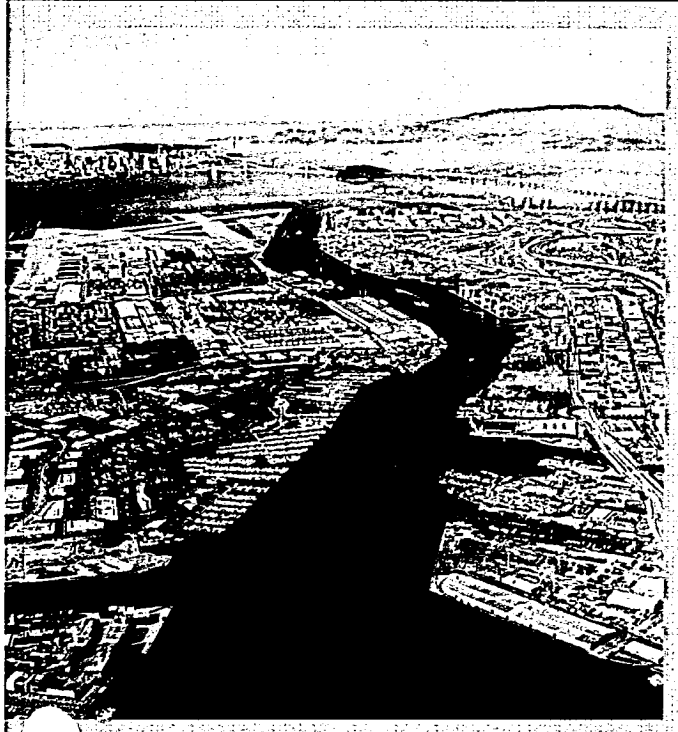
AR_N00236_003281
ALAMEDA POINT
SSIC NO. 5090.3.A

Final

Record of Decision
IR Site 31 Soil

Alameda Point, Alameda, California



September 2008

BEI 7526-0089-0074

1 Declaration

1.1 Site Name and Location

This Record of Decision (ROD) addresses soil at Installation Restoration (IR) Program Site 31, Marina Village Housing, at the former Naval Air Station (NAS) Alameda, now referred to as Alameda Point, in Alameda, California. The United States Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Information System (referred to as CERCLIS) identification number for NAS Alameda is CA2170023236.

1.2 Statement of Basis and Purpose

This ROD presents the selected remedy, no action for soil at IR Site 31. This document was developed in accordance with CERCLA (1980), as amended by the Superfund Amendments and Reauthorization Act of 1986 (Title 42 *United States Code* Section 9601, et seq.) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 *Code of Federal Regulations* Part 300).

This decision is based on information contained in the Administrative Record[1] file (a site-specific Administrative Record Index is included as part of this ROD), as well as on extensive field investigations, laboratory analyses, interpretation of the data, evaluation of current and future conditions, and thorough assessment of the potential human health and ecological risks. Based on these findings, there are no land-use restrictions, environmental monitoring, Resource Conservation and Recovery Act (RCRA) corrective action, or other actions required at this site.

The Department of the Navy (DON), EPA, State of California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), and San Francisco Bay Regional Water Quality Control Board (Water Board) concur on the selected remedy for this site.

[1]**Bold blue text** identifies detailed site information available in the Administrative Record and listed in the References Table. This ROD is also available on CD whereby **bold blue text** serves as a hyperlink to referenced information. The excerpts referenced by the hyperlinks are part of the ROD. To the extent there may be any inconsistencies between the referenced information attached to this ROD via hyperlinks and the information in the basic ROD itself, the language in the basic ROD controls. The hyperlink will open a text box at the top of the screen. A blue box surrounds applicable information in the hyperlink.

1.3 Assessment of the Site

The DON, in coordination with the regulatory agencies, has concluded that no action for soil is necessary to protect human health and the environment at IR Site 31, based on the following:

- site history
- field investigations
- laboratory analytical results
- evaluation of potential ecological and human health risks
- current and reasonably anticipated future land use

Results of these investigations at IR Site 31 showed that the soil does not pose an unacceptable risk to human health or the environment. The carcinogenic risks for soil for residential use are within the NCP risk management range of 10^{-4} to 10^{-6}. Additionally, the noncarcinogenic risks, as expressed by the hazard index (HI), are below 1 when naturally occurring metals are excluded. The ecological risk assessment concluded that IR Site 31 supports only limited habitat, the presence of terrestrial receptors is limited, and there is no significant ecological risk to current and expected future terrestrial receptors.

Groundwater beneath IR Site 31 is being addressed as part of the Operable Unit (OU)-5/IR-02 groundwater remediation program. The remedy for OU-5/IR-02 groundwater was selected in a separate ROD in August 2007. Additional information regarding the groundwater remedy is provided in Section 2.3.

1.4 Statutory Determinations

The DON has concluded that no remedial action is necessary for IR Site 31 soil because the soil does not pose an unacceptable risk to human health or the environment. The selected remedy, no action, is protective of human health and the environment and complies with federal and state requirements. The selected remedy obviates the need for and satisfies potential requirements of RCRA or otherwise applicable state hazardous waste or water quality protection laws. A five-year status review is not required because this remedy does not result in hazardous substances, pollutants, or contaminants remaining on-site at levels above those that allow for unlimited use and unrestricted exposure.

1.5 Data Certification Checklist

The information provided in Table 1 is included in Section 2 of this ROD. Additional information can be found in the Administrative Record for this site.

TABLE 1: DATA CERTIFICATION CHECKLIST

Checklist Item	Description
Identification of chemicals of potential concern and their concentrations.	Chemicals of potential concern in the soil were characterized throughout IR Site 31 based on data from several investigations. Descriptions of these investigations are provided in Section 2.3 of this ROD.
Risk assessments representative of the chemicals of potential concern.	A baseline human health risk assessment and screening-level ecological risk assessment were conducted as part of the remedial investigation using data representative of current conditions at IR Site 31. Results of these risk assessments are presented in Section 2.5 of this ROD.
How source materials constituting principal threats are addressed.	There are no principal threat wastes at IR Site 31, as described in Section 2.6.
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater.	IR Site 31 will remain a residential area. Drinking water is supplied to site residents by the East Bay Municipal Utility District, and groundwater at the site is not expected to be used for domestic purposes in the future. Additionally, groundwater has been addressed separately in the OU-5/IR-02 Groundwater ROD. Current and potential future site uses are discussed in Section 2.4 of this ROD.

1.6 AUTHORIZING SIGNATURES

This signature sheet documents the DON's and the EPA's co-selection of no action for soil in this ROD for IR Site 31 at Alameda Point, and the State of California, by the Department of Toxic Substances Control's and the San Francisco Bay Regional Water Quality Control Board's concurrence with this ROD. The respective parties may sign this sheet in counterparts.

George Patrick Brooks — 9-10-08

Signature **Date**

Mr. George Patrick Brooks
Base Realignment and Closure Environmental Coordinator
Base Realignment and Closure Program Management Office West
Department of the Navy

10/14/08

Signature **Date**

Mr. Michael M. Montgomery
Chief, Superfund Federal Facilities and Site Cleanup Branch, Region 9
United States Environmental Protection Agency

The State of California, Department of Toxic Substances Control had an opportunity to review and comment on the Record of Decision and the Department of Toxic Substances Control comments were addressed.

Anthony J. Landis — 10-29-08

Signature **Date**

Mr. Anthony J. Landis, P.E.
Supervising Hazardous Substances Engineer II
Sacramento Office
Brownfields and Environmental Restoration Program
California Environmental Protection Agency
Department of Toxic Substances Control

Bruce H. Wolfe — 10/31/08

Signature **Date**

Mr. Bruce H. Wolfe
Executive Officer
California Environmental Protection Agency
San Francisco Bay Regional Water Quality Control Board

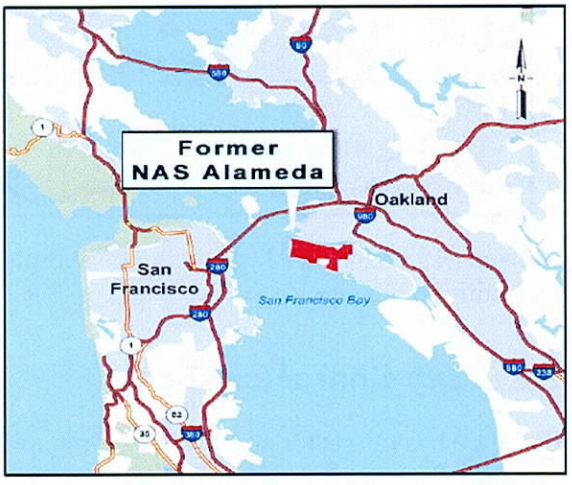
2 Decision Summary

2.1 Site Description and History

IR Site 31 is located on the **former NAS Alameda, now referred to as Alameda Point**; NAS Alameda ceased operations in 1997. Alameda Point is located on the western tip of Alameda Island, which is on the eastern side of San Francisco Bay (Figure 1). **IR Site 31** is a 24.9-acre site located at the eastern end of Alameda Point (Figure 2). In April 2008, ownership of IR Site 31 was transferred to the United States Coast Guard. Marina Village Housing, which is United States Coast Guard housing, is located on IR Site 31. The site is bounded by IR Site 25 (former North Village Housing) to the north, IR Site 30 (Island High School and Woodstock Child Development Center) to the northeast, and the Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex (FISCA) Former Warehouse Area to the east and south. The FISCA Defense Reutilization and Marketing Office scrapyard and screening lot were located east of IR Site 31.

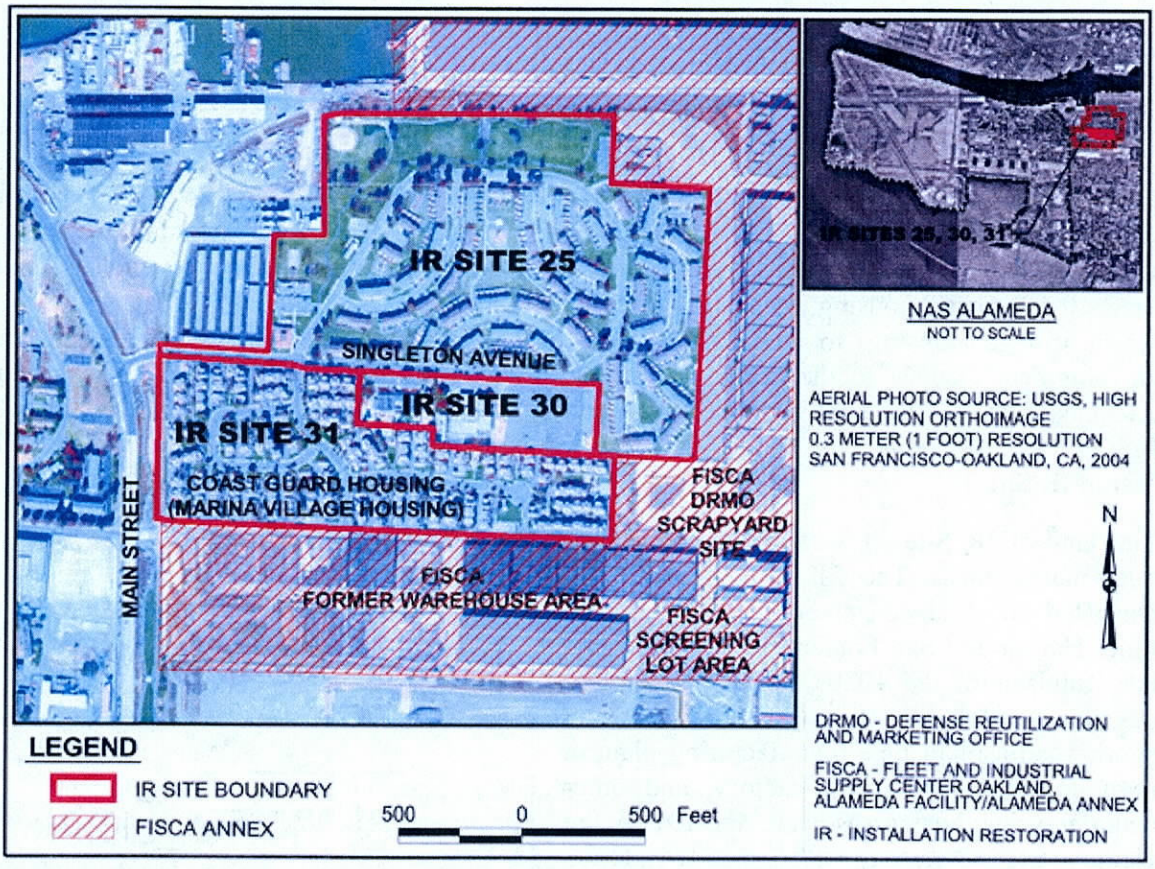
The land at IR Site 31 was created by filling tidal marshlands. The fill material primarily consisted of dredged material from Oakland Inner Harbor and San Francisco Bay. From the late 1800s until the 1920s, two manufactured gas plants and an oil refinery (Pacific Coast Oil Works), an asphalt pipe manufacturing plant, a soap company, a carriage factory, and other manufacturing businesses were located in the vicinity of present-day IR Site 31. These facilities may have discharged gas plant and refinery wastes along the sides of tidal channels and on the surface of marshlands near IR Site 31. As the marshlands and intertidal areas were filled in, these wastes became entrapped in the subsurface, creating what is now referred to as the **Marsh Crust**. The Marsh Crust was addressed separately in a Marsh Crust Remedial Action Plan/ROD in 2001. Subsequent filling actions have buried the Marsh Crust at depths typically ranging from approximately 5 to 18 feet below ground surface (bgs). IR Site 31 fill history shows that the fill material was in place by 1927.

FIGURE 1
Alameda Point Location Map



IR Site 31 is located in the northwestern corner of the former San Francisco Bay Airdrome property. The San Francisco Bay Airdrome was a commercial airfield constructed in 1929 and closed in 1941. In 1947, housing was present across the northwestern corner of IR Site 31. In December 1951, the DON acquired the majority of the site for storage purposes. By 1953, two warehouse buildings were located in the southwestern portion of IR Site 31, and a storage lot was located in the eastern portion of the site. The northwestern corner of IR Site 31 was acquired by the DON in June 1956 and paved in the late 1950s; the southern portion of the site was mostly unpaved at this time. IR Site 31 was used for storage until approximately 1985.

FIGURE 2
IR Site 31 Location Map



Between 1985 and 1993, the warehouse buildings were demolished, and Marina Village Housing was built on the site.

2.2 Site Characteristics

IR Site 31 is characterized by flat topography. There are no streams or surface water bodies at the site. Urban and barren **habitats** occur at IR Site 31. Urban habitat vegetation, which is characterized by ornamental shrubs, trees, and landscaped areas, generally supports few wildlife species due to human disturbances and limited vegetation. Urban habitat also is the expected future habitat for the site.

Alameda Point **geology** is characterized by unconsolidated sedimentary deposits. The Marsh Crust layer is between the fill layer and the Bay Sediment Unit. The **hydrogeology** at Alameda Island includes a shallow water table aquifer above the deeper regional aquifers. Groundwater in the first water-bearing zone at IR Site 31 was typically first encountered between 3.8 and 7 feet bgs in remedial investigation (RI) soil borings.

2.3 Previous Investigations

IR Site 31 was designated as an IR site because groundwater beneath the site was impacted by the OU-5/IR-02 groundwater plume. When NAS Alameda was designated for closure, the Alameda Point Base Realignment and Closure (BRAC) Cleanup Team (BCT) became responsible for the environmental cleanup program at Alameda Point. The BCT consists of representatives from the DON, EPA, DTSC, and Water Board.

A series of environmental **investigations** were conducted at IR Site 31 between 1987 and 2005 to assess potential sources of contamination. These investigations are summarized in Table 2. No enforcement activities have occurred in association with IR Site 31, and there are no RCRA units at the site.

In addition to the environmental investigations conducted by the DON, as specified in Table 2, some environmental evaluations also were conducted at IR Site 31 by other agencies. An independent preliminary health consultation was conducted by the Agency for Toxic Substances and Disease Registry in 2000. Their evaluation concluded that unsafe levels of volatile organic compounds (VOCs) had not migrated up through the soil from the groundwater based on indoor air and soil gas sampling. This finding was summarized in the Environmental Baseline Survey.

In 2002, the Coast Guard conducted a risk assessment to evaluate the potential health risks associated with living at the Coast Guard housing area. VOC concentrations in crawl spaces did not differ from those in indoor air. VOC concentrations in indoor air were consistent with outdoor air concentrations and ambient measurements collected by the California Air Resources Board. Results indicated that the cancer risks and noncancer hazards were below the threshold values for predicted indoor air concentrations based on both soil vapor and groundwater data, and risks to residents were comparable to risks to other residents in the San Francisco Bay Area.

The IR Site 31 Soil **RI** Report evaluated the soil analytical data collected during the RI and data from previous investigations, as appropriate, for a total of:

- 694 soil samples analyzed for polycyclic aromatic hydrocarbons (PAHs);
- 126 soil samples analyzed for metals, VOCs, and non-PAH semivolatile organic compounds (SVOCs); and
- 129 soil samples analyzed for polychlorinated biphenyls (PCBs) and pesticides.

A separate ROD for OU-5 at Alameda Point addresses the groundwater beneath IR Site 31. The selected remedy for OU-5/IR-02 groundwater is biosparging with soil vapor extraction and nutrients/microorganism enhancement, as required; monitored natural attenuation; and institutional controls. The selected remedy is presented in the **OU-5/IR-02 Groundwater ROD**. The soil and groundwater data at OU-5 support the conclusion that IR Site 31 is not a source for the benzene and naphthalene contaminants in the OU-5/IR-02 groundwater plume beneath IR Site 31.

TABLE 2: TIME LINE SUMMARY OF PREVIOUS STUDIES AND INVESTIGATIONS

Previous Study/Investigation*	Date	Investigation Activities
Preliminary Environmental Investigations	1987 to 1988	Soil and groundwater samples were collected in 1987 and 1988 to evaluate contaminant concentrations prior to construction of housing. The soil samples were analyzed for VOCs, SVOCs, and metals. For soil, the investigations concluded that only chromium and nickel concentrations appeared elevated, but these metals also appeared elevated in the background sample collected from East Housing. The study recommended replacing the top 0.5 to 1 foot of soil, which was included in the construction specifications for Marina Village Housing.
Shallow Soil Gas Investigation	1989	A shallow soil gas investigation was conducted prior to constructing housing at IR Site 31 to assess concentrations of benzene in soil vapor originating from the groundwater. Five out of 41 soil gas samples collected had detectable concentrations of benzene.
Environmental Baseline Survey, Zone 16: Housing Zone, Parcels 178 and 184	2001	Three soil samples and two soil gas samples were collected in 1994 and 1995. The surface soil samples were analyzed for pesticides and PCBs; the soil gas samples were analyzed for VOCs. Data were used in the RI human health and ecological risk assessments.
PAH Assessment	2002	This assessment was conducted to examine the potential presence of PAHs in fill material. A total of 46 soil samples were collected from 12 locations. Data were used in the RI human health and ecological risk assessments.
PAH Assessment	2003	A total of 648 soil samples were collected from 163 borings at IR Site 31 and analyzed for PAHs. Data were used in the RI human health and ecological risk assessments.
Remedial Investigation	2005 to 2007	Soil and groundwater RI sampling were performed in 2005. Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Results were combined with those from previous investigations to determine the nature and extent of contaminants. The RI Report presented human health and ecological risk assessments. No action was recommended for soil at IR Site 31.

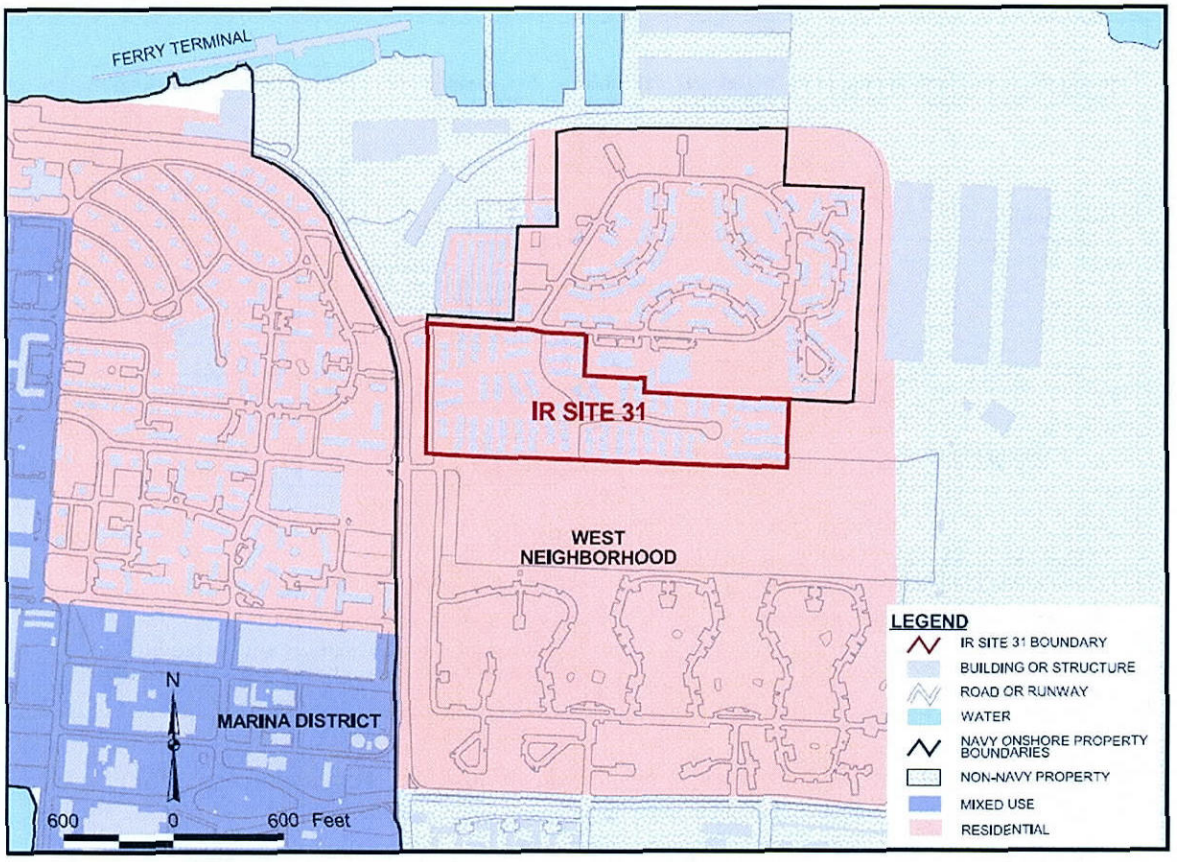
* The documents listed above are available in the Administrative Record and provide detailed information used to support the remedy selection for soil at IR Site 31.

