0.3565	0.3179	0.0004	0.0302	31.6	0.0108
	120	0.1233	0.5204	0.7534	0.0009	0.0706	75.0	0.0111
	175	0.1575	0.8008	1.2212	0.0016	0.0717	139	0.0142
	250	0.1205	0.3447	1.3019	0.0018	0.0402	162	0.0109
Sweepers/Scrubbers Composite		0.1278	0.5215	0.7403	0.0009	0.0576	78.5	0.0115
Tractors/Loaders/B	25	0.0199	0.0662	0.1250	0.0002	0.0061	15.9	0.0018
	50	0.1006	0.3305	0.3030	0.0004	0.0267	30.3	0.0091
	120	0.0760	0.3557	0.4910	0.0006	0.0432	51.7	0.0069
	175	0.1058	0.5866	0.8294	0.0011	0.0478	101	0.0095
	250	0.1264	0.3755	1.2813	0.0019	0.0415	172	0.0114
	500	0.2386	0.7714	2.2621	0.0039	0.0784	345	0.0215
	750	0.3611	1.1563	3.5105	0.0058	0.1199	517	0.0326
Tractors/Loaders/Backhoes Comp		0.0862	0.3824	0.5816	0.0008	0.0435	66.8	0.0078
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5	0.0009
	25	0.0398	0.1355	0.2519	0.0004	0.0101	32.9	0.0036
	50	0.1656	0.4176	0.3536	0.0004	0.0374	32.9	0.0149
	120	0.1354	0.4732	0.8257	0.0008	0.0709	64.9	0.0122
	175	0.2050	0.8694	1.6306	0.0016	0.0901	144	0.0185
	250	0.2483	0.7418	2.3854	0.0025	0.0951	223	0.0224
	500	0.3135	1.4011	3.0220	0.0031	0.1190	311	0.0283
	750	0.5949	2.6307	5.8034	0.0059	0.2259	587	0.0537
Trenchers Composite		0.1507	0.4749	0.6995	0.0007	0.0582	58.7	0.0136
Welders	15	0.0111	0.0425	0.0660	0.0001	0.0045	6.2	0.0010
	25	0.0224	0.0609	0.1044	0.0001	0.0068	11.3	0.0020
	50	0.1071	0.2854	0.2637	0.0003	0.0260	26.0	0.0097
	120	0.0708	0.2687	0.4376	0.0005	0.0387	39.5	0.0064
	175	0.1183	0.5475	0.9688	0.0011	0.0531	98.2	0.0107
	250	0.0909	0.2704	1.0791	0.0013	0.0329	119	0.0082
	500	0.1154	0.4072	1.3538	0.0016	0.0431	168	0.0104
Welders Composite		0.0703	0.2150	0.2702	0.0003	0.0243	25.6	0.0063

Appendix J

Statement of Reasons
Including Non-Binding Preliminary Allocation of Responsibility

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

STATEMENT OF REASONS

for Draft Feasibility Study/Remediation Action Plan
Mountain Lake
Presidio of San Francisco, California

Pursuant to California Health and Safety Code (HSC), section 25356.1(d), the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this Statement of Reasons as part of the Draft Feasibility Study/Remedial Action Plan (FS/RAP) for Mountain Lake located at the Presidio of San Francisco, California (the Site).

This FS/RAP presents a summary of the investigations that have identified contaminants of concern (COCs) in sediment at the Site. These COCs include both inorganics and organics and are summarized in Section 3.6.2 of the FS/RAP. The sediment cleanup levels for the COCs are included in Table 3-1 of the FS/RAP. The cleanup levels have been approved by DTSC and are protective of human health and the environment. The FS/RAP also provides a discussion of the feasible remedial alternatives. The FS/RAP selects a remedial alternative that will meet the objectives of protecting public health and the environment. The FS/RAP has selected dredging with partial capping for the Site. This alternative includes dredging and offsite disposal with contingent capping in areas of potential slope instability that may limit sediment removal activities.

The DTSC believes that the attached FS/RAP complies with the law as specified in California Health and Safety Code, section 25356.1. Section 25356.1(e) requires that RAPs “shall include a statement of reasons for setting forth the basis for the removal and remedial actions selected.” The statement of reasons “shall also include an evaluation of the consistency of the removal and remedial actions proposed by the plan with the federal regulations and factors specified in subdivision (d)…” Subdivision (d) specifies six factors against which the remedial alternatives in the RAP must be evaluated. A brief summary of each factor follows. The selected remedial action is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the federal Superfund regulations. The attached FS/RAP has addressed all these factors in detail. The statement of reasons also includes the preliminary Nonbinding Allocation of Responsibility (NBAR) as required by HSC section 25356.1 (e).