2.4 Current and Potential Future Site Uses

There are no current land-use restrictions for soil at IR Site 31. In accordance with the City of Alameda's Alameda Point General Development Plan, as amended in 2003, IR Site 31 will remain a residential area. Figure 3 shows the planned reuse for property in the vicinity of IR Site 31.

Drinking water is supplied to site residents by the East Bay Municipal Utility District, and groundwater at the site is not expected to be used for domestic purposes in the future. Additionally, groundwater has been addressed separately in the OU-5/IR-02 Groundwater ROD.

FIGURE 3
Community Reuse Plan



2.5 Summary of Site Risks

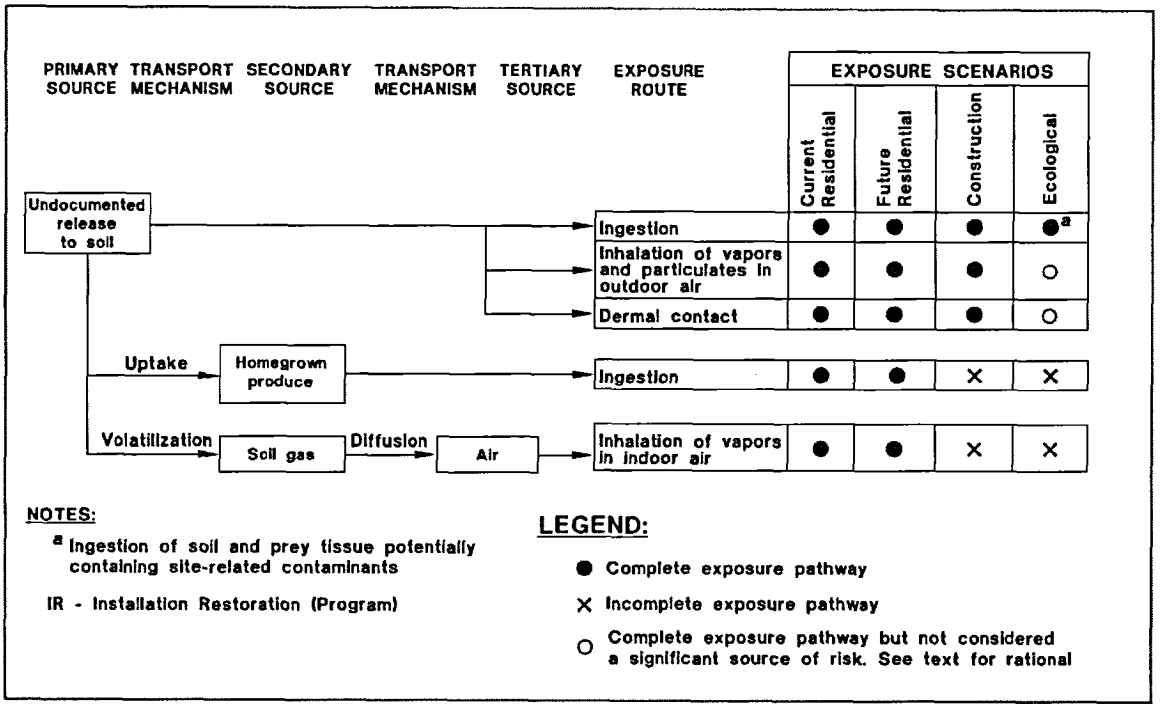
Risk assessments were performed as part of the RI to assess current and potential future risk for human and ecological receptors at IR Site 31. The RI Report concluded that no action is necessary for soil based on the results of the human health and ecological risk assessments.

2.5.1 Human Health Risk Assessment

A **human health risk assessment** (HHRA) was performed for IR Site 31 as part of the evaluation in the RI Report. The risk assessment was designed to provide a margin of safety to protect human health by using conservative assumptions so that risks are not underestimated. An example of a conservative assumption is that a person would ingest soil for 350 days per year for 30 years. The HHRA was conducted in accordance with EPA and DTSC guidance.

Exposure pathways in the risk assessment are based on current and reasonable future exposure scenarios. As shown on the conceptual site model (Figure 4), soil exposure pathways for current and potential future receptors included:

FIGURE 4
Conceptual Site Model



- direct contact with soil (ingestion, inhalation of dust, and skin absorption) for all receptors;
- consumption of homegrown produce for current and future residents; and
- inhalation of vapors in indoor air from volatile chemicals in soil and groundwater for current and future residents.

In the HHRA, values were calculated for three receptor populations potentially exposed to IR Site 31 soil, as follows:

- **Current residents** are assumed to be exposed to chemicals in the upper 2 feet of soil via incidental soil ingestion, dermal contact, inhalation of particulates and vapors from soil in outdoor air, inhalation of vapors from soil and groundwater migrating into indoor air, and ingestion of produce grown in local soil.
- **Future residents** are assumed to be exposed to chemicals in soil from 0 to 7 feet bgs (to allow for future construction) via the same pathways as current residents.
- **Construction workers** are assumed to be exposed to chemicals in soil from 0 to 7 feet bgs via incidental soil ingestion, dermal contact with soil, inhalation of particulates from soil in outdoor air, and inhalation of vapors from groundwater in outdoor air.

In the RI Report, the toxicity assessment component of the risk assessment presented the numerical toxicity values used to characterize the risk. A cancer slope factor is used for

carcinogenic health effects and a reference dose (RfD) is used for noncancer health effects. The RI Report provided dual-calculation of risk based on EPA and Cal/EPA toxicity values.

The final step in the HHRA is risk characterization. During this step, the estimated rate at which a person takes in a chemical is compared with information about the toxicity of that chemical to estimate the potential risk posed by exposure. Cancer and noncancer risks for IR Site 31 soil are provided in Table 3.

TABLE 3: POTENTIAL HUMAN HEALTH RISKS FOR SOIL

Exposure Scenario	Total Cancer Risk[a]	Incremental Cancer Risk (Without Ambient Metals)[b]	Total Hazard Index (Noncancer Risk)[a]	Incremental Hazard Index (Noncancer Risk)[b]
Current Residential	6×10^{-5}	7×10^{-6}	5	1
Future Residential	6×10^{-5}	1×10^{-5}	4	1
Construction Worker	2×10^{-6}	3×10^{-7}	0.2	0.03

[a] Risk calculations were performed using EPA toxicity factors; reasonable maximum exposure risks.
[b] Without iron and ambient metals arsenic, cadmium, chromium, and vanadium.

Cancer risk is expressed as a statistical probability that an individual could have an increased risk of cancer incidence. A 1 in 10,000 chance is a risk of 1×10^{-4}. For every 10,000 people, one additional cancer risk may occur as a result of exposure. A 1 in 1,000,000 chance is expressed as 1×10^{-6}. In this case, for every 1,000,000 people, one additional cancer risk may occur as a result of exposure.

A health risk assessment does not predict actual health effects, but is a tool for making risk management decisions. In accordance with EPA OSWER Directive 9355.0-30, the risk management range is 10^{-4} to 10^{-6}. The risk management range was established by EPA to set guidelines for making risk management decisions. EPA OSWER Directive 9355.0-30 states, "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} and the noncarcinogenic hazard quotient (HQ) is less than 1, action generally is not warranted unless there are adverse environmental impacts." Site-specific factors are typically considered when making decisions about whether action is required at sites where cancer risks are in the risk management range. Risks less than 10^{-6} are considered negligible. When risks are greater than 10^{-4}, action is generally required.

The noncancer health risk associated with exposure to a chemical is expressed as an HQ for risk from individual chemicals or an HI for cumulative risk. The target threshold level for HQ and HI values is 1.

Risk assessment procedures include assessment of ambient metals. The metals that contributed most to the risk and were considered potential site contaminants were arsenic, cadmium, chromium, and vanadium. The iron data did not meet all criteria for ambient concentrations; however, the data did follow a similar pattern to that in the background data. Typically, ambient arsenic is associated with iron in minerals indicating that iron is also ambient. The cancer risk

when ambient metals are removed is the incremental risk. Therefore, in accordance with EPA OSWER Directive 9355.0-30 and DTSC's *Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities*, these ambient metals were removed from incremental risk calculations.

The total cancer risk for IR Site 31 soil for both current and future residential scenarios is 6×10^{-5}, which is within the risk management range. The incremental cancer risk is 7×10^{-6} for current residents and 1×10^{-5} for future residents. The total cancer risk for construction workers is 2×10^{-6} and the incremental risk is 3×10^{-7}.

Four chemicals are associated with the incremental cancer risk above 1×10^{-6} for current and future residents: two PCBs (Aroclor 1016 and 1260), a pesticide (Dieldrin) and one PAH (benzo[a]pyrene). The PCBs and Dieldrin were rarely detected, and so the risks (which were calculated assuming that these chemicals are present in every sample) are not representative of actual site conditions. Benzo(a)pyrene is the only PAH with a cancer risk of 1×10^{-6} or greater. For benzo(a)pyrene the risks for current and future residents are 2×10^{-6} and 6×10^{-6}, respectively.

The noncancer HI value at IR Site 31 is at or below 1 without iron and ambient metals arsenic, cadmium, chromium, and vanadium. The HQs for arsenic, cadmium, chromium, and vanadium each are less than 1.

The risk associated with inhalation of vapors in indoor air from groundwater is 8×10^{-7} for current and future residential scenarios. In addition, the indoor air risks are expected to decrease as the remediation for OU-5/IR-02 groundwater proceeds.

For IR Site 31 soil, there is a high level of confidence that the cancer risks, which are in the risk management range or less than 10^{-6}, are not underestimated, based on the large number of samples collected and analyzed, the conservative exposure assumptions, detailed uncertainty analysis, and other technical considerations. The human health risk assessment concluded that current conditions are protective of residents, and that there are no unacceptable risks for IR Site 31 soil.

2.5.2 Ecological Risk Assessment

A Tier 1 screening-level **ecological risk assessment** was completed as part of the RI Report with a refined exposure assessment to estimate the potential ecological impacts of chemicals reported at concentrations above detection limits in soil at IR Site 31. The past, current, and expected future use of the site is residential housing; therefore, the current urban habitat is expected to be maintained at the site. Ecological risk assessment considers the potential for adverse effects to common ecological receptors such as mice and rabbits as well as threatened or endangered species or species-of-concern (plants and animals). The ecological risk assessment also considers the possibility that there is habitat for these receptors on the site. Most of IR Site 31 is paved or covered by buildings and has been continuously occupied as residential housing for many years. There is currently no habitat for plants of ecological concern and limited habitat for common animals such as birds and no habitat for special status species. Therefore, exposure pathways to chemicals in soil by ecological receptors are incomplete and ecological risk to

current and expected future terrestrial receptors is minimal for current or expected future habitat at IR Site 31. The ecological risk assessment concluded that there is no significant risk to ecological receptors.

2.5.3 Additional Risk-Based Rationale for No Action

As discussed in Section 2.5.1, human health risks are in the risk management range of 10^{-4} to 10^{-6}. In accordance with EPA OSWER Directive 9355.0-30, risks less than 10^{-6} are considered negligible, and site-specific factors are typically considered when making decisions about whether action is required at sites where cancer risks are in the risk management range.

Four chemicals are associated with the incremental cancer risk above 1×10^{-6} for current and future residents: two PCBs (Aroclor 1016 and 1260), a pesticide (Dieldrin) and one PAH (benzo[a]pyrene). The PCBs and Dieldrin were rarely detected, and so the risks (which were calculated assuming that these chemicals are present in every sample) are not representative of actual site conditions. Benzo(a)pyrene is the only PAH with a cancer risk of 1×10^{-6} or greater. For benzo(a)pyrene the risk for current and future residents are 2×10^{-6} and 6×10^{-6}, respectively.

The risk associated with inhalation of vapors in indoor air from groundwater is 8×10^{-7} for current and future residential scenarios. The noncancer HI value at IR Site 31 is at or below 1 without iron and ambient metals arsenic, cadmium, chromium, and vanadium. The HQs for arsenic, cadmium, chromium, and vanadium each are less than 1.

The human health and ecological risk assessments concluded that current conditions are protective of residents, and that there are no unacceptable risks for IR Site 31 soil. For IR Site 31 soil, there is a high level of confidence that the cancer risks are not underestimated based on the large number of samples collected and analyzed, the conservative exposure assumptions, detailed uncertainty analysis, and other technical considerations. The additional evaluation of exposure factors, uncertainty factors, and technical factors in this section shows that the IR Site 31 risk assessment results are representative of or more conservative than potential reasonable maximum exposure with regard to site conditions, and this assessment provides further support for the no action decision.

2.5.3.1 Exposure Factors

The evaluation of exposure factors in this section shows that the risk assessments for IR Site 31 adequately addressed the effects of exposure to multiple chemicals, exposure via multiple exposure pathways, and any special considerations for the potentially exposed population and ecological receptors.

- **Cumulative effect of multiple chemicals.** The HHRA, following EPA's 1989 Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual (Part A), evaluated all chemicals and their cumulative health effects. The cumulative health effects of all chemicals reported in soil and volatile chemicals in groundwater were calculated. No widespread evidence of soil impacts from organic chemicals was identified, and metals of concern were found at concentrations consistent with background. Conservatively, noncancer health effects are added together to estimate a protective noncancer hazard even

though EPA guidance requires that cumulative hazard only be considered for chemicals that have the same health effect (i.e., affect the same target organ).

- **Potential for exposure from other pathways.** All reasonably possible complete exposure pathways have been addressed. The exposure pathways included in the HHRA were ingestion of soil, dermal contact with soil, inhalation of dust in outdoor air, inhalation of vapors in indoor and outdoor air, and ingestion of homegrown produce by child and adult current and future residents. The migration of vapors from the groundwater into indoor air was included in the HHRA. The groundwater in the area, as well as directly beneath IR Site 31, is impacted by benzene and naphthalene. It is unlikely that future residents would have access to shallow groundwater for drinking or any other purpose. Residents of Alameda Point are currently provided with potable water from the East Bay Municipal Utility District. The groundwater, part of the operable unit OU-5/IR-02 groundwater plume, will be remediated as described in the OU-5/IR-02 Groundwater ROD.
- **Population sensitivities.** EPA's assumptions and toxicity factors are designed to be protective of sensitive populations. No evidence suggests that residents of IR Site 31 will be more sensitive to chemicals than the receptors that the EPA risk assessment process is designed to protect. The EPA risk assessment process is designed to be protective of sensitive populations including children and the elderly. Residents of a highly industrialized area with exposure to other sources of chemicals might be more sensitized to chemical exposure. However, Alameda Point is not highly industrialized and heavy industry is not included in the future development plans. There are no unique exposures to other sources of chemicals at Site 31 which need to be considered with regards to population sensitivity at Alameda Point.
- **Potential impacts on environmental receptors.** An ecological risk assessment conducted as part of the RI concluded that chemical concentrations did not pose a concern to ecological receptors. Also, the future use of the property greatly limits the habitat available for wildlife.
- **Cross media impacts.** Site 31 was found not to be a source of the OU-5/IR-02 groundwater plume. The chemicals reported in soil were principally ambient metals and semivolatile organics that have limited potential to impact other media. The detected organic chemicals are not likely to migrate into groundwater because of their low solubility in water and their tendency to adsorb onto soil particles. Therefore, IR Site 31 soil contaminants can be considered immobile except for wind that picks up particles of soil as airborne dust. The HHRA shows that the cancer risks associated with inhalation of dust in the air are well below the 10^{-6} cancer risk level. Therefore, cross media impacts to air are not a concern.

2.5.3.2 Uncertainty Factors

Uncertainty associated with the weight of evidence for exposure and health effects and the reliability of exposure data was adequately addressed using standard methods.

- **Weight of evidence for exposure and health effects.** There is a high level of confidence that the exposure and health effects information used in the HHRA is protective of human health for the following reasons.
  - Exposure is conservatively based on reasonable maximum exposure for a hypothetical child/adult assumed to be exposed for 30 years (6 years as a child and 24 years as an adult) for 350 days a year.
  - The toxicity factors for the majority of chemicals are designed to maximize the ability of the test to identify any tendency for the chemical to produce tumors or other evidence of adverse health effects.
- **Reliability of exposure data.** At IR Site 31, there is a high level of confidence that the exposure concentrations are reliable estimates of the true concentrations because of the large data set and the conformity of the data with the conceptual site model. The exposure concentration was represented by the 95th upper bound confidence limit of the average concentration (95th UCL) and assumed that this concentration was present from the surface to the groundwater at all locations within Site 31. The exposure concentrations are based on almost 15,000 data points from 774 soil samples collected as part of the site investigations. This data set is comprised of the chemicals that were reported in at least one sample, and only represents about one third of all the chemicals included in the laboratory analyses as part of the investigation. The majority of chemicals were not detected.

2.5.3.3 Technical Factors

The technical factors that apply to IR Site 31 include adequacy of detection/quantification limits and determination of background. The detection or quantification limits in the samples used in the risk assessment were sufficiently low that there is a high level of confidence that the distribution of the chemicals is understood and the risks are representative. Extensive analysis of background data was conducted that shows that concentrations of metals which are risk drivers are consistent with ambient concentrations and are not the result of a release from DON activities.

2.5.4 Basis for No Action

Results of the human health and ecological risk assessments show that soil does not pose an unacceptable risk to human health or the environment. No action for soil at IR Site 31 is proposed for the following reasons.

- Results of the human health and ecological risk assessments show that site conditions are protective of human health and the environment.
- There is no evidence of a release of hazardous substances related to DON activities.

- There is no evidence that the soil at the site has contributed to a release to groundwater, which is being addressed in the OU-5/IR-02 groundwater remedial action program.

2.6 Principal Threat Waste

No principal threat wastes have been identified for IR Site 31. Principal threat wastes are source materials considered to be highly toxic, highly mobile, or those that would present a significant risk to human health or the environment should exposure occur.

2.7 Selected Remedy

The selected remedy for IR Site 31 soil is no action. This determination is based on extensive field investigations, laboratory analyses, data evaluations, review of current and future land use, and thorough assessment of potential human health risk and ecological risk. Results of the human health and ecological risk assessments show that soil at the site does not pose an unacceptable risk to human health or the environment. No land-use restrictions, environmental monitoring, RCRA corrective action, or other actions are required at this site.

2.8 Community Participation

A Community Relations Plan for Alameda Point was developed to document interests, issues, and concerns raised by the community regarding ongoing investigation and cleanup activities and to describe a specific program designed to address these issues and concerns. The initial plan for Alameda Point was prepared in February 1989 and was revised most recently in 2006. The revisions incorporated the most recent assessment of community issues, concerns, and informational needs related to the ongoing environmental investigation and remediation program at Alameda Point.

2.8.1 Restoration Advisory Board

In 1993, individuals from local communities began to play an increasingly significant role in the environmental restoration process with the establishment of the Alameda Point Restoration Advisory Board (RAB). Original membership in the board was solicited by the DON through newspaper notices and included business and homeowner representatives, residents, local elected officials, and regulatory agency staff.

The RAB currently consists of members of the DON, the community, and regulatory agencies. The RAB meetings occur monthly and are open to the public. Meetings are held in the evenings after normal working hours on the first Thursday of each month at Building 1, Room 140, at 950 West Mall Square at Alameda Point. RAB members also review and comment on technical documents.

The DON and regulators report information about IR Site 31, including the availability of site documents, to the RAB members during the monthly RAB meetings. Copies of the RAB meeting minutes and documents describing environmental investigations and removal actions are

available at the following Alameda Point information repository and **Administrative Record file** locations:

Alameda Point Information Repository
950 West Mall Square
Building 1, Room 240
Alameda, California 94501

Administrative Record
Naval Facilities Engineering Command, Southwest
937 Harbor Drive, Building 1, 3rd Floor
San Diego, California 92132

The new Alameda public library will also maintain new DON environmental documents during review periods. The Alameda public library is located at 1550 Oak Street, Alameda, CA 94501. RAB meeting minutes also are available at the **DON BRAC Program Management Office website** at:

http://www.bracpmo.navy.mil

2.8.2 Public Mailings

Public mailings, including information updates, fact sheets, and Proposed Plans, have been used to ensure a broad distribution of information throughout the local community. Since March 1990, information updates announcing the program process at IR Site 31 have been delivered to residents living near Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex and mailed to city, state, and federal officials; agencies; local groups; and individuals identified in the Community Relations Plan. Updates and fact sheets have included information concerning:

- status of environmental investigations,
- removal action activities,
- remedy selection process,
- opportunities for the public to participate in the investigation and remediation,
- history and geology of the area, and
- access to the Administrative Record for Alameda Point.

Proposed Plans provide an overview of environmental investigation results (including ecological and human health risk assessment results), present remedial alternatives for a site or group of sites, and describe the preferred alternative. The updates, fact sheets, and Proposed Plans are mailed to between 400 and 1,400 households, businesses, public officials, and agencies in an effort to reach community members. These public documents related to IR Site 31 or basewide information are summarized in Table 4.

TABLE 4: SUMMARY OF ALAMEDA POINT FACT SHEETS, NEWSLETTERS, AND PROPOSED PLAN RELATED TO IR SITE 31

Date	Title
May 1995	Fact Sheet #5: Base Realignment and Closure Cleanup Plan
June 1996	Fact Sheet #7: History and Geology
Winter 2005	Alameda Point Focus Newsletter #3
Fall 2006/Winter 2007	Alameda Point Focus Newsletter #5
March 2008	Proposed Plan for Installation Restoration Site 31 Soil Marina Village Housing Former NAS Alameda

2.8.3 Community Participation for IR Site 31

The RI Report for IR Site 31 was finalized in August 2007. The Proposed Plan for IR Site 31 was released to the public in March 2008, at the beginning of the public comment period, to provide information and solicit public input on the DON's recommended remedy. These documents are available to the public at the information repository maintained at Alameda Point and in the Administrative Record file maintained at the Naval Facilities Engineering Command, Southwest, located in San Diego, California. The information repository also contains a complete index of the Administrative Record file.

A 30-day public comment period for the IR Site 31 Proposed Plan extended from March 3, 2008 through April 2, 2008. The RAB was briefed on the Proposed Plan on March 6, 2008. In addition, a public meeting was held on March 12, 2008. A notice of the public comment period and public meeting has been published in the *Alameda Journal* and in the *Oakland Tribune.*

At the public meeting, the BRAC Environmental Coordinator and DON Project Manager were available to discuss IR Site 31 and describe the selected remedy. Representatives from the DON and environmental regulatory agencies were available to answer questions. A court reporter prepared a transcript of the meeting. No comments were received during the public comment period.

3 Responsiveness Summary

The participants in the public meeting held on March 12, 2008, included representatives of the DON, EPA, DTSC, and Water Board. No questions or concerns were received during the meeting, but the meeting was documented in the **meeting transcript**. No additional written comments, concerns, or questions were received by the DON, EPA, DTSC, or Water Board during the public comment period.

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
1	**former NAS Alameda, now referred to as Alameda Point**	**Section 2.1**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.2, Pages 1-6 to 1-7. CDM 2007.
2	**IR Site 31**	**Section 2.1**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.3, Pages 1-7 to 1-10; Appendix K; Figures 1-2, 4-2, and A-1 to A-9. CDM 2007.
3	**Marsh Crust**	**Section 2.1**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.3, Page 1-7. CDM 2007.
4	**habitats**	**Section 2.2**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 2.5, Pages 2-8 to 2-9. CDM 2007.
5	**geology**	**Section 2.2**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 2.3, Pages 2-1 to 2-6, Figures 2-1 to 2-10. CDM 2007.
6	**hydrogeology**	**Section 2.2**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 2.4, Pages 2-6 to 2-8, Figures 2-1 and 2-11. CDM 2007.
7	**investigations**	**Section 2.3**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.5, Pages 1-12 to 1-17, Tables 3-2 to 3-4, Figures 1-3 and 4-1. CDM 2007.
8	**RI**	**Section 2.3**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.1, Pages 1-2 to 1-3. CDM 2007.
9	**OU-5/IR-02 Groundwater ROD**	**Section 2.3**	Final Record Of Decision for Operable Unit 5/IR-02 Groundwater. Section 12. August 2007.
10	**human health risk assessment**	**Section 2.5.1**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 6.1, Pages 6-1 to 6-15, Tables 6-1 to 6-11, Figure 6-1. CDM 2007.
11	**ecological risk assessment**	**Section 2.5.2**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 6.2, Pages 6-15 to 6-24, Tables 6-12 to 6-16. CDM 2007.
12	**Administrative Record file**	**Section 2.8.1**	Alameda Point NAS Draft Administrative Record File Index. Pages 1-11.
13	**DON BRAC Program Management Office website**	**Section 2.8.1**	http://www.bracpmo.navy.mil
14	**meeting transcript**	**Section 3**	Public Meeting Transcript, March 12, 2008, Public Comment Period for Proposed Plan for IR Site 31, former NAS Alameda, Alameda, California.

[1] **Bold blue text** indicates hyperlinks available on the ROD's reference CD to detailed site information that also is contained in the publicly available Administrative Record. For access to information contained in the Administrative Record for Former NAS Alameda, please contact: Administrative Record, Naval Facilities Engineering Command, Southwest, Attn: Ms. Diane Silva, 937 Harbor Drive, Building 1, 3rd Floor, San Diego, California 92132, phone: (619) 532-3676.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
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1.3.2 Base Description and History

In 1929, the San Francisco Bay Airdrome (SFBA) was constructed on a 458-acre parcel, and in 1930, the City of Alameda deeded a 100-acre parcel to the Army. The Army established an air base on the airport, now known as Benton Field, and began construction activities in 1931. On June 1, 1936, Alameda deeded another 929-acre parcel of diked and filled reclaimed land to the Navy for the nominal fee of $1. Four months later, the Army abandoned Benton Field and turned over its facilities to the Navy (Alameda Education Foundation 2006). Construction of the rest of the base included several iterations of filling tidelands, marshlands, and sloughs with dredge materials from the San Francisco Bay. In December 1951, the Navy acquired the majority of IR Site 31 for storage purposes. The northwest portion of IR site 31 was acquired in June 1956 (Naval Facilities Engineering Command 1994). NAS Alameda was operated as an active Naval facility from 1940 to 1997.

Operations conducted by the Navy at Alameda Point included aircraft, engine, gun, and avionics maintenance; engine overhaul and repair; fueling activities; and plating, stripping, and painting activities (including radium-dial painting). The Navy Public Works Center also operated two power plants, a transportation shop, and a pesticide shop at Alameda Point. Historical aviation and jet engine test activities at Alameda Point were supported by a network of fuel delivery pipelines that transported aviation and other fuels to various areas of Alameda Point (International Technology Corporation [IT] 2001). In addition, the base operated a deepwater port capable of berthing aircraft carriers. The port was used primarily for minor carrier maintenance and ship overhaul. The following tenants also used Alameda Point during its tenure as an active military base:

- Construction Battalion Unit 416;
- Commander Naval Air Force, U.S. Pacific Fleet Material Representative;
- Defense Property Disposal Office;
- Navy Disease Vector Ecology Control Center;
- Alameda Detachment, Explosive Ordnance Disposal Group One;
- Marine Air Group 42;
- Naval Air Reserve Unit;
- Naval Regional Dental Center Branch Clinic;
- Naval Regional Medical Center Branch Clinic;
- Pacific Fleet Audio-Visual Facility Component;
- Shore Intermediate Maintenance Activity; and

- **Supervisor of Shipbuilding, Conversion, and Repair.**

1.3.3 Site Description and Operations

IR Site 31 is a 24.9-acre site located at the eastern end of Alameda Point (Figure 1-2). The site is bounded by IR Site 25 to the north, IR Site 30 to the northeast, and the non-Navy Fleet and Industrial Supply Center Oakland, Alameda Facility/ Alameda Annex (FISCA) Former Warehouse Area to the east and south. The FISCA Defense Reutilization and Marketing Office (DRMO) Scrapyard and Screening Lot are located east of IR Site 31.

In the late 1800s, the area was intertidal marsh lands and included municipal railroad embankments that connected with the Alameda Point ferry terminals. From the late 1800s until the 1920s, two coal gas plants and an oil refinery (Pacific Coast Oil Works), an asphalt pipe manufacturing plant, a soap company, a carriage factory, and other manufacturing businesses were located near the present-day site (Willard 1988). These facilities may have discharged petroleum products, trace metals, and other wastes, which were deposited along the sides of tidal channels and on the surface of marshlands near the present-day site.

IR Site 31 is located in an area that was created by diking, draining, and then filling tidelands, marshlands, and sloughs, beginning in the early 1900s and continuing until 1927. This is documented by a fill history (Figure 4-2) compiled by Bechtel Environmental, Inc. (Appendix H-2) and confirmed by historical maps of IR Site 31 (Figures A-1 through A-4 in Appendix A), which show that the land was predominantly undeveloped before 1927.

As the marshlands and intertidal areas were filled in, the discharged petroleum products became entrapped in the subsurface, creating what is now referred to as the Marsh Crust. The Marsh Crust layer consists of entrapped organic matter with medium- to heavy-weight petroleum hydrocarbons situated at the original marshland and tidal channel surface across Alameda Point. (Neptune et al. 2002; PRC Environmental Management, Inc. [PRC] and Versar 1996). Subsequent filling actions have buried the Marsh Crust at depths reported to range from 8 feet to 15 feet below ground surface (bgs). The fill material that overlies the Marsh Crust consists mostly of dredged sediment from the Oakland Inner Harbor. The fill used to create the site is believed to contain Oakland Inner Harbor dredge materials (IT 2001), which contained characteristic manufactured coal gas waste (coal ash with abundant trace metals and PAH coal tar) from shoreline plant sites in Oakland and Alameda (Bechtel Environmental, Inc. [BEI] 2004b).

The last documented dredged fill event at Site 31 occurred in 1927. In 1929, construction of the SFBA, an airfield consisting of two runways and a hangar, was

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2	**IR Site 31**	**Section 2.1**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.3, Pages 1-7 to 1-10, Appendix K, Figures 1-2, 4-2, and A-1 to A-9. CDM 2007.

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The last documented dredged fill event at Site 31 occurred in 1927. In 1929, construction of the SFBA, an airfield consisting of two runways and a hangar, was

initiated on a rectangular tract consisting of 458 acres of reclaimed marshland that was bounded by Atlantic Avenue to the south, Main Street to the west, the Bethlehem Steel Shipbuilding Company yard to the north, and Webster Street to the east. The SFBA was used primarily by private airplanes and business air fleets. A second hangar was added after 1930 when the SFBA was operated jointly with the Army's Benton Field from 1930 to 1936, where after the Navy took possession. The Navy closed the SFBA in 1941 with the construction of the newer airfield further west on Alameda Point (Freeman 2006). IR Site 31 is located in the northwestern corner of the former SFBA property. Figures A-5 through A-7 show the SFBA property, hangars, and the IR Site 31 boundaries.

An aerial photograph from 1947 (Figure A-6) shows the presence of housing across the northwestern corner of the site. Construction of this housing may have included the addition of construction fill. The southern half of the site had a railway switchyard in the southern perimeter. The railway switchyard remained present until 1953 (Figures A-6 through A-8), at which time the land was graded again. Buildings 369 and 172 (Figure 1-3) were established within the southwest corner of IR Site 31 boundaries, and a storage lot was set up within the eastern half of IR Site 31 boundaries. The storage lot was apparently used for equipment and was not surfaced.

An aerial photograph from 1959 (Figure A-9) shows the former military housing areas on the northwest corner of IR Site 31 and much of IR Site 30 were demolished, paved over, and apparently used as a storage yard. Aerial photographs document that this storage continued on the site until approximately 1985. Aerial photograph review shows that between 1985 and 1993, Buildings 369 and 172 were demolished, and approximately 160 units of the Marina Village Coast Guard Housing were built on IR Site 31.

The Navy completed a Proposed Housing Site Investigation in January 1987 to provide an FS for upgrading the Naval Supply Center Annex for future Navy family housing units (Bissell and Karn, Inc. 1987). It was recommended that the structures be placed on a 4-foot thick layer of engineered fill for adequate support. To achieve this, it was recommended that the upper 2 feet of existing material be reworked and compacted in 12-inch lifts on top of a geotextile fabric. Then an additional 2 feet of imported, non-expansive fill would be placed on top of the reworked fill and compacted in 8-inch lifts. The design drawings (Appendix K) specify the houses be constructed on a total of 4 feet of compacted fill.

The Navy completed an investigation of potential soil and groundwater contamination associated with past activities at the NAS Alameda Supply Annex warehouse area (ERM-West 1987). The study indicated that concentrations of metals were "elevated" in the northern portion of the warehouse area and recommended additional soil samples be collected and analyzed for metals. In 1988, additional soil sampling was conducted, and analytical data indicated high levels of nickel and chromium in the northern

portion of the study area and in the background soil (ERM-West 1988). It was recommended that replacing the top 6 inches to 1 foot of soil in the northern portion of the site would reduce potential risks associated with direct contact with soil at the housing development in the northern portion of the warehouse area.

The ERM study was for the warehouse area, which included areas south of Site 31, and addressed only the southern portion of Site 31. The study made no estimates of human health risk and only reported metals as "elevated" above a median value derived from the results of the 29 sample analyses performed during that study. Construction specifications (Appendix K) specify removal of 6 inches of Site 31 soil prior to importing fill for the housing construction.

The referenced reports (ERM 1987 and 1988) were thoroughly reviewed and discussed with the regulatory agencies during development of the RI work plan and sampling and analysis plan (SAP). Information from these reports was used in developing the investigation and selecting sample locations. The Phase 1 and Phase II ERM reports make repeated mention that the investigation reviewed past use and aerial photos and found no evidence of a spill or release. In addition, the report clearly states that the very limited investigation "was not sufficiently detailed to identify the extent of contamination...." The area sampled extended significantly beyond the southern and eastern boundaries of the current IR Site 31. The Phase II report identified soil analytes of concern as chromium and nickel. For the combined Phase I and II, there were 18 locations sampled and 29 soil samples analyzed. Approximately 10 of the locations were within the current Site 31 area. Only two analyses of chromium were detected at concentrations greater than the current residential preliminary remediation goal (PRG) values (residential preliminary remediation goal [rPRG] - 210 milligrams per kilogram [mg/kg]). The Phase II ERM report shows these two chromium sample results are associated with two soil sample locations (SB-1 north side of Building 369 and SB-3 in the eastern quarter of Site 31) within the area of current Site 31. The reported values for chromium at location SB-1 were 360 mg/kg at a depth of 0 to 0.5 feet bgs; at location SB-3, the sample from 1 to 1.5 feet bgs reported chromium at 250 mg/kg. Chromium data collected during the Site 31 RI did not exceed the current rPRG.

In 1989, the Navy recommended installing a vapor barrier under proposed housing units to mitigate the potential of benzene migrating to indoor air (Woodward-Clyde Consultants 1989). In late 1989, a risk assessment was conducted for the Marina Village Housing Units. Based on the location and distribution of benzene and naphthalene in groundwater, it was determined that these contaminants likely originated in the FISCA screening lot and scrapyard area adjacent to the site and that there was no evidence of an onsite source (PRC 1990).

In 1993, the Navy reported that the Marina Village housing units were completed with an underlying barrier intended to be impermeable to VOC vapors. The final approved

drawings for the housing units, dated 29 March 1990, have been included as Appendix K. The drawings specify the soil removal, addition of fill soil, and details for the foundation base, sand fill, and the planned location for the vapor barriers. The drawings indicate that the following fill activities occurred prior to building the housing units: removal of a 3-inch asphalt layer, removal of 6 inches of soil, reconditioning of existing fill, addition of 2-feet minimum imported construction fill, and compaction of 4 feet of fill, addition of 4 inches of capillary material, placement of a 40-mil vapor barrier, addition of 2 inches (minimum) of sand, and addition of an 8-inch slab.

1.3.4 Operations Adjacent to IR Site 31

IR Site 31 is located near four IR sites: 25 and 30 on Alameda Point and IR-01 and IR-02 on FISCA where many environmental investigations and remediation activities have been conducted. Portions of IR Sites 25, 30, and 31 are underlain by a groundwater plume comprised of dissolved phase benzene and naphthalene that also underlies a portion of FISCA Sites IR-01 and IR-02. The highest concentrations of these chemicals are centered under FISCA Site IR-02 and the southeastern portion of IR Site 25 (see Section 1.3.5.7). The groundwater RI for this plume has already been completed. Descriptions of these four sites and their historical operations are presented below. Like IR Site 31, both of these sites were marshlands until the early 1900s when imported fill material was used to create the land present today.

1.3.4.1 IR Site 25

IR Site 25 is located immediately northwest of IR Site 31 and has been used historically for military housing. The site presently contains the U.S. Coast Guard North Village multi-unit housing structures, a community center, a housing office, and a park containing baseball and soccer fields and a fitness course. There are currently no residents in this housing, which is not planned for future use by the U.S. Coast Guard. The primary contaminants in soil at IR Site 25 are PAHs that are theorized to have originated from the historical emplacement of contaminated fill material (Neptune et al. 2002). The Navy conducted two removal actions at IR Site 25 where approximately 66,763 cubic yards of PAH-contaminated soil was removed across approximately 26 acres.

1.3.4.2 IR Site 30

IR Site 30 is located northeast of IR Site 31 and was also first developed as part of the former SFBA although development was limited to grading and grass cover. The SFBA was constructed in 1929 and used primarily by private airplanes and business air fleets until it was closed in 1941.

Legend

- IR Site Boundary
- Fisc Annex

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Feet
0 100 200 400

1 inch equals 385 feet

Aerial Photo Source: USGS, High Resolution Orthoimage
0.3 Meter (1 Foot) resolution
San Francisco-Oakland, CA, 2004

Draft Final Soil Remedial Investigation
for IR Site 31
Figure 1-2
Location Map

Alameda, California

CDM

Date: 6/07/07
File No.: 060118
Job No.: 6229-003
Rev No.: A

Document: M:\alameda\avquery\RI Figures\Revised\060117_Figure 1-2SiteVicinityMap.mxd

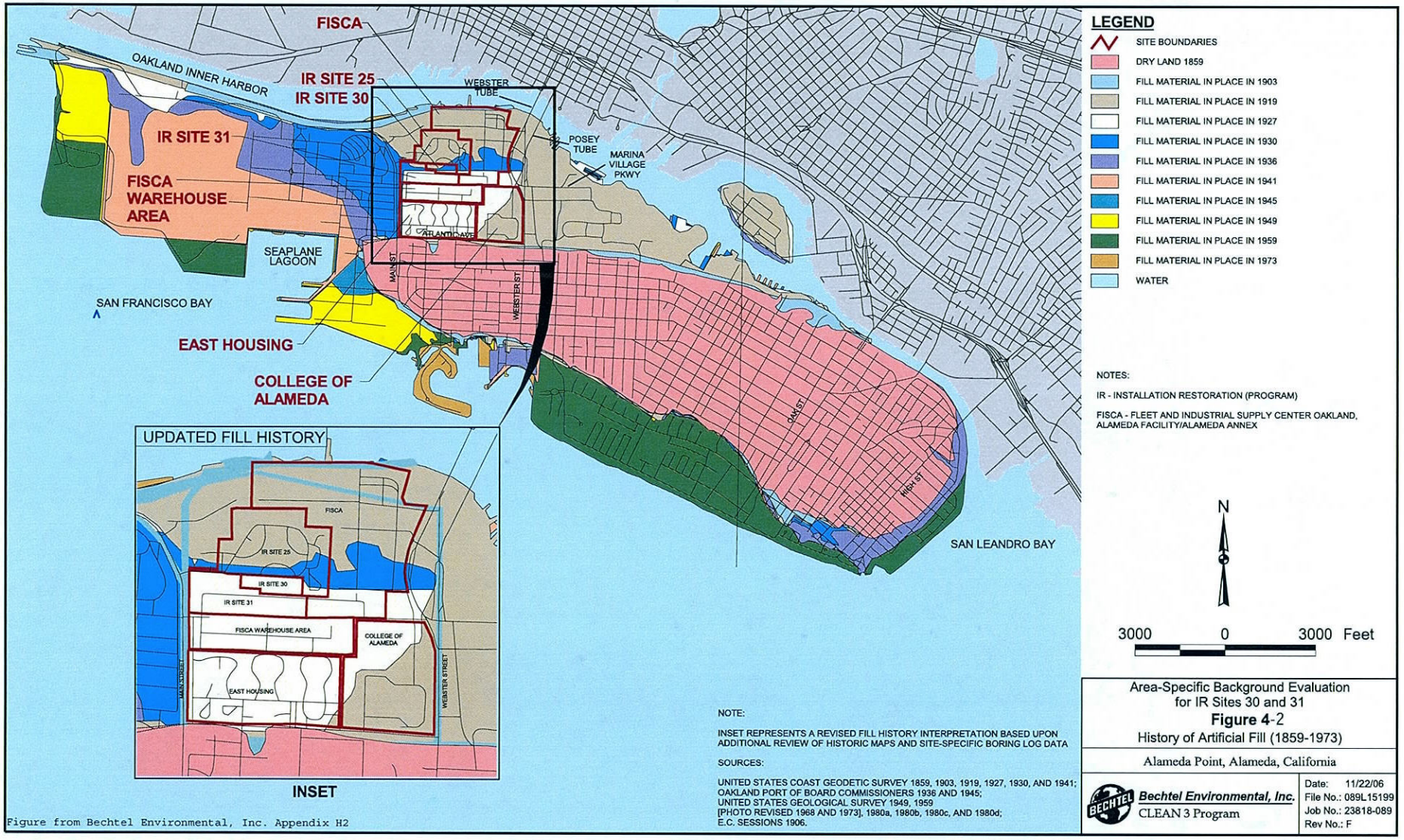
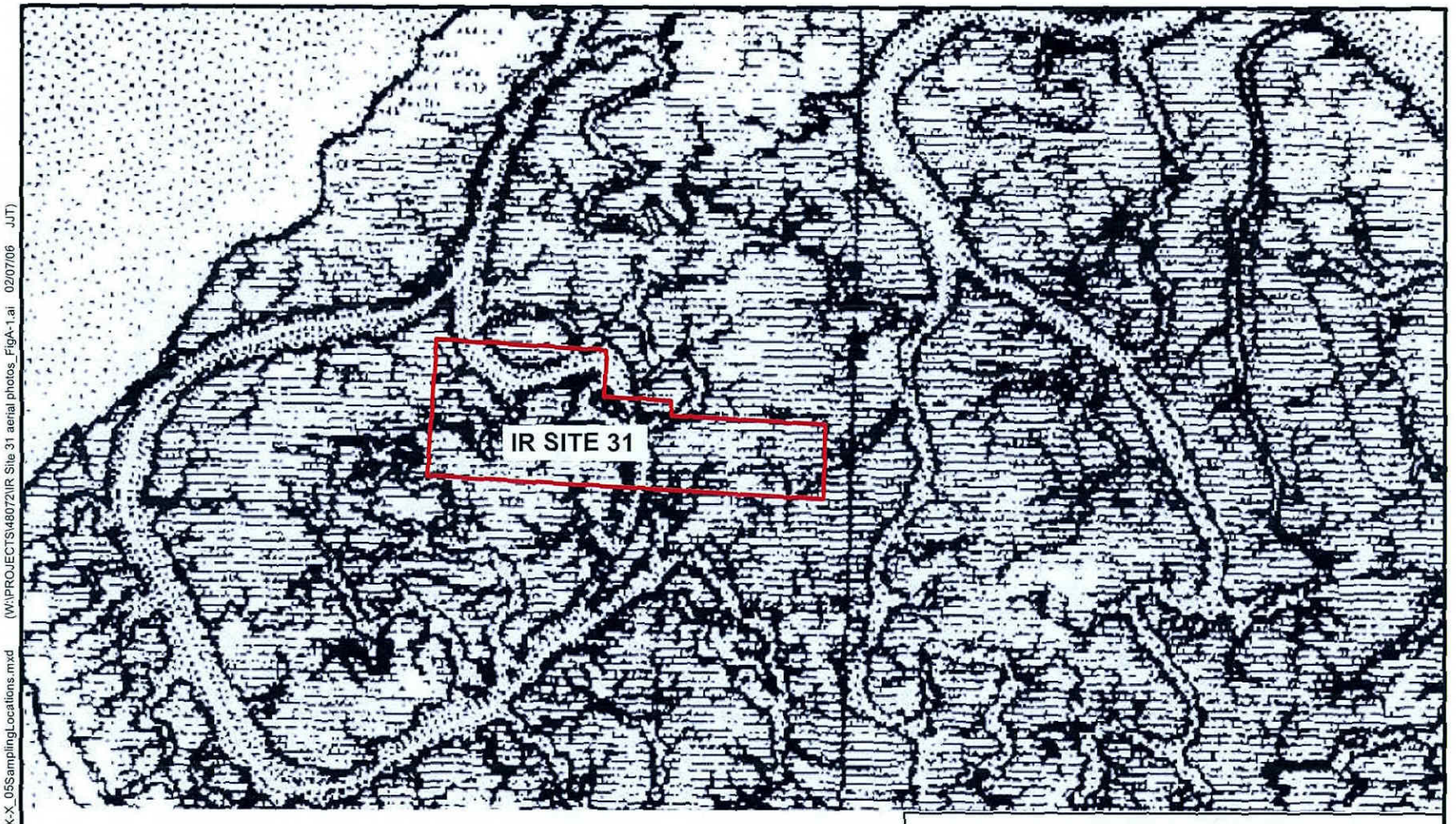


Figure from Bechtel Environmental, Inc. Appendix H2



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SOURCE: 1859 NAUTICAL CHART. SCALE 1:50,000.