1. Health and Safety Risks – Section 25356.1(d)(1)

   The COCs for the Site include both inorganics and organics in sediment and are presented in Section 3.6.2 and Table 3-1 of the FS/RAP.

2. Beneficial Uses of the Site Resources – Section 25356.1(d)(2)

   The Basin Plan adopted by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) recognizes that beneficial uses of surface water at the Presidio include municipal or potable water supply and ecological and recreational uses. Surface water in the Lake is not currently used for drinking water purposes.

3. Effect of the Remedial Actions on Groundwater Resources

   Available technologies were evaluated to meet the overall remedial action objective of restoring the Lake to its potential beneficial uses identified by the RWQCB's Basin Plan. A variety of scientific engineering approaches and technologies were considered. The selected remedy offers the best combination of effective removal for the protection of human health and the environment and level of cost certainty compared to the other alternatives. Long-term monitoring will not be required.

4. Site-Specific Characteristics – Sections 25356.1(d)(4)

   Chemicals in sediment and surface water have been extensively characterized during site investigations and monitoring programs. The selected remedial alternative would remove sediment that has COCs above cleanup levels and is compatible with the Trust's intended land uses. Results of surface water sampling support conclusions that significant leaching of COCs from sediment into the overlying surface water is not occurring. Through sediment removal, contingent capping in select areas, and source control implemented by Caltrans, the selected remedial alternative provides an increased level of protection for minimizing the exposure of COCs to receptors and meets all of the ARARs.

5. Cost Effectiveness of Alternative Remedial Action Measures – Section 25356.1(d)(5)

   The selected remedial alternative includes dredging and offsite disposal with contingent capping in areas of potential slope instability that may limit sediment removal activities. The selected remedial action is the most cost-effective alternative to meet the cleanup objectives.

6. Potential Environmental Impacts of Remedial Actions – Section 25356.1(d)(6)

   The selected remedial alternative will not create any significant environmental impacts. Because of this, a Draft Negative Declaration was prepared pursuant to the California Environmental Quality Act (CEQA) for the remedial alternative. An Environmental Study Checklist was completed for the Site, which discusses potential environmental impacts of the recommended alternative, as well as actions that will be taken to reduce or eliminate these potential environmental impacts during implementation. The CEQA Environmental Study Checklist and Draft Negative Declaration are included in Appendix I of the FS/RAP.

7. Preliminary Nonbinding Allocation of Financial Responsibility – Section 25356.1(e)

   The current NBAR for the Site, as issued by the DTSC, is presented on the next page.

PRELIMINARY NONBINDING ALLOCATION OF RESPONSIBILITY

California Health and Safety Code (HSC) Section 25356.1(e) requires the Department of Toxic Substances Control (DTSC) to prepare a preliminary nonbinding allocation of responsibility (NBAR) among all identifiable potentially responsible parties (PRPs). California HSC Section 25356.3(a) allows PRPs with an aggregate allocation in excess of 50 percent to convene an arbitration proceeding by submitting to binding arbitration before an arbitration panel. If PRPs with over 50 percent of the allocation convene arbitration, then any other PRPs wishing to do so may also submit to binding arbitration.

The sole purpose of the NBAR is to establish which PRPs will have an aggregate allocation in excess of 50 percent and can therefore convene arbitration if they so choose. The NBAR, which is based on the evidence available to the DTSC, is not binding to anyone, including PRPs, DTSC, or the arbitration panel. If a panel is convened, its proceedings are *de novo* and do not constitute a review of the provisional allocation. The arbitration panel's allocation will be based on the panel's application of the criteria spelled out in HSC Section 25356.3(c) to the evidence produced at the arbitration hearing. Once arbitration is convened, or waived, the NBAR has no further effect, in arbitration, litigation or any other proceeding, except that both the NBAR and the arbitration panel's allocation are admissible in a court of law, pursuant to the HSC Section 25356.7 for the sole purpose of showing the good faith of the parties who have discharged the arbitration panel's decision.

DTSC sets forth the following preliminary nonbinding allocation of responsibility for Mountain Lake:
The U.S. Army is allocated 40 percent responsibility and the California Department of Transportation (Caltrans) is allocated 60 percent responsibility.

Appendix K

Responsiveness Summary

(To Be Provided in Final FS/RAP)