Draft Final Soil RI Report for IR Site 31

Figure A-1

IR Site 31 Historical Map, 1859

Alameda, California

CDM

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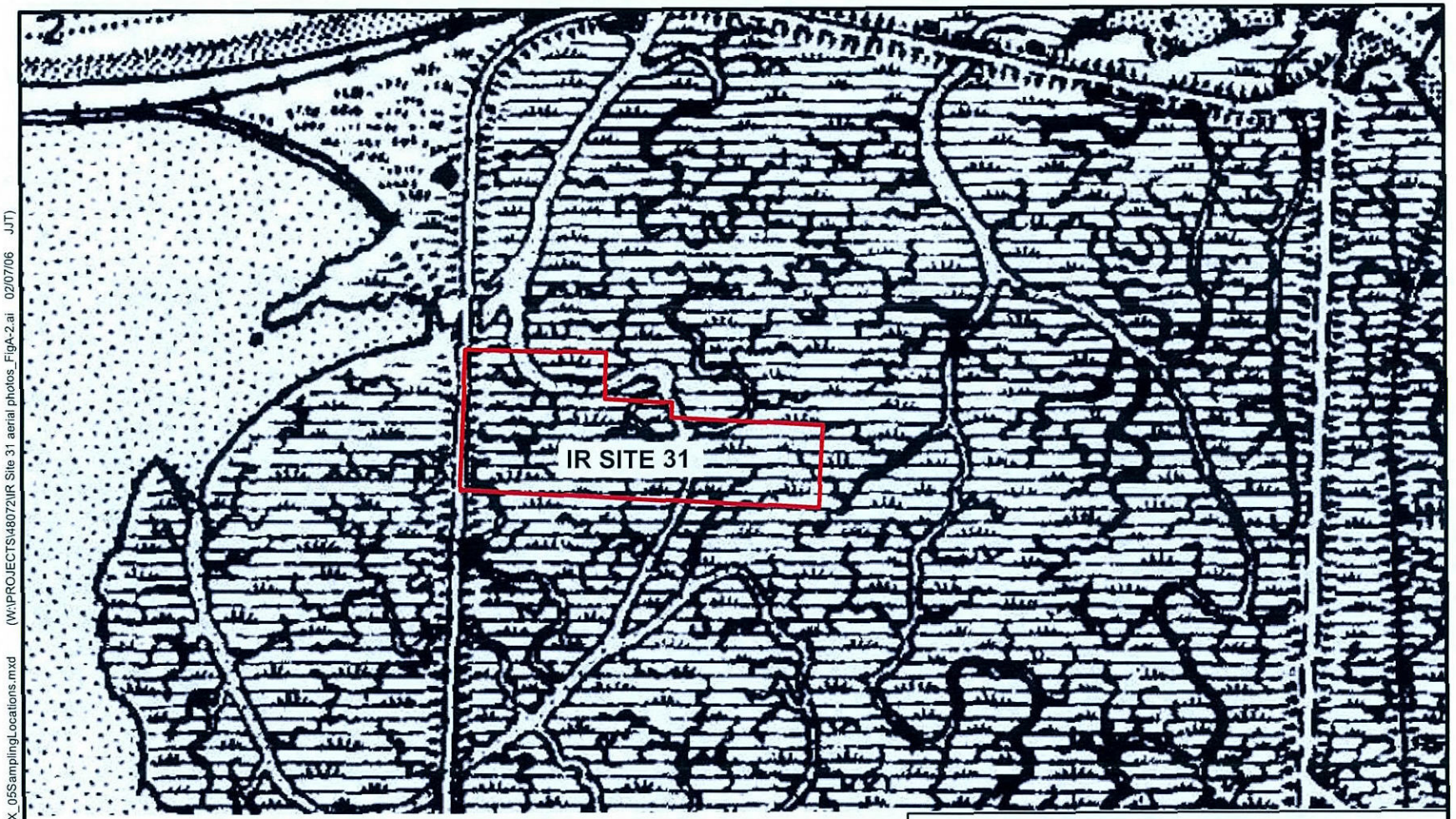

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SOURCE: 1903 NAUTICAL CHART. SCALE 1:50,000.

Draft Final Soil RI Report for IR Site 31

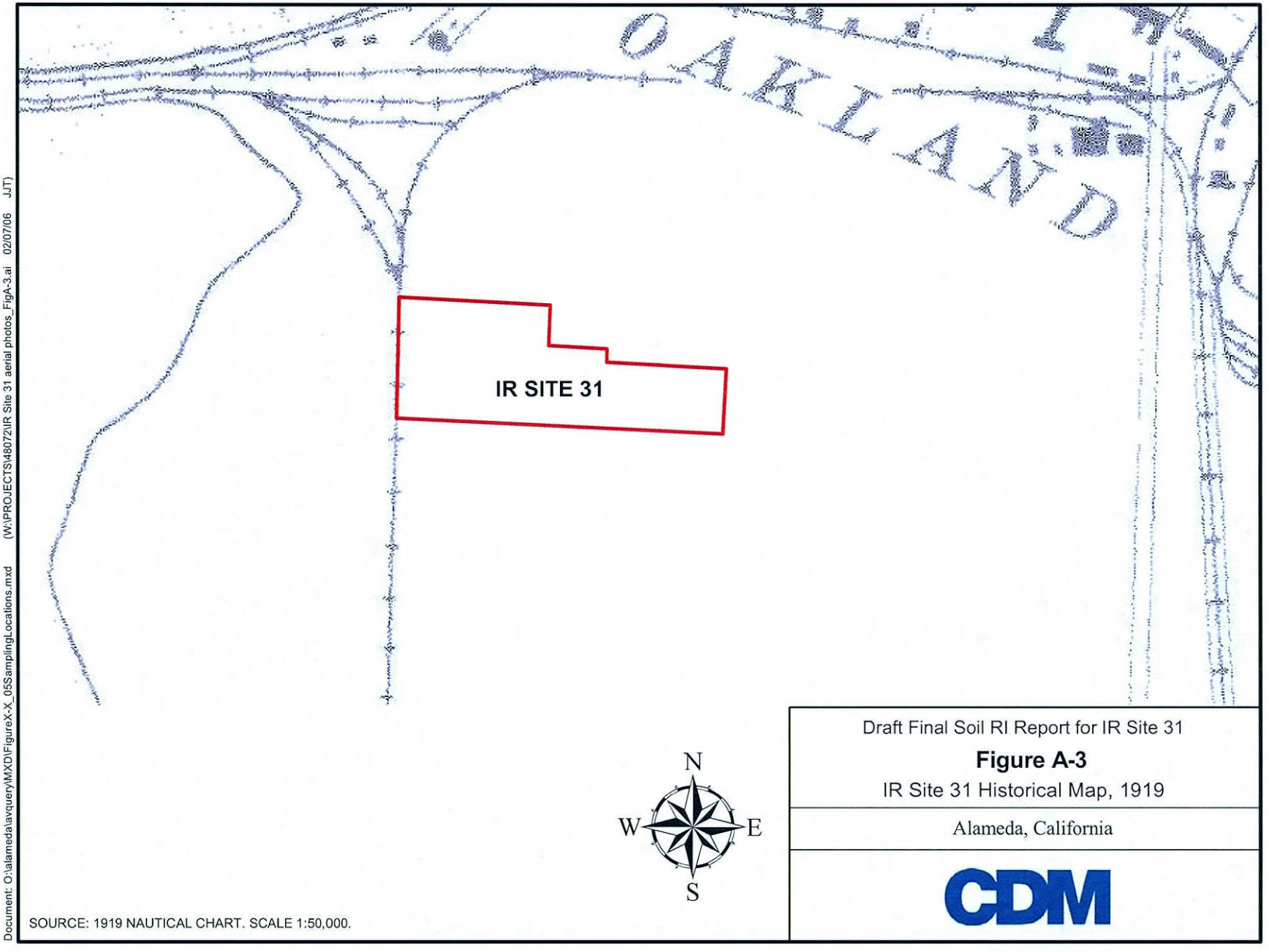
Figure A-2

IR Site 31 Historical Map, 1903

Alameda, California

CDM

Document: O:\alameda\avquery\MXD\FigureX-X_05SamplingLocations.mxd (W:\PROJECTS\48072\IR Site 31 aerial photos_FigA-2.ai 02/07/06 JJT)



Draft Final Soil RI Report for IR Site 31

Figure A-3

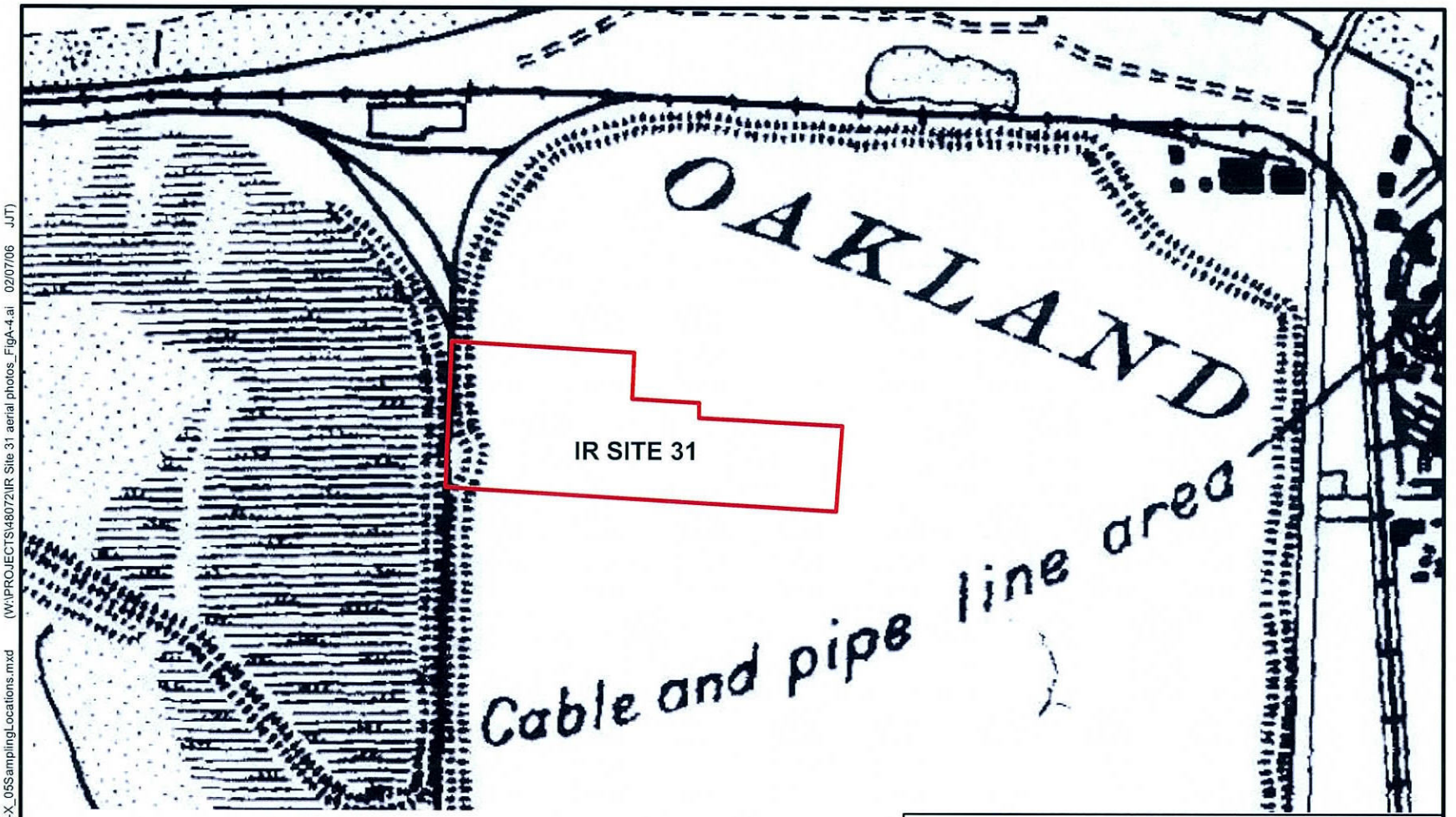
IR Site 31 Historical Map, 1919

Alameda, California

CDM

SOURCE: 1919 NAUTICAL CHART. SCALE 1:50,000.

Document: O:\alameda\avquery\MXD\FigureX-X_05SamplingLocations.mxd (W:\PROJECTS\48072\IR Site 31 aerial photos_FigA-3.ai 02/07/06 JJT)



Draft Final Soil RI Report for IR Site 31

Figure A-4

IR Site 31 Historical Map, 1927

Alameda, California

CDM

SOURCE: 1927 NAUTICAL CHART. SCALE 1:50,000.

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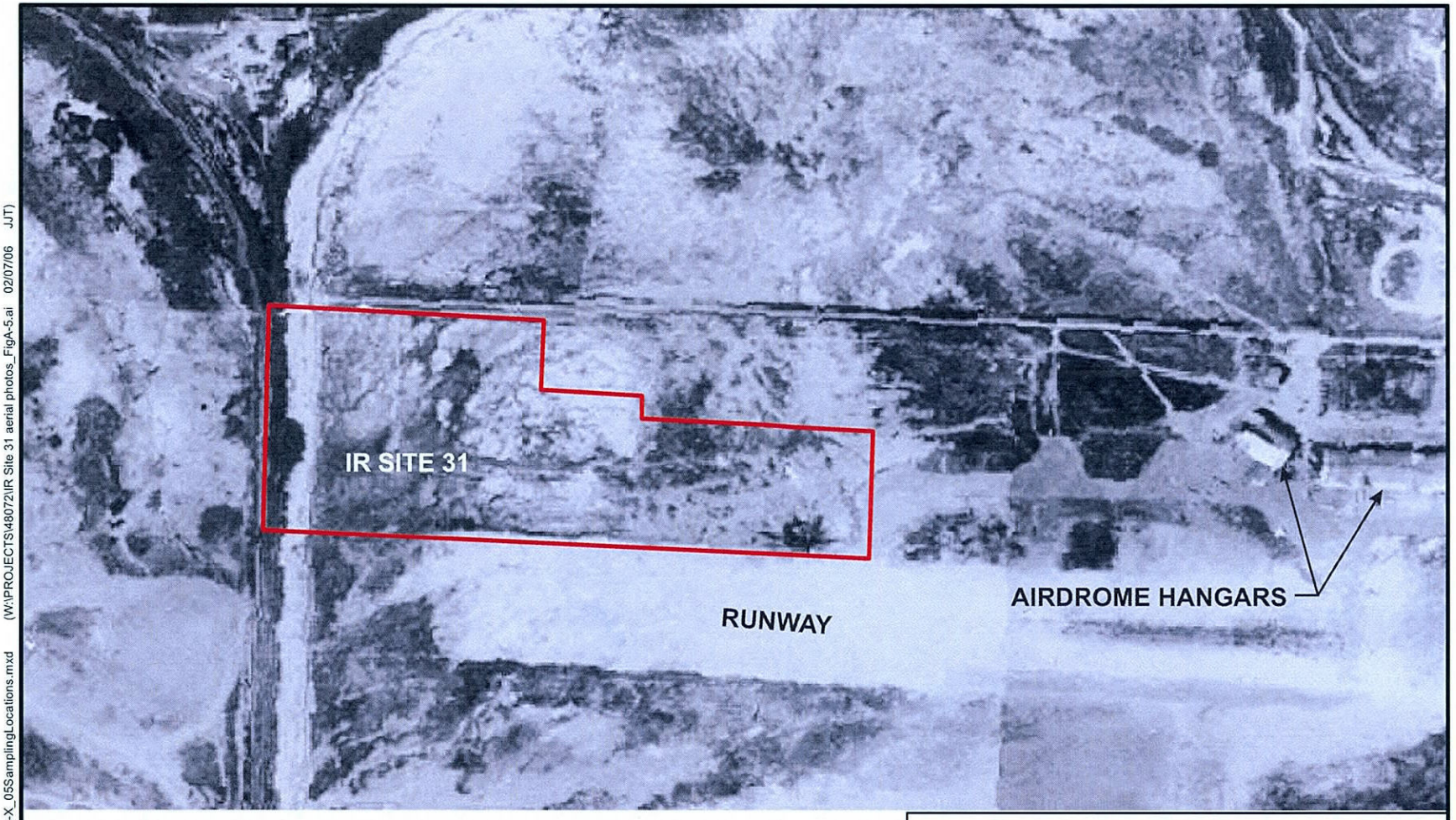

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SOURCE: UNITED STATES NAVAL RESERVE. 1937. PROPOSED NAVAL AIR STATION AND SUPPLY DEPOT SITE, SOUTH WESTERN HARBOR AREA, ALAMEDA AND OAKLAND. SCALE 1:12000. SEPTEMBER.

Draft Final Soil RI Report for IR Site 31

Figure A-5

IR Site 31 Aerial View, 1937

Alameda, California

CDM

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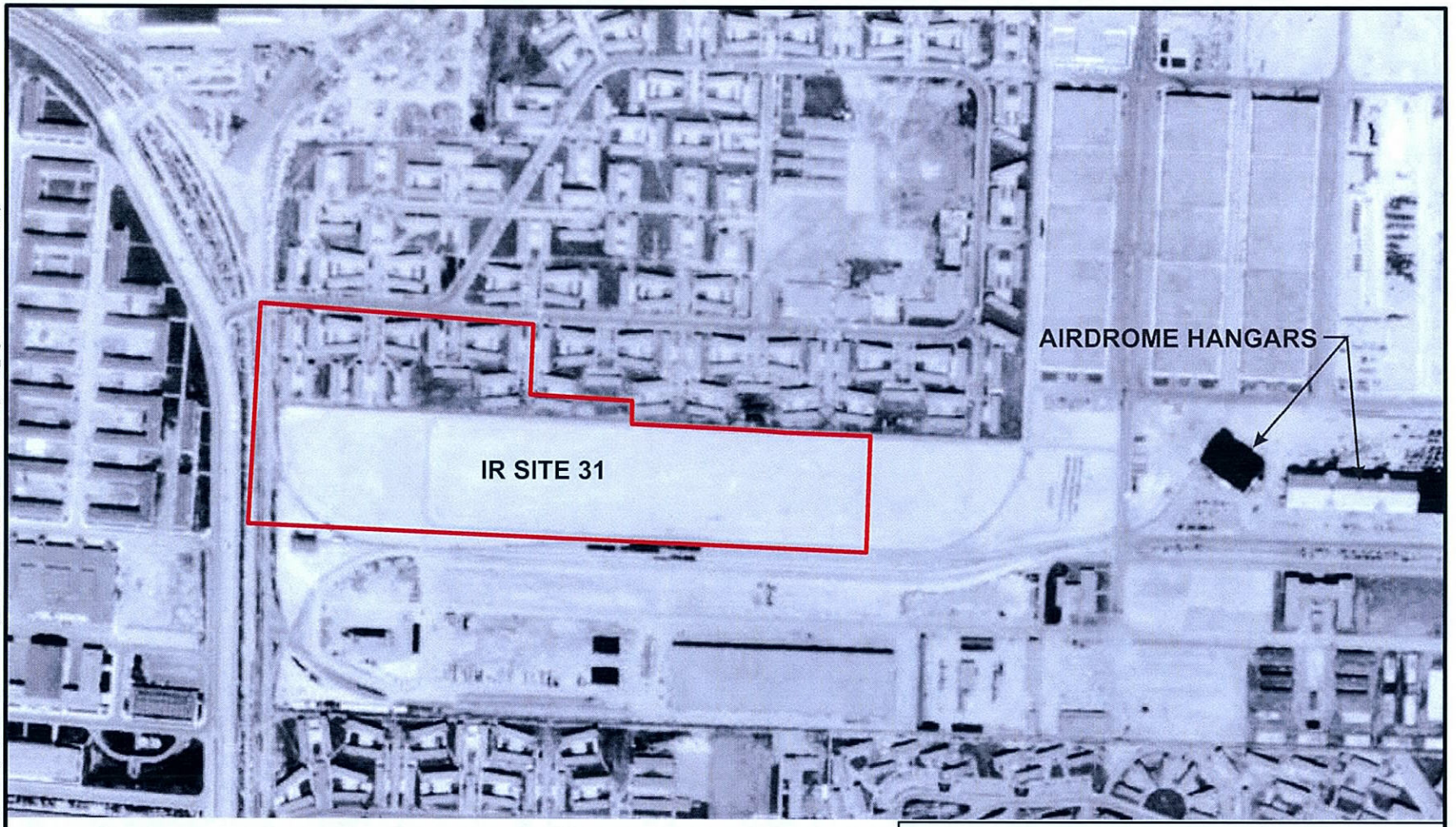

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SOURCE: PACIFIC AERIAL SURVEYS. 1947. SCALE 1:20,000.

Draft Final Soil RI Report for IR Site 31

Figure A-6

IR Site 31 Aerial View, 1947

Alameda, California

CDM

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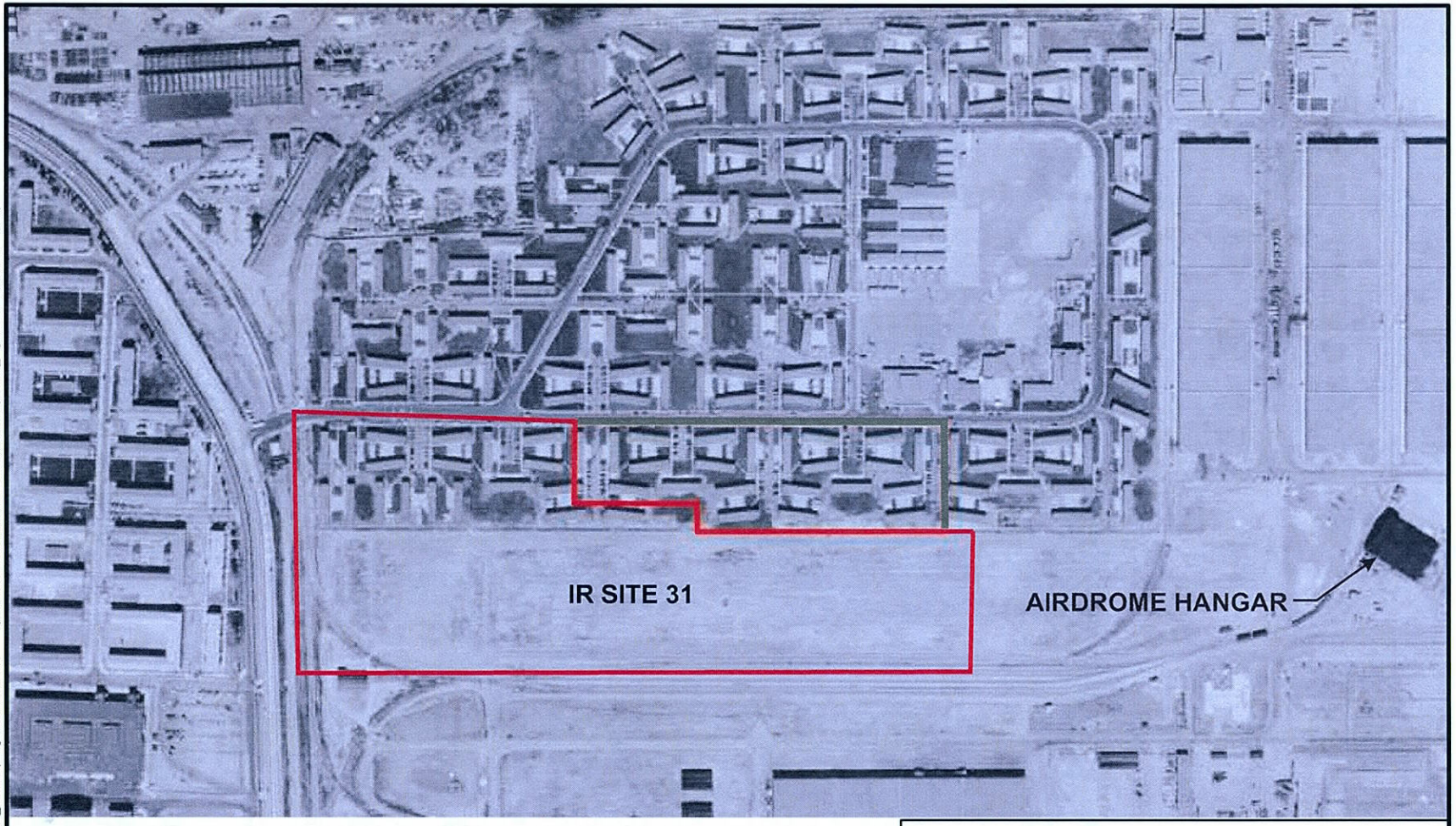

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SOURCE: PACIFIC AERIAL SURVEYS. 1949. SCALE 1:9,500.

Draft Final Soil RI Report for IR Site 31

Figure A-7

IR Site 31 Aerial View, 1949

Alameda, California

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SOURCE: PACIFIC AERIAL SURVEYS. 1953. SCALE 1:10,000.

Draft Final Soil RI Report for IR Site 31

Figure A-8

IR Site 31 Aerial View, 1953

Alameda, California

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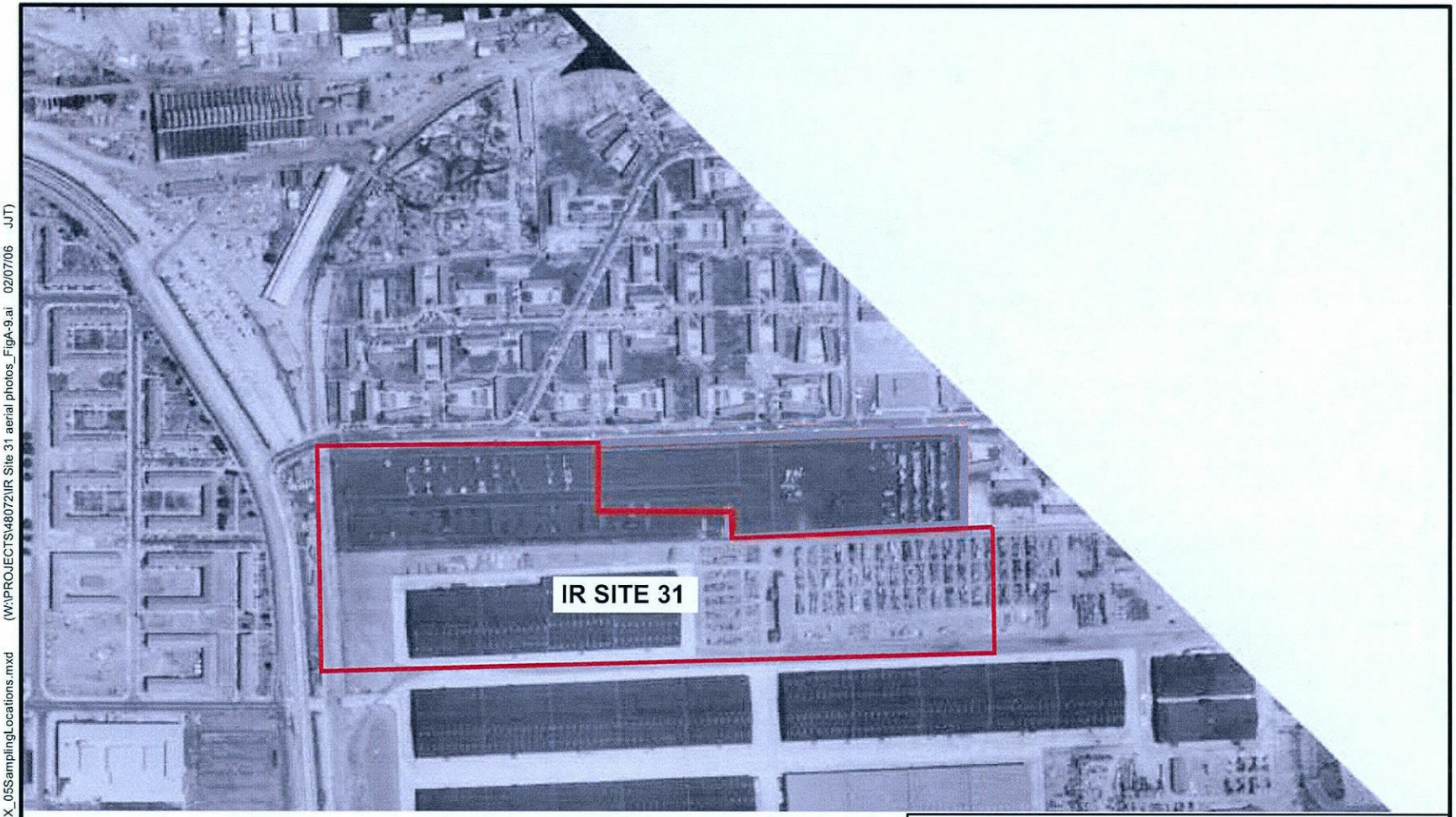

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SOURCE: PACIFIC AERIAL SURVEYS. 1959. SCALE 1:9,600.

Draft Final Soil RI Report for IR Site 31

Figure A-9

IR Site 31 Aerial View, 1959

Alameda, California

CDM

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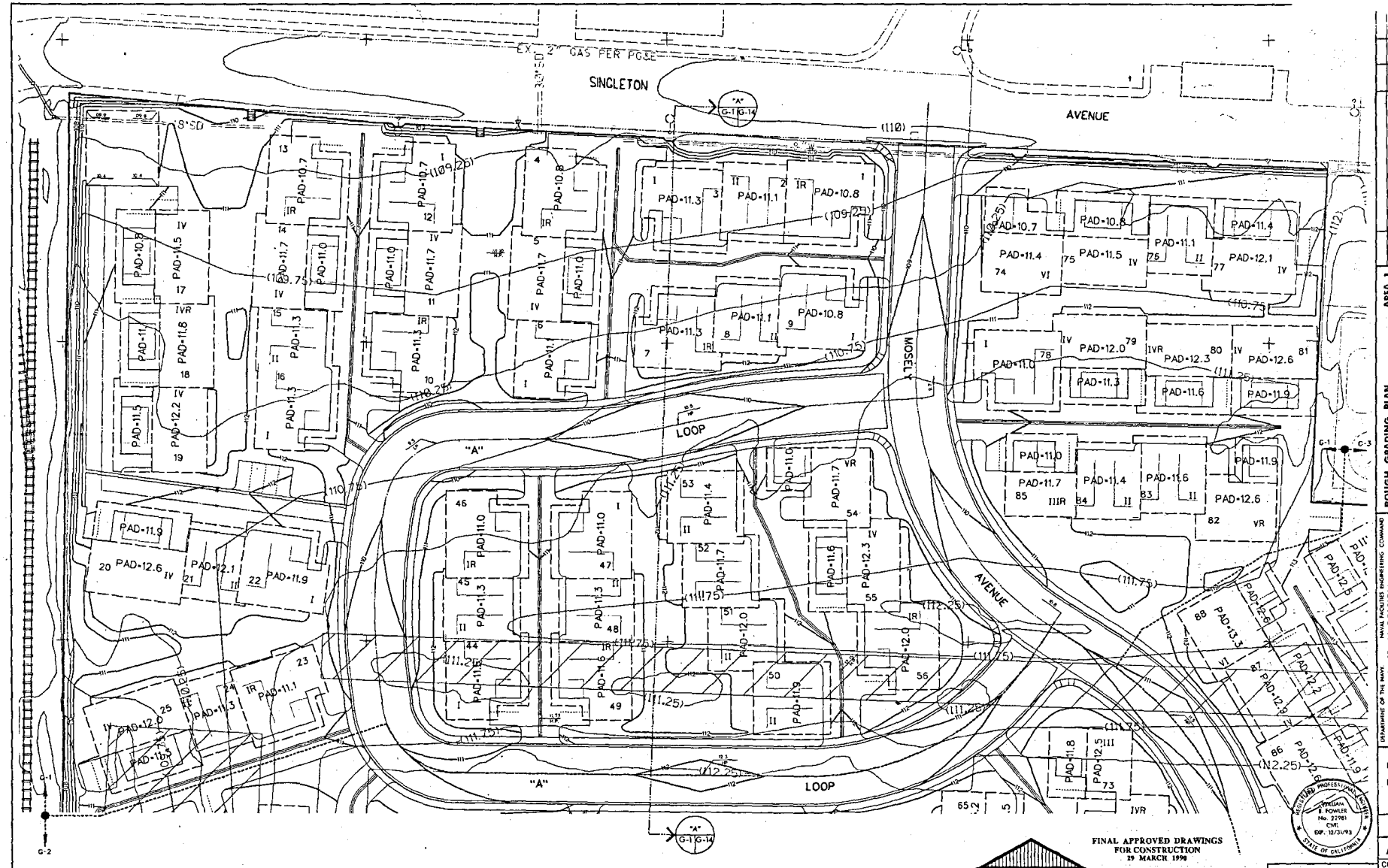

NOTE: THIS PLAN REPRESENTS ELEVATIONS FOR ROUGH GRADING OF STREETS, ALLEYS, YARDS AND BUILDING PADS PRIOR TO IMPORTING 2 FEET OF FILL. THE EXISTING TOPOGRAPHY SHOWN HEREON REPRESENTS A LEVEL OF SOIL AFTER REMOVAL OF 3" OF ASPHALT AND 6" OF CONTAMINATED SOIL. NOTE THAT THE CROSSHATCHED AREAS REPRESENT LOCATIONS WHERE ASPHALT DID NOT EXIST ON THE SITE - THEREFORE ADD 3" TO EXISTING CONTOURS IN THESE AREAS.

SEE SHT. G-8 FOR NOTES
SEE SHT. G-4 FOR LEGEND

REVISIONS

ROUGH GRADING PLAN — AREA 1

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND — WESTERN DIVISION — SAN BRUNO, CALIFORNIA

PUBLIC WORKS CENTER - SAN FRANCISCO
ALAMEDA ANNEX
FY 97 300 FAMILY HOUSING UNITS

BY HUNT BUILDING CORPORATION

SIZE D
IF SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT - SCALE REDUCED ACCORDINGLY

CODE IDENT. NO.

PROJ. LOCATION
ALAMEDA ANNEX

CONSTR. CONTR. NO.
N62474-87-C-7769

SPEC. 12-87-7769

NAVFAC DWG. NO.
6364361

SHEET 10 OF 132

G-1

HUNT BUILDING CORPORATION

SPECTRUM LAND PLANNING
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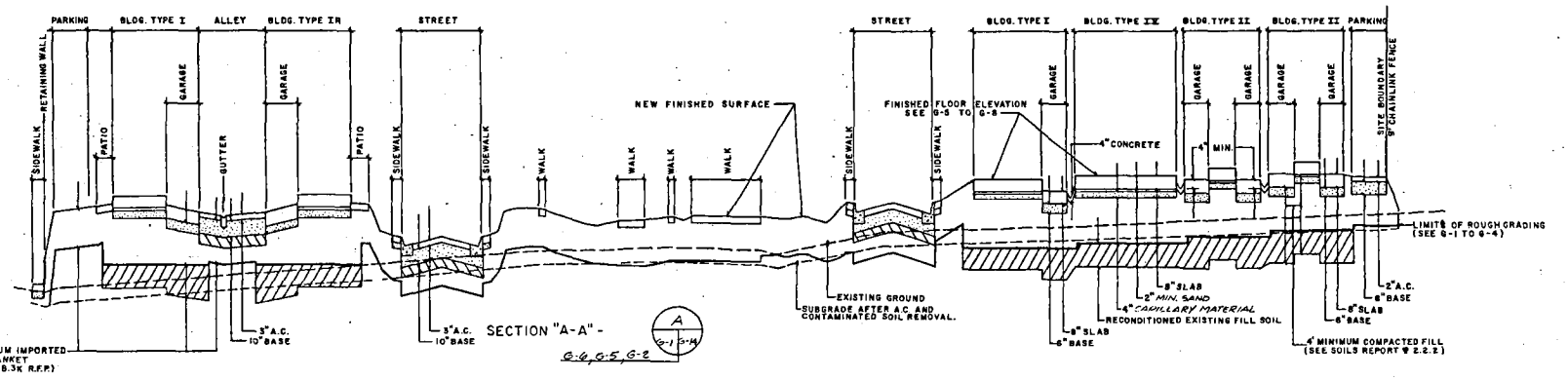
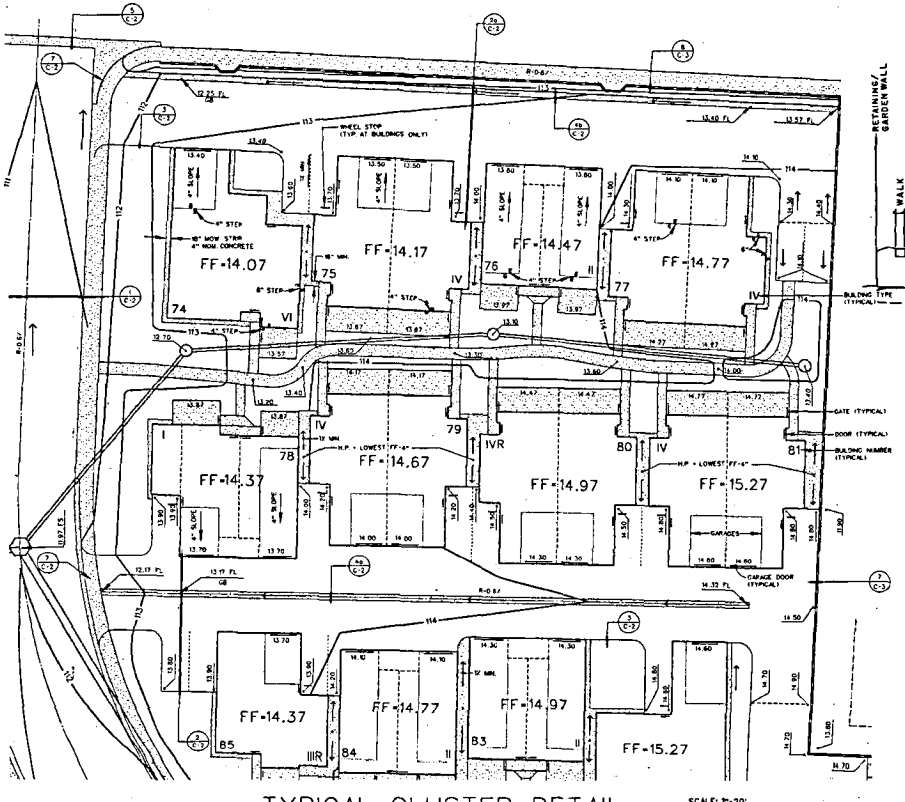


SECTION "A-A" - A G-1 G-14

G-6, G-5, G-2



TYPICAL CLUSTER DETAIL

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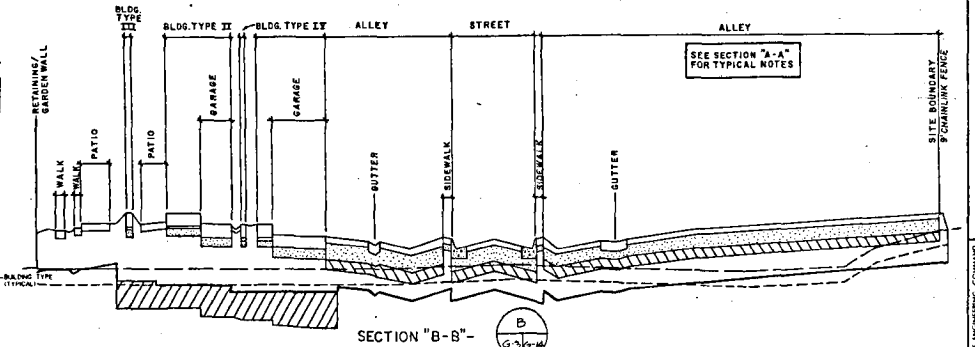
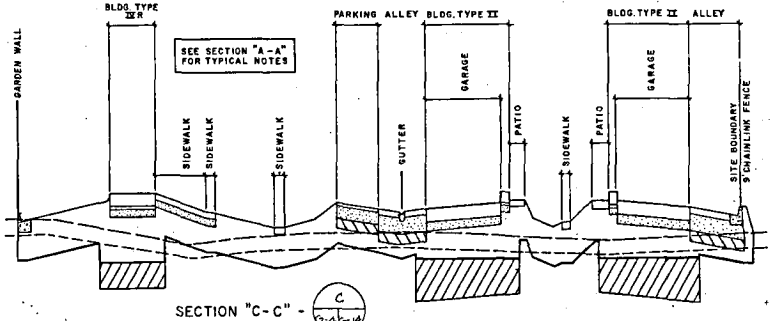


SECTION "B-B" - B G-3 G-14

G-7



SECTION "C-C" - C G-4 G-14

G-8

REGISTERED PROFESSIONAL ENGINEER WILLIAM S. FOWLER No. 22981 CIVIL EXP. 12/31/93 STATE OF CALIFORNIA

SCALE

VERT.: 1"=5'

HORIZ.: 1"=30'

FINAL APPROVED DRAWINGS FOR CONSTRUCTION 29 MARCH 1990

HUNT BUILDING CORPORATION P.O. BOX 9566 • EL PASO, TEXAS • (915) 533-1122

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REVISIONS

SYMBOL	DESCRIPTION	PREP. BY	DATE	APPROVED

GRADING DETAILS

DESIGNED BY: BCW WBF | DR: SK | CHK: RJS | REVIEWED BY: | DATE

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND WESTERN DIVISION SAN BRUNO, CALIFORNIA

PUBLIC WORKS CENTER - SAN FRANCISCO ALAMEDA ANNEX FY 89 300 FAMILY HOUSING UNITS

BY HUNT BUILDING CORPORATION P.O. BOX 9566 EL PASO, TEXAS 79985 (915) 533-1122

SIZE D

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CODE IDENT. NO.

PROJ. LOCATION ALAMEDA ANNEX

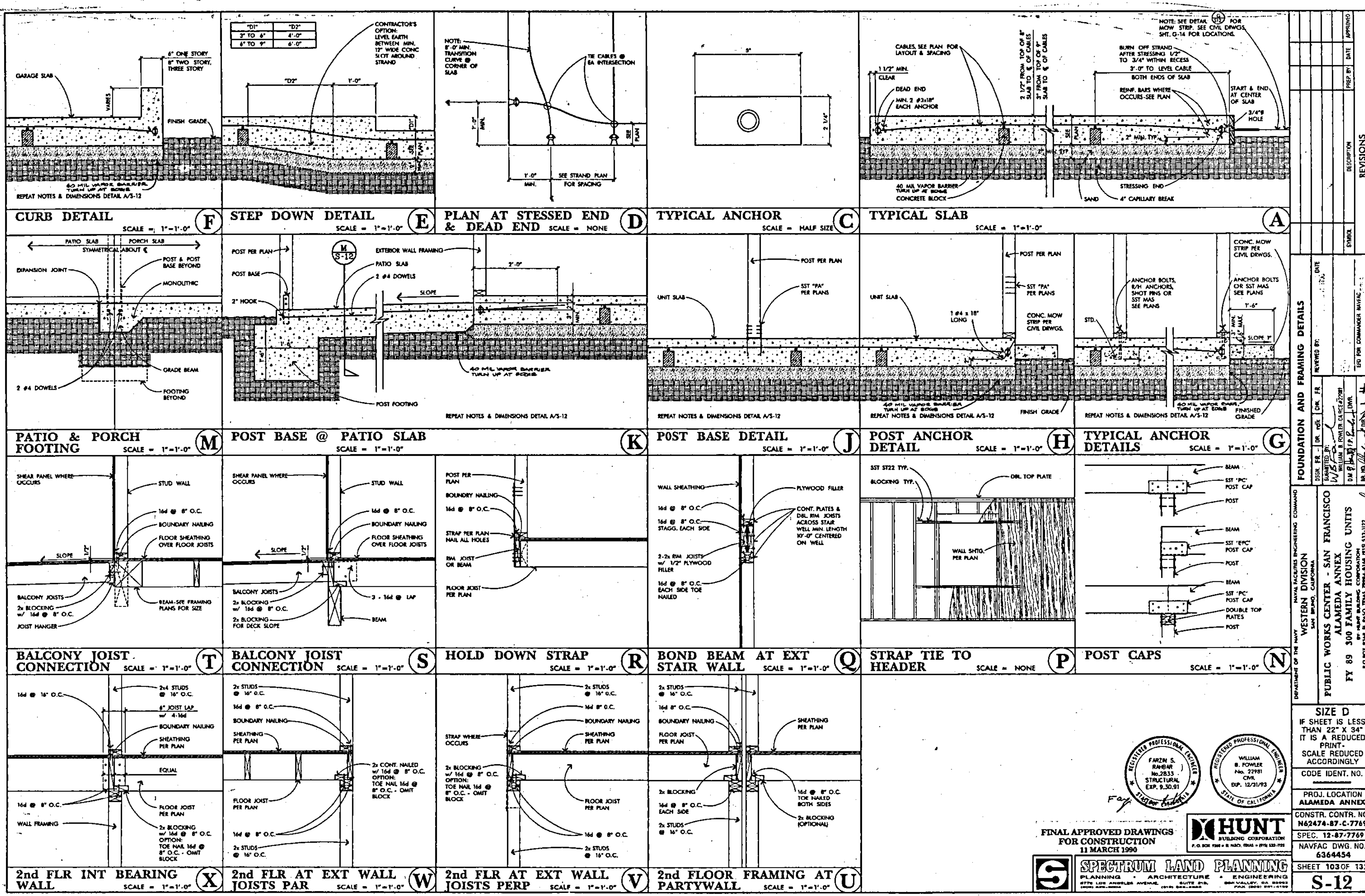
CONSTR. CONTR. NO. N62474-87-C-7769

SPEC. 12-87-7769

NAVFAC DWG. NO. 6364374

SHEET 23 OF 132

G-14



CURB DETAIL SCALE = 1"=1'-0" F
STEP DOWN DETAIL SCALE = 1"=1'-0" E
PLAN AT STESSED END & DEAD END SCALE = NONE D
TYPICAL ANCHOR SCALE = HALF SIZE C
TYPICAL SLAB SCALE = 1"=1'-0" A
PATIO & PORCH FOOTING SCALE = 1"=1'-0" M
POST BASE @ PATIO SLAB SCALE = 1"=1'-0" K
POST BASE DETAIL SCALE = 1"=1'-0" J
POST ANCHOR DETAIL SCALE = 1"=1'-0" H
TYPICAL ANCHOR DETAILS SCALE = 1"=1'-0" G
BALCONY JOIST CONNECTION SCALE = 1"=1'-0" T
BALCONY JOIST CONNECTION SCALE = 1"=1'-0" S
HOLD DOWN STRAP SCALE = 1"=1'-0" R
BOND BEAM AT EXT STAIR WALL SCALE = 1"=1'-0" Q
STRAP TIE TO HEADER SCALE = NONE P
POST CAPS SCALE = 1"=1'-0" N
2nd FLR INT BEARING WALL SCALE = 1"=1'-0" X
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2nd FLR AT EXT WALL JOISTS PERP SCALE = 1"=1'-0" V
2nd FLOOR FRAMING AT PARTYWALL SCALE = 1"=1'-0" U
REPEAT NOTES & DIMENSIONS DETAIL A/S-12
FINAL APPROVED DRAWINGS FOR CONSTRUCTION 11 MARCH 1990
HUNT BUILDING CORPORATION
SPECTRUM LAND PLANNING
PLANNING · ARCHITECTURE · ENGINEERING
REVISIONS
FOUNDATION AND FRAMING DETAILS
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
WESTERN DIVISION SAN BRUNO, CALIFORNIA
PUBLIC WORKS CENTER - SAN FRANCISCO
ALAMEDA ANNEX
FY 89 300 FAMILY HOUSING UNITS
SIZE D
IF SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT-SCALE REDUCED ACCORDINGLY
CODE IDENT. NO.
PROJ. LOCATION ALAMEDA ANNEX
CONSTR. CONTR. NO. N62474-87-C-7769
SPEC. 12-87-7769
NAVFAC DWG. NO. 6364454
SHEET 103 OF 132
S-12

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
3	Marsh Crust	Section 2.1	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.3, Page 1-7. CDM 2007.

1.3.3 Site Description and Operations

IR Site 31 is a 24.9-acre site located at the eastern end of Alameda Point (Figure 1-2). The site is bounded by IR Site 25 to the north, IR Site 30 to the northeast, and the non-Navy Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex (FISCA) Former Warehouse Area to the east and south. The FISCA Defense Reutilization and Marketing Office (DRMO) Scrapyard and Screening Lot are located east of IR Site 31.

In the late 1800s, the area was intertidal marsh lands and included municipal railroad embankments that connected with the Alameda Point ferry terminals. From the late 1800s until the 1920s, two coal gas plants and an oil refinery (Pacific Coast Oil Works), an asphalt pipe manufacturing plant, a soap company, a carriage factory, and other manufacturing businesses were located near the present-day site (Willard 1988). These facilities may have discharged petroleum products, trace metals, and other wastes, which were deposited along the sides of tidal channels and on the surface of marshlands near the present-day site.

IR Site 31 is located in an area that was created by diking, draining, and then filling tidelands, marshlands, and sloughs, beginning in the early 1900s and continuing until 1927. This is documented by a fill history (Figure 4-2) compiled by Bechtel Environmental, Inc. (Appendix H-2) and confirmed by historical maps of IR Site 31 (Figures A-1 through A-4 in Appendix A), which show that the land was predominantly undeveloped before 1927.

As the marshlands and intertidal areas were filled in, the discharged petroleum products became entrapped in the subsurface, creating what is now referred to as the Marsh Crust. The Marsh Crust layer consists of entrapped organic matter with medium- to heavy-weight petroleum hydrocarbons situated at the original marshland and tidal channel surface across Alameda Point. (Neptune et al. 2002; PRC Environmental Management, Inc. [PRC] and Versar 1996). Subsequent filling actions have buried the Marsh Crust at depths reported to range from 8 feet to 15 feet below ground surface (bgs). The fill material that overlies the Marsh Crust consists mostly of dredged sediment from the Oakland Inner Harbor. The fill used to create the site is believed to contain Oakland Inner Harbor dredge materials (IT 2001), which contained characteristic manufactured coal gas waste (coal ash with abundant trace metals and PAH coal tar) from shoreline plant sites in Oakland and Alameda (Bechtel Environmental, Inc. [BEI] 2004b).

The last documented dredged fill event at Site 31 occurred in 1927. In 1929, construction of the SFBA, an airfield consisting of two runways and a hangar, was

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
4	Habitats	Section 2.2	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 2.5, Pages 2-8 to 2-9. CDM 2007.

Buena Mud. The paleochannel was filled with low-permeability silts and clays with discontinuous layers of poorly graded sands associated with the BSU (TtEMI 1999a). Previous investigations suggest that the SWBZ in the vicinity of IR Site 31 is 40 to 50 feet thick and would be encountered at a depth of 36 to 55 feet bgs (TtEMI 1999a, PRC and Versar 2003).

Throughout Alameda Point, the SWBZ is subject to saltwater intrusion due to direct hydraulic connection with the Oakland Inner Harbor and the San Francisco Bay (TtEMI 2000). The SWBZ is underlain by the Yerba Buena Mud of the lower San Antonio Formation, which is thick and continuous, forming a regional aquitard (TtEMI 1999a).

Groundwater in the FWBZ at IR Site 31 was typically first encountered at 3.8 to 7 feet bgs in RI soil borings, which correlates to water table elevations between 3.3 feet AMSL (western portion of the site) and 8.6 feet AMSL (eastern portion of the site). In shallow IR Site 25 monitoring wells (generally screened at 10 to 20 feet bgs) located in the area surrounding IR Site 31, water table elevations vary seasonally and range from less than 1 to more than 10 feet AMSL (ITSI 2007a). At IR Site 31, the continuous clay layer separates the upper portion of the FWBZ (above 16 feet bgs) from the lower portion of the FWBZ (16 to 20 feet bgs). Nearby, IR Site 25 monitoring well D-02 is screened in the SWBZ at 95 to 105 feet bgs in the lower BSU. The cross-sections of Figures 2-4 through 2-9 show the differentiation of soil type at the shallower depth, which is approximately at a vertical extent of 30 feet bgs. Water levels for this well range from 4.8 to 6.7 feet MSL (ITSI 2007a). No paired wells are available to interpret potential vertical gradient between the FWBZ and SWBZ.

2.4.3 Surface Water Drainage System

Because there are no natural streams or ponds on Alameda Island, precipitation evaporates into the atmosphere, runs off in the storm drain network, or infiltrates to groundwater. Most of the ground surface at IR Site 31 is covered with buildings, concrete, or asphalt (Figure 1-3). Although ponding may occur in some areas at IR Site 31, precipitation is generally collected in catch basins that connect to main storm drain lines and discharge into the Oakland Inner Harbor at outfalls.

2.5 Ecological Habitats

IR Site 31 is a 25-acre property with approximately 300 residential houses with extensive paved roads and parking areas. Urban and barren habitat occurs at IR Site 31 and on adjacent land at Alameda Point and in the cities of Oakland and Alameda as ornamental shrubs, trees, and landscaped areas. Urban habitat generally supports few wildlife species due to human disturbances and limited vegetation. Urban habitat is the current and expected future habitat condition for IR Site 31. The following ecological habitats are known to occur in the vicinity of Alameda Point.

- Barren habitat occurs as bare soil, buildings, roads, parking areas, and runways.
- Urban habitat occurs as grass lawns, ornamental shrubs, trees, and landscaped areas.
- Annual grassland habitat occurs throughout Alameda Point.
- Saline emergent wetland habitat occurs at the West Beach Landfill wetland and the runway wetlands.
- Coastal scrub habitat occurs between the annual grassland habitat and the saline emergent wetland habitat at the West Beach Landfill and runway wetlands.
- Estuarine habitat occurs at the Oakland Inner Harbor to the north of Alameda Point, Seaplane Lagoon, and the San Francisco Bay to the south of Alameda Point.

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
5	Geology	Section 2.2	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 2.3, Pages 2-1 to 2-6, Figures 2-1 to 2-10. CDM 2007.

Section 2
Physical Setting

This section provides an overview of the climate, topography, geology, and hydrogeology of IR Site 31. Discussions of surface water drainage and ecological habitats at Alameda Point and the IR Site 31 vicinity are also presented. The scope of the IR Site 31 RI activities are described in Section 4; however, pertinent information collected during RI activities is presented in this section to provide a more complete description of the physical setting.

2.1 Climate

The San Francisco Bay area is characterized by a Mediterranean climate, with mild summer and winter temperatures. The mean annual precipitation at Alameda Island is 23 inches, with most of the precipitation occurring from October to April. Mean yearly low and high temperatures are 52 and 67 degrees Fahrenheit (°F), respectively. The wind direction is predominantly from the west or northwest, with rare occurrences of gale-force or greater winds. Heavy fog occurs an average of 21 days per year (National Weather Service 2001). Table 2-1 summarizes maximum and minimum monthly temperatures and average rainfall totals.

2.2 Topography

Alameda Island lies at the base of a gently westward-sloping plain that extends from the Oakland-Berkeley Hills in the east to the shore of the San Francisco Bay in the west. Alameda Island is characterized by a low topographic profile, with surface elevations varying from mean sea level (MSL) to approximately 30 feet above mean sea level (AMSL). Alameda Point is located on the western portion of Alameda Island and in the northeastern portion of Alameda Point. The topography of IR Site 31 is primarily flat and lies within an enclosed contour level for 10 feet AMSL (U.S. Geological Survey [USGS] Topographic Map 7.5 Minute Quadrangle Oakland West, 1993). Surveyed ground elevations for the onsite monitoring wells range from 10 to 13 feet AMSL.

2.3 Geology

Alameda Island is located on the east side of the San Francisco Bay. The bay occupies a depression between the Berkeley Hills to the east and the San Mateo Peninsula to the west. The depression and hills were formed by two active faults: the San Andreas Fault, west of the San Francisco Bay, and the Hayward Fault, east of the San Francisco Bay. The San Andreas and Hayward Faults are approximately 12 miles west and 5 miles east of the island, respectively.

The stratigraphy beneath Alameda Island and the San Francisco Bay consists of unconsolidated sediments approximately 400 to 500 feet thick at the eastern margin of the bay (Rogers and Figuers 1991).

2.3.1 Alameda Island Geology

Alameda Island sedimentary deposits consist of five stratigraphic units. Figure 2-1 presents the generalized stratigraphic and hydrogeologic units. From oldest to youngest, they are the Alameda Formation, the lower unit of the San Antonio Formation, the upper unit of the San Antonio Formation, the Merritt Sand Formation, and the BSU (upper bay sediment, also referred to as the Young Bay Mud).

These sediments overlie bedrock consisting of metamorphosed sandstone, siltstone, shale, graywacke, and an ophiolite base of Jurassic to Cretaceous age, all of which constitute the Franciscan Formation (Rogers and Figuers 1991, Norfleet Consultants 1998). Table 2-2 presents the sequence and descriptions of sediments beneath Alameda Island.

The stratigraphy beneath the northeastern portion of Alameda Point has been characterized with soil borings advanced to depths ranging from 20 to 105 feet bgs during previous investigations (Neptune et al. 2002, TtEMI 1999a, ERRG 2004, Shaw 2004a). Cross-section locations are shown on Figure 2-2. The derivative cross-sections incorporate shallow lithologic information from this investigation.

The eastern portion of Alameda Point, from surface to a depth of 7 feet to 10 feet, is comprised of imported construction fill and dredged fill material that overlies a marsh crust (2 to 6 inches thick), which typically exists at a depth of 5 feet to 18 feet bgs. This layer of marsh crust overlying the Young Bay Mud portion of the BSU helps to distinguish reworked from undisturbed Young Bay Mud. The marsh crust horizon is underlain by the BSU, which has a reported thickness of up to 110 feet and includes an upper and a lower unit. The upper unit of the BSU is referred to as the Young Bay Mud and consists of an estuarine deposit of stiff, dark, olive-gray clay with discontinuous silty and clayey sand layers. The lower unit consists of estuarine deposits of silty sand with interbedded layers of fine sand (TtEMI 1999a).

The BSU overlies the Merritt Sand Formation, which has a reported thickness of up to 60 feet and is composed of a brown, poorly graded, fine-to-medium-grained sand. The Merritt Sand is laterally continuous across Alameda Point except where it is bisected by a paleochannel. The paleochannel parallels the Inner Oakland Harbor, as mapped for the Oakland Inner Harbor navigation improvement project (Subsurface Consultants, Inc. 1999), and is approximately 1,200 to 1,600 feet wide; its central lowest point is located approximately 1,400 feet south of the present Inner Oakland Harbor and is coincident with the northern margin of IR Site 31.

The Merritt Sand Formation overlies the Upper San Antonio Formation, which consists of interbedded layers of silty sand and green-gray silty clay alluvial deposits and has a reported thickness of up to 35 feet. The upper unit of the San Antonio Formation is continuous over most of Alameda Point but is absent in the area of the paleochannel.

The paleochannel (synchronous with the BSU) underlies IR Site 31 at depths from approximately 60 feet bgs to its central lowest point (95 feet bgs) beneath the northern margin of IR Site 31. The paleochannel marks a prominent erosional unconformity that places the BSU on top of the Yerba Buena Mud due to removal of both the Merritt Sand Formation and the Upper San Antonio Formation. The paleochannel was filled with low-permeability silts and clays with discontinuous layers of poorly graded sands associated with the BSU (TtEMI 1999a).

The Upper San Antonio Formation overlies the lower San Antonio Formation estuarine deposits. The Yerba Buena Mud (or Old Bay Mud) is the uppermost member of the lower San Antonio Formation, with a thickness of up to 90 feet. The Yerba Buena Mud is partially eroded by the paleochannel but is considered to be locally and regionally continuous and a barrier to potential contaminant migration. The San Antonio Formation is underlain by the terrestrial and estuarine deposits of the Alameda Formation. The Quaternary and Tertiary deposits discussed above are underlain by the bedrock of the Franciscan Formation (TtEMI 1999a).

2.3.2 Fill History

The area east of Main Street and north of Atlantic Avenue was created from successive filling of tidal flats between 1859 and 1930 (before Navy occupancy). From 1925 through 1927, the tidal marsh and sloughs that were to become the future site of the SFBA (from 1927 through 1940) were filled with "intermittent dredger fill" (Lee and Praszker 1969). Fill activities that occurred between 1925 and 1930 may also have included use of materials from the excavation of the Posey Tube tunnel beneath Oakland, connecting Alameda Island with Oakland. Fill material associated with the Posey Tube construction may have contained PAHs and metals resulting from waste produced by nearby industries (located within 0.25 mile of the excavation site), including Union Iron Works, Bethlehem Steel, and Associated Oil Company/Phillips (BEI 2005a). Beginning in the 1930s, the Army and then the Navy filled tidelands, marshes, and sloughs between Oakland Inner Harbor and the western tip of Alameda Island (west of Main Street). The fill material consisted largely of dredge spoils from the Oakland Inner Harbor and surrounding San Francisco Bay.

Fill material thickness generally decreases from west to east across Alameda Point. A maximum thickness of 40 feet of fill material is present at the western margin of Alameda Point where offshore areas were filled to create new land. The imported fill material at Alameda Point consists mainly of three types of material:

- The principal type of fill material at Alameda Point is dredged material (also referred to as poorly graded sand dredge spoils or hydraulic fill) from the surrounding San Francisco Bay and Oakland Inner Harbor that is predominantly poorly graded, fine-to-medium-grained gray sand with silt and clay.
- The second most prevalent fill is dredged material from the Young Bay Mud member of the BSU (predominantly clay), also referred to as reworked Young Bay Mud - materials that have been transported or displaced by human activity.
- Occasionally there are materials imported from other areas (i.e., outside of Alameda Island and its surrounding waters such as Oakland Hills), usually distinguishable from poorly graded dredge spoils or reworked Young Bay Mud.

In the eastern portion of Alameda Point, a marsh crust (2 to 6 inches thick) exists between the fill layer and the BSU. This thin layer of marsh crust overlying the Young Bay Mud portion of the BSU helps to distinguish reworked from undisturbed Young Bay Mud. The marsh crust is a soil horizon typically occurring at 5 feet to 18 feet bgs that is comprised of coal or petroleum-related combustion products SVOCs and trace metals. A remedial action plan/record of decision (RAP/ROD) has been written for the marsh crust and has been signed and approved by DON, EPA, and Cal/EPA (DON 2001b). The Marsh Crust RAP/ROD applies institutional controls on property owned by the City of Alameda (Alameda Annex property) and across property leased by the City of Alameda (Alameda Point). The institutional controls prohibit excavations below specified depths without approved work plans. The institutional controls are administered and enforced through the City of Alameda's Marsh Crust Excavation Ordinance number 2824 executed 2 February 2001 (presented in Appendix M).

IR Site 31 fill history (Figure 4-2) shows that the fill was in place by 1927. The most recent construction fill placement was prior to 1993 when construction fill was placed to construct Marina Village Housing. The design drawings (Sheet G-14 Appendix K) show that the housing units were constructed on a minimum 4-foot thick layer of compacted fill. The minimum of 4 feet of compacted fill is comprised of the 2 feet of blanket fill for site grading (reconditioned/compacted) plus 2 feet of foundation fill beneath each house and garage foundation. An evaluation of fill history and lithology is summarized in Section 4.1.5.2, with details and supporting information presented in Appendix H2.

2.3.3 IR Site 31 Geology

The land at IR Site 31 was tidal marshlands until the early 1900s. The marshlands contained numerous tidal channels ranging in width from 10 to 200 feet (PRC and Versar 1993). The history and development of IR Site 31 through multiple fill episodes is traceable through historical maps and aerial photographs presented in Appendix A.

According to these maps and photographs, the IR Site 31 area was completely filled by 1927 (Figures A-1 through A-4 in Appendix A). The fill events include the historical filling of tidal marshlands and the construction fill material emplaced during site development. As identified in the City of Alameda Ordinance No. 2824, Alameda Municipal Code Chapter XIII, Section 13-56, the marsh crust at IR Site 31 is deeper on the east side of the site and shallower to the west. The threshold depth identified in the ordinance changes to 5 feet below the surface in the western portion of IR Site 31.

Data from previous investigations indicate that the BSU is encountered at an average depth of approximately 18 feet bgs at sites contiguous with IR Site 31. A BSU depth of 18 feet bgs is to be expected for locations that were historically tidal channels or offshore. IR Site 31 was historically marshland with tidal channels, and the BSU seemed to be present at 7.5 feet bgs (2.5 feet AMSL) in many boring locations, which would correspond to the upper elevation limit for original tidal marsh topography. The variability of the thickness of the fill material is due to infilling over tidal flats and channels in the original marshland topography (PRC and Versar 1993).

The direct push sample probes completed during the RI at IR Site 31 were advanced to a maximum depth of 8 feet bgs for soil sampling and to 20 feet bgs for the groundwater sample points. The maximum depth of 24 feet bgs was in one groundwater sample probe. The fill material encountered in borings at IR Site 31 included one or more of the following: clay, poorly graded sand, clayey gravel, well-graded gravel with sand, and well-graded sand with gravel. The shallowest fill materials (0 to 4 feet bgs) were dense brown to yellowish-brown clayey sand or gravel that may have been imported from terrestrial fill sources outside of Alameda Island.

The remaining fill materials (soft to medium stiff silty clay or silty sand between approximately 4 and 7.5 feet bgs) appeared to be dredged materials consisting of hydraulic fill from the San Francisco Bay or Oakland Inner Harbor and reworked Young Bay Mud. This mud layer was not fully penetrated in most cases since the borings typically terminated at or just below the water table; hence, a measured thickness is not widely available. Geotechnical analysis of IR Site 31 soils (Appendix E) indicates that the clays have an effective air permeability of 10^{-8} to 10^{-11} square centimeters (cm^2). Figure 2-2 shows the locations of cross-sections, the legend for the cross-sections is on Figure 2-3, and the geologic sections are Figures 2-4, 2-5, 2-6, 2-7, 2-8, and 2-9. These figures represent the shallow subsurface geology at IR Site 31 and were constructed using boring logs from the RI activities (Appendix D).

Figure 2-10 presents a top of clay in the shallow subsurface at IR Site 31. The clay represented by the map includes dark gray or black clays that are first encountered at depths of 4 to 6 feet bgs across the site. The mapped clay is not continuous and includes deep pockets of yellowish-brown gravelly clays that appeared to be part of the imported fill materials. The map (Figure 2-10) and the cross-sections (Figures 2-4

through 2-9) demonstrate that the clay is a recognizable horizon separating older dredged harbor fill from newer, more oxidized, and imported construction fill. The figures show that the elevation of the top of the clay is undulating with inconsistent directional slope.

2.4 Hydrogeology

This subsection discusses regional hydrogeology at Alameda Point and site-specific hydrogeology at IR Site 31.

2.4.1 Regional

Alameda Island is underlain by two primary regional aquifers, the shallow Merritt Sand aquifer that yields brackish-to-very-saline water (20,000 to 35,000 milligrams per liter [mg/L] total dissolved solids) (TtEMI 2000) and the deeper Alameda aquifer that yields freshwater. The generalized hydrogeologic units are shown on Figure 2-1. These aquifers are separated by the regional San Antonio aquitard, which is approximately 55 to 90 feet thick beneath Alameda Point and comprises three parts (TtEMI 1999a):

- Yerba Buena Mud;
- Other estuarine deposits; and
- The upper clay-rich portion of the Alameda Formation.

The Merritt Sand aquifer is a semi-confined aquifer with potentiometric head elevations from 0 foot to 6 feet AMSL at Alameda Island (TtEMI 1999a). Groundwater was observed in November 2005 (Figure 2-11) at elevations ranging from 1 to 4 feet AMSL (depths varying from 5 to 9 feet bgs in 20 feet deep monitoring wells) on IR Site 31. These water levels are consistent with previous regional groundwater mapping for the IR Site 25, 30, and 31 group in base-wide monitoring (ITSI 2007a) in that levels are at 4 feet AMSL or higher on the east side of IR Site 31 and drop to 1 foot AMSL on the west side of IR Site 31. As shown on Figure 2-11, the general groundwater gradient in the FWBZ is from the northeast to southwest across the western half of IR Site 31.

Regionally, groundwater recharge occurs in outcrop areas of the Merritt Sand Formation located in the southeastern portion of Alameda Point, as well as east of Alameda Point. This groundwater recharge is from irrigation, precipitation, and possibly leaking water-supply lines, sewer lines, and storm drains. There is no hydraulic association between the shallow aquifer systems on Alameda Island and the Oakland mainland because of the barrier created by the Oakland Inner Harbor. The Merritt Sand aquifer beneath Alameda Island is hydraulically isolated from mainland aquifers (TtEMI 1999a).

TOP OF UNIT (IN FEET BELOW GROUND SURFACE)	STRATIGRAPHIC UNITS			HYDROGEOLOGIC UNITS
0	FILL (UNDERLAIN BY MARSH CRUST AT SOME LOCATIONS)			WATER TABLE AQUIFER - NOT A PRIMARY AQUIFER (FWBZ)
10-35	BAY SEDIMENT UNIT (BSU)			AQUITARD
3-45	MERRITT SAND FORMATION			MERRITT SAND AQUIFER - A PRIMARY AQUIFER (SWBZ)
60-80	SAN ANTONIO FORMATION	UPPER UNIT	ALLUVIAL DEPOSITS	
80-110		LOWER UNIT	YERBA BUENA MUD	AQUITARD
			OTHER ESTUARINE DEPOSITS	
100-200	ALAMEDA FORMATION	UPPER CLAY-RICH PORTION		
180-220		ALLUVIAL DEPOSITS		ALAMEDA AQUIFER - PRINCIPAL REGIONAL AQUIFER
400-800	FRANCISCAN FORMATION			

NOTES:

FWBZ – FIRST WATER-BEARING ZONE

SWBZ – SECOND WATER-BEARING ZONE

SOURCES:

TETRA TECH EM, INC. 1999. OU-2 RI REPORT DRAFT, ALAMEDA POINT, ALAMEDA, CALIFORNIA. PREPARED FOR THE UNITED STATES DEPARTMENT OF THE NAVY, ENGINEERING FIELD ACTIVITY WEST, NAVAL FACILITIES ENGINEERING COMMAND, SAN BRUNO, CALIFORNIA. JUNE 29.

SHAW ENVIRONMENTAL, INC. 2004. FINAL WORK PLAN BASEWIDE GROUNDWATER MONITORING PROGRAM. ALAMEDA POINT, ALAMEDA, CALIFORNIA. FEBRUARY 6

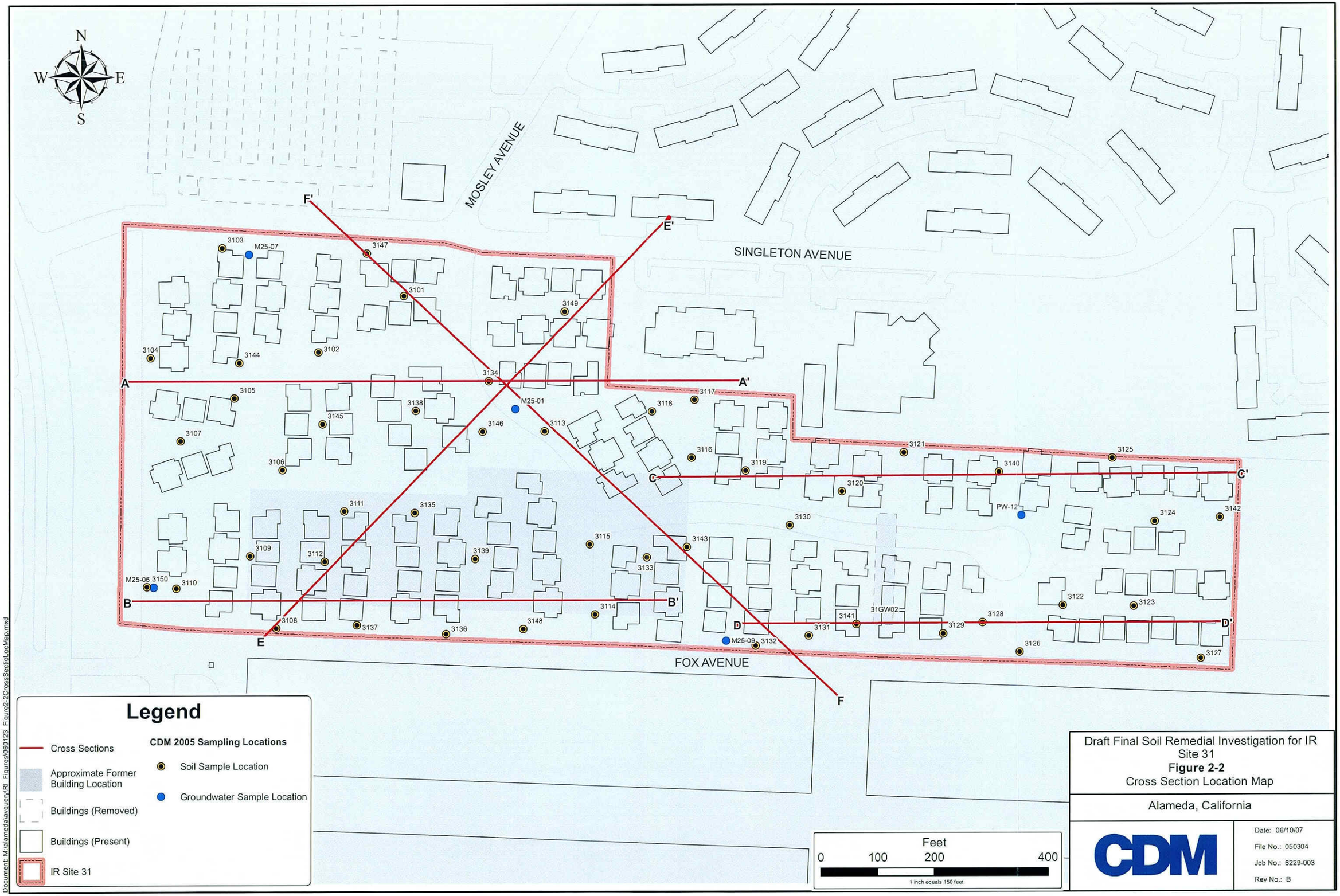
Draft Final Soil Remedial Investigation Report
for IR Site 31

Figure 2-1

Generalized Stratigraphic and Hydrologic Units at Alameda Point

Alameda, California

CDM


N
W
E
S
MOSLEY AVENUE
SINGLETON AVENUE
FOX AVENUE
A
A'
B
B'
C
C'
D
D'
E
E'
F
F'
3103
M25-07
3147
3101
3149
3104
3144
3102
3134
3105
3138
3145
3107
3146
3113
3106
3118
3117
M25-01
3116
3119
3121
3125
3140
3120
PW-12
3124
3142
3130
3111
3135
3115
3143
3109
3112
3139
3133
M25-06
3150
3110
3114
3122
3123
3141
31GW02
3128
3108
3137
3136
3148
3131
3129
M25-09
3132
3126
3127
Legend
Cross Sections
Approximate Former Building Location
Buildings (Removed)
Buildings (Present)
IR Site 31
CDM 2005 Sampling Locations
Soil Sample Location
Groundwater Sample Location
Feet
0
100
200
400
1 inch equals 150 feet
Draft Final Soil Remedial Investigation for IR Site 31
Figure 2-2
Cross Section Location Map
Alameda, California
CDM
Date: 06/10/07
File No.: 050304
Job No.: 6229-003
Rev No.: B
Document: M:\alameda\avquery\RI_Figures\060123_Figure2-2CrossSectionLocMap.mxd

SOIL CLASSIFICATION LEGEND

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS (More than half is larger than No. 200 sieve)	GRAVELS (More than half coarse fraction is larger than No. 4 sieve size)	Clean gravels with little or no fines	GW	Well graded gravels, gravel-sand mixtures
			GP	Poorly graded gravels, gravel-sand mixtures
		Gravel with over 12% fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than half coarse fraction is smaller than No. 4 sieve size)	Clean sands with little or no fines	SW	Well graded sands, gravelly sands
			SP	Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM	Silty sand, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than half is smaller than No. 200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic clays and organic silty clays of low plasticity
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils

SAMPLE TYPE SYMBOLS

- Disturbed bag or jar sample
- Std. Penetration Test (2.0" OD)
- Type U Ring Sampler (3.25" OD)
- California Sampler (3.0" OD)
- Undisturbed Tube Sample
- Grab Sample
- Core Run
- Non-standard Penetration Test (with split spoon sampler)
- Bulk Sample

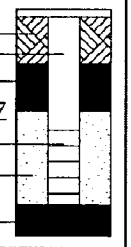
CONTACT BETWEEN UNITS

- Well-defined change in unit
- Gradational change in unit which was clearly noted in the exploration
- Change in unit which was not clearly defined

DESCRIPTORS FOR SOIL STRATA AND STRUCTURE (ENGLISH/METRIC)

General Thickness or Spacing		Structure		General Attitude	
Parting:	less than 1/16 in. (1/6 cm)	Pocket:	Erratic, discontinous deposit of limited extent	Near horizontal:	0 to 10 deg.
Seam:	1/16 to 1/2 in. (1/6 to 1 1/4 cm)	Lens:	Lenticular deposit	Low angle:	10 to 45 deg.
Layer:	1/2 to 12 in. (1 1/4 to 30 1/2 cm)	Varved:	Alternating seams of silt and clay	High angle:	45 to 80 deg.
Stratum:	> 12 in. (30 1/2 cm)	Laminated:	Alternating seams	Near Vertical	80 to 90 deg.
Scattered:	< 1 per ft. (30 1/2 cm)	Stratified:	Alternating layers		
Frequent:	> 1 per ft. (30 1/2 cm)				

WELL COMPLETIONS



STRUCTURE DESCRIPTION (cont.)

Fractured	Breaks easily along definite fractured planes
Slickensided	Polished, glossy, fractured planes
Blocky, Diced	Breaks easily into small angular lumps
Sheared	Disturbed texture, mix of strengths
Homogeneous	Same color and appearance throughout

MOISTURE DESCRIPTION

- Dry - Free of moisture, dusty
- Moist - Damp but no visible free water
- Wet - Visible free water

MODIFIERS

Trace	Particles present at levels estimated < 5%
Slightly (Clayey, Silty, Sandy, Gravelly)	Particles present at levels estimated at 5 to 12%
Clayey, Silty, Sandy, Gravelly	Particles present at levels estimated at 12 to 30%
Very (Clayey, Silty, Sandy, Gravelly)	Percentage of minor constituents estimated > 30%

RELATIVE DENSITY OR CONSISTENCY VS. SPT N-VALUE

COARSE GRAINED			FINE GRAINED		
Density	N (blows/ft)	Approx. Relative Density (%)	Consistency	N (blows/ft)	Approx. Undrained Shear Str. (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	Over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

PHYSICAL PROPERTY TEST

- AL - Atterberg Limits
- FC - Fines Content
- GSD - Grain Size Distribution
- MC - Moisture Content
- MD - Moisture Content/Dry Density
- SG - Specific Gravity
- Perm - Permeability
- TXP - Triaxial Permeability
- Cons - Consolidation
- Chem - Analytical Chemical Analysis
- Corr - Corrosion
- VS - Vane Shear
- DS - Direct Shear
- UC - Unconfined Compression
- TX - Triaxial Compression
- UU - Unconsolidated, Undrained
- CU - Consolidated, Undrained
- CD - Consolidated, Drained

Notes:

1. Sample descriptions in this report are based on visual field and laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual classification methods in accordance with ASTM D 2488 were used as an identification guide. Where laboratory data are available, soil classifications are in general accordance with ASTM D 2487.

2. Dual symbols are used to indicate gravel and sand units with 5 to 12 percent fines and fine-grained units that plot in the CL-ML area of the plasticity chart.

3. WOR = weight of rod, WOH = weight of hammer.

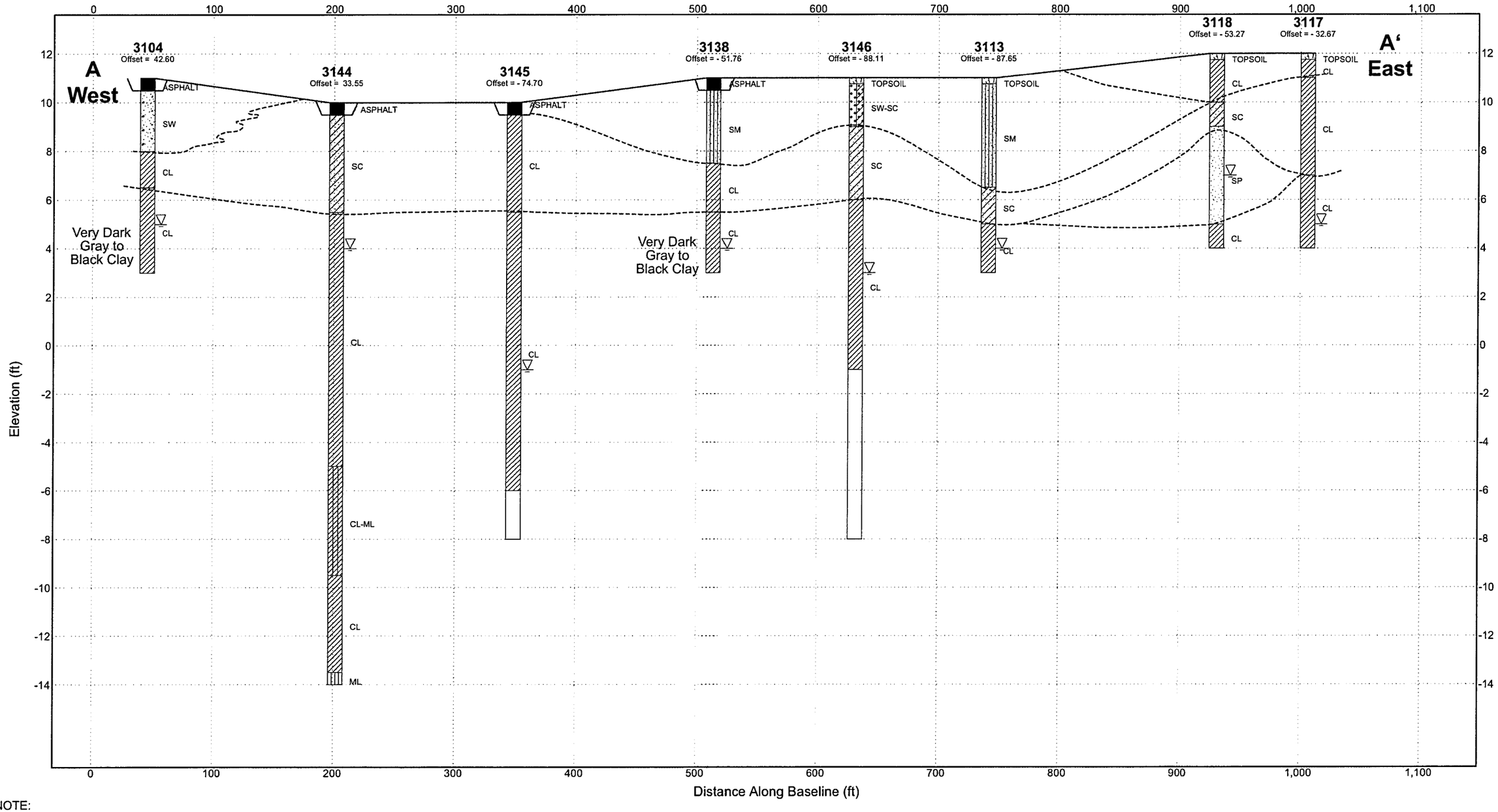
Legend gINT Library
Figure 2-3
Location Map

Alameda, California

CDM

Date: 6/10/07
File No.: 060323
Job No.: 6229-003
Rev No.: A

Document: M:\alameda\aqueryRI_Figures\Revised\060123_Figure2-3CrossSectionLegend.mxd



NOTE:
See Figure 2-3 for geological/soil classifications.
Elevations are feet above mean sea level.

Horizontal Scale: 1" = 80'
Vertical Scale: 1" = 4'

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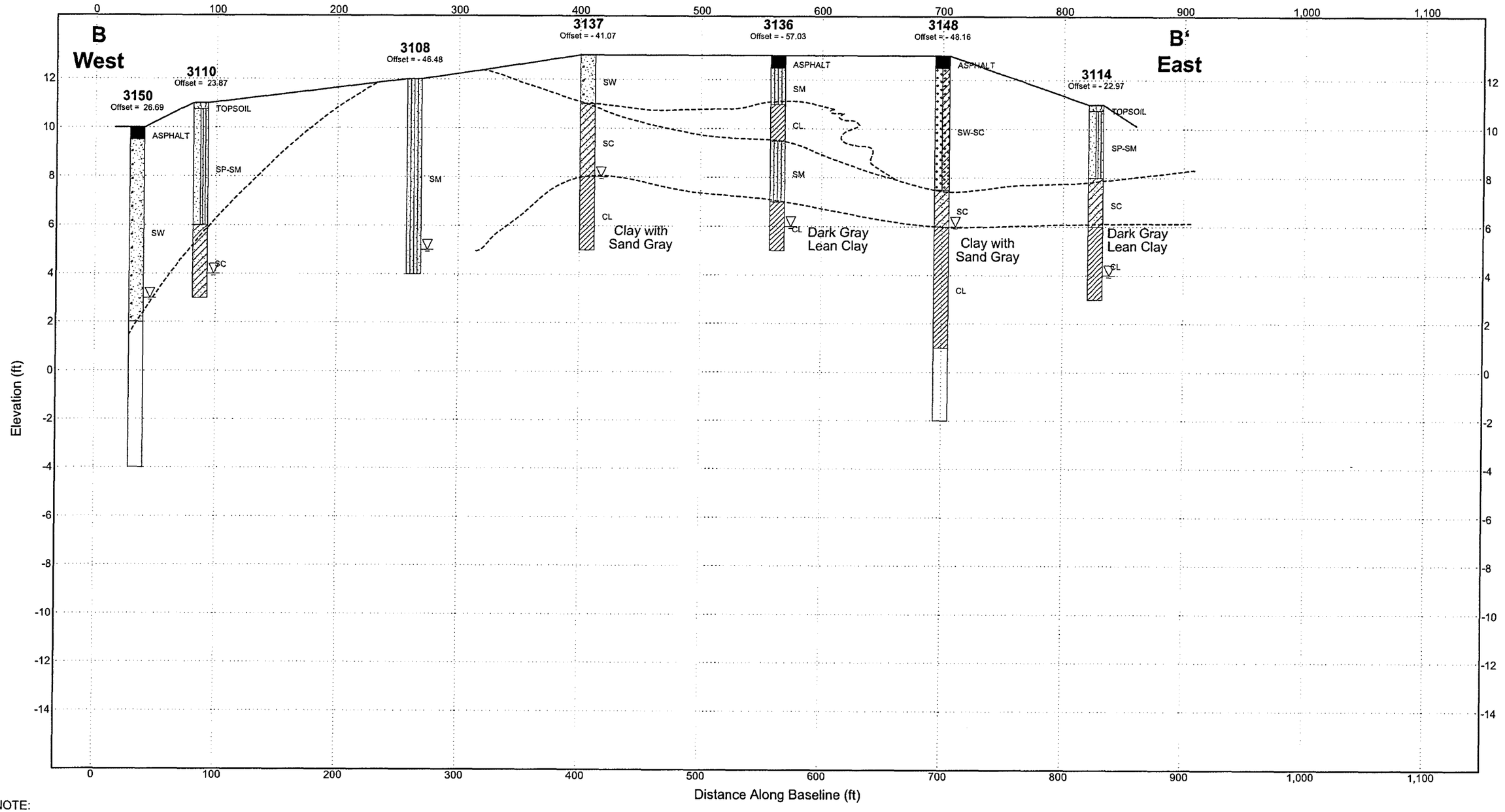
July 2007

Figure 2-4
Geologic Cross Section A-A'
Alameda, California
6229.003

FENCE 11X17 4to57 ALAMEDA BORING LOGS.GPJ CDM_BLLV.GDT 1/30/06 REV: (W:\Projects\48072\SectionA_Geology.ai 01/31/06 JJT)



NOTE:
See Figure 2-3 for geological/soil classifications.
Elevations are feet above mean sea level.

Horizontal Scale: 1" = 80'
Vertical Scale: 1" = 4'

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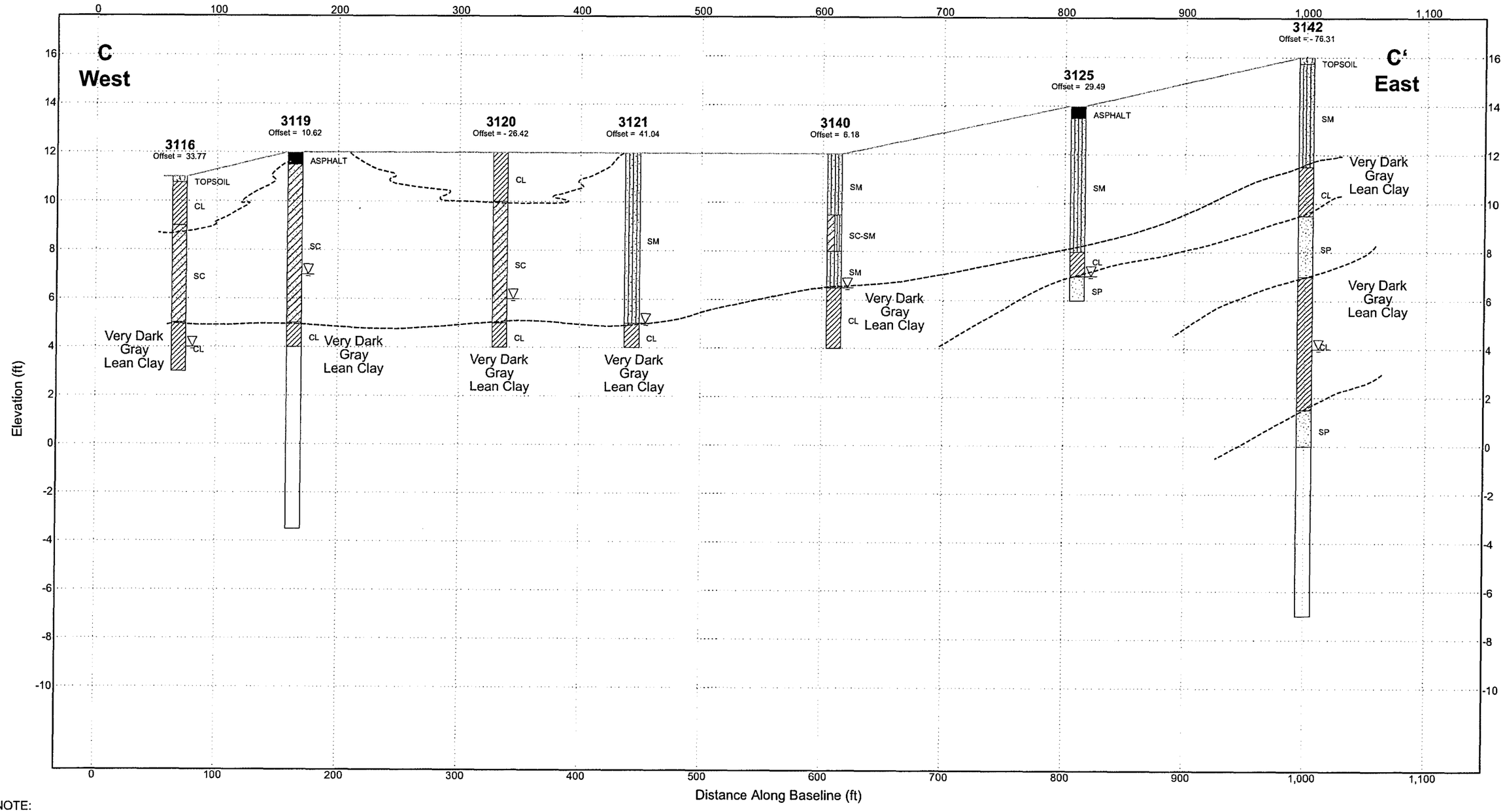
July 2007

Figure 2-5
Geologic Cross Section B-B'
Alameda, California
6229.003

FENCE 11X17 45657 ALAMEDA BORING LOGS.GPJ CDM_BLLV.GDT 1/30/06 REV. (W:\PROJECTS\48072\SectionB_Geology.ai 01/31/06 JJT)



NOTE:
See Figure 2-3 for *geological/soil classifications*.
Elevations are feet above mean sea level.

Horizontal Scale: 1" = 80'
Vertical Scale: 1" = 4'

CDM

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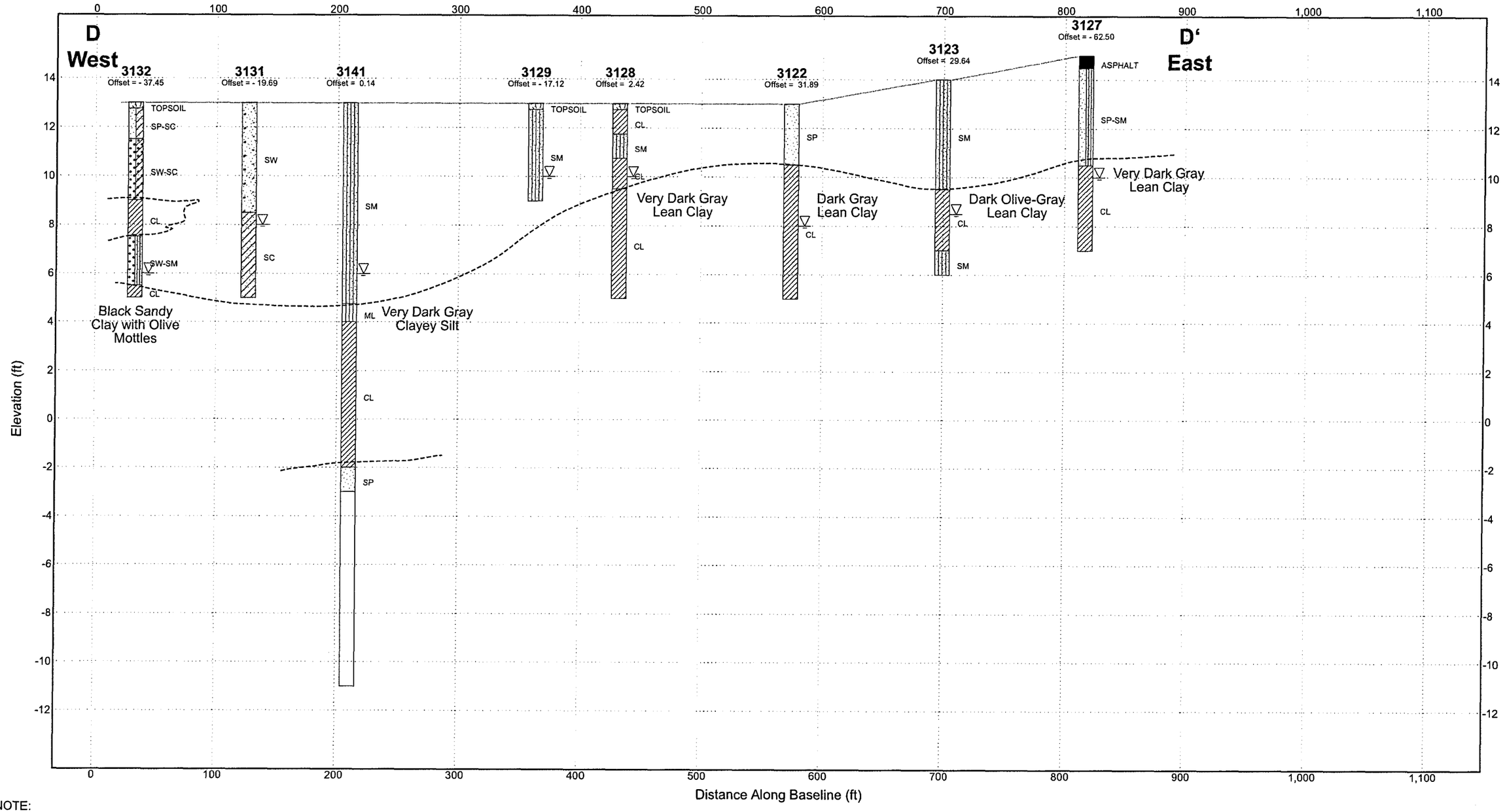
July 2007

Figure 2-6
Geologic Cross Section C-C'
Alameda, California
6229.003

FENCE 11X17 45657 ALAMEDA BORING LOGS.GPJ CDM_BLLV.GDT 1/30/06 REV. (W:\PROJECTS\48072\SectionC_Geology.ai 01/31/06 JJT)



NOTE:
See Figure 2-3 for geological/soil classifications.
Elevations are feet above mean sea level.

Horizontal Scale: 1" = 80'
Vertical Scale: 1" = 4'

CDM

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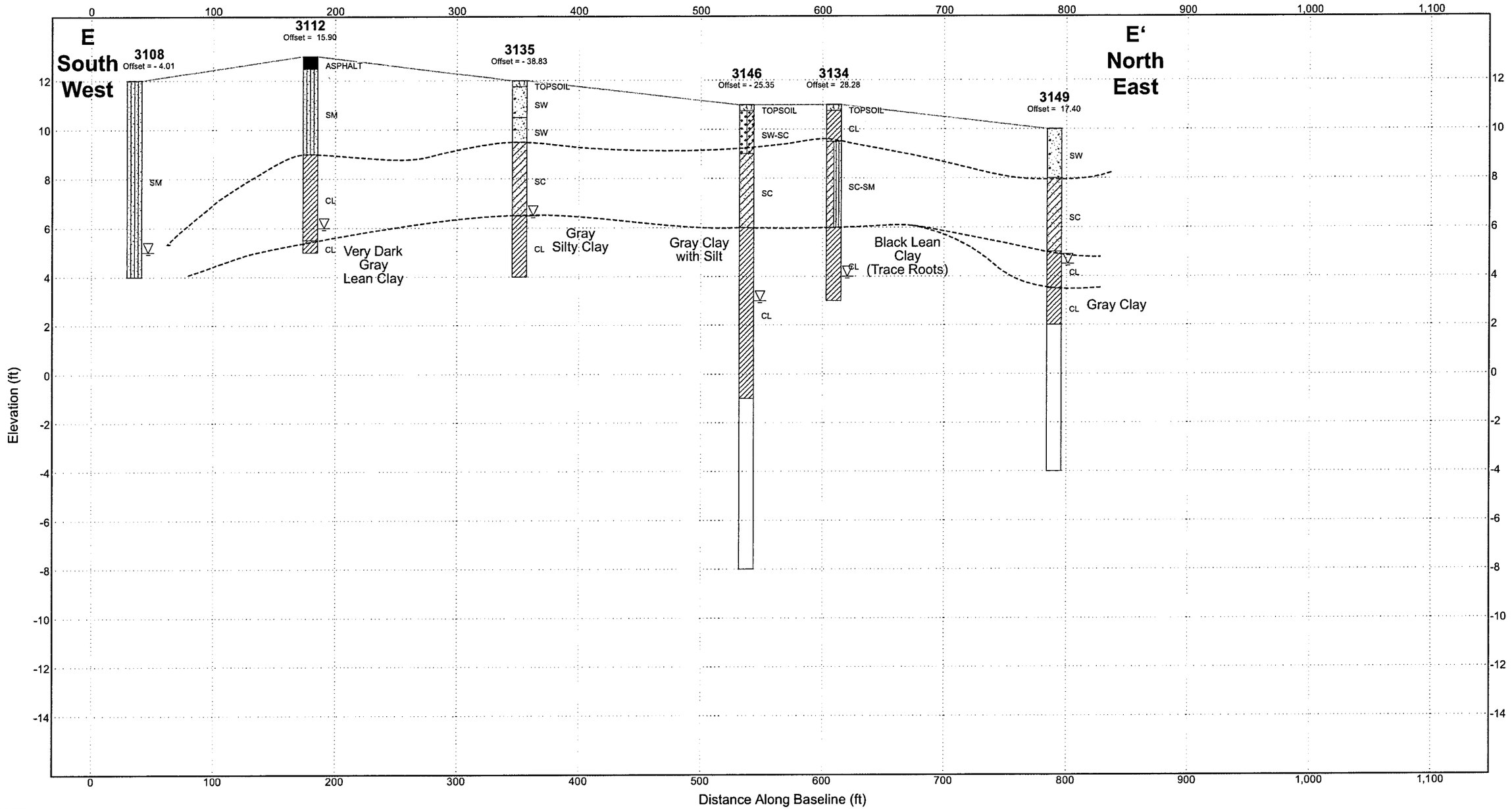
Figure 2-7
Geologic Cross Section D-D'
Alameda, California
6229.003

FENCE 11X17 4pag7 ALAMEDA BORING LOGS.GPJ CDM_BLLV.GDT 1/30/06 REV. (W:\PROJECTS\48072\SectionD_Geology.ai 01/31/06 JJT)



NOTE:
See Figure 2-3 for geological/soil classifications.
Elevations are feet above mean sea level.

Horizontal Scale: 1" = 80'
Vertical Scale: 1" = 4'

CDM

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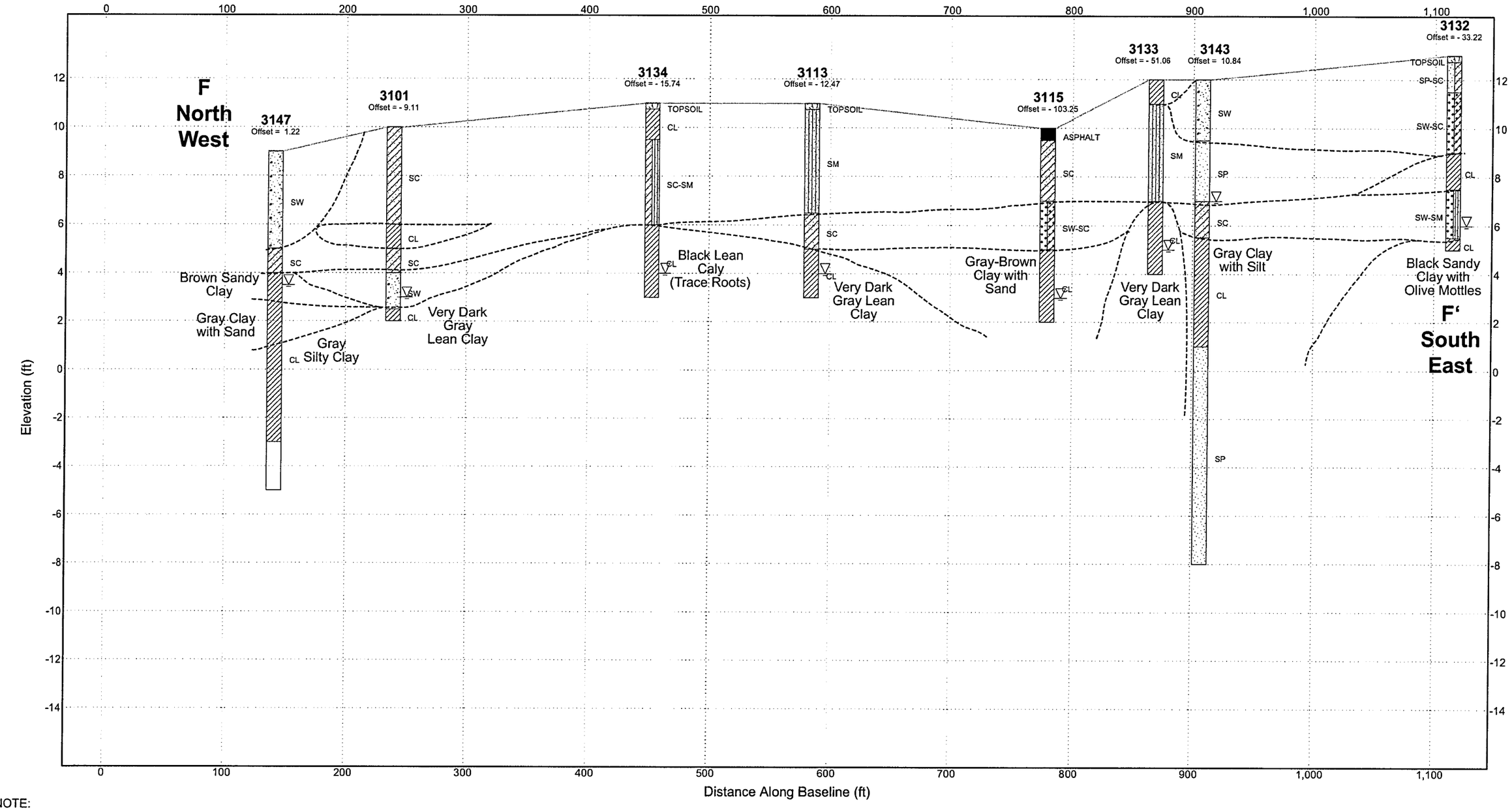
July 2007

Figure 2-8
Geologic Cross Section E-E'
Alameda, California
6229.003

FENCE 11X17 45so7 ALAMEDA BORING LOGS.GPJ CDM_BLLV.GDT 1/30/06 REV. (W:\PROJECTS\48072\SectionE_Geology.ai 01/31/06 JJT)



NOTE:
See Figure 2-3 for geological/soil classifications.
Elevations are feet above mean sea level.

Horizontal Scale: 1" = 80'
Vertical Scale: 1" = 4'

FENCE 11X17 45657 ALAMEDA BORING LOGS.GPJ CDM_BLLV.GDT 1/31/06 REV. (W:\PROJECTS\48072\SectionF_Geology.ai 01/31/06 JJT)

CDM

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July 2007

Figure 2-9
Geologic Cross Section F-F'
Alameda, California
6229.003

N
W E
S

MOSLEY AVENUE

SINGLETON AVENUE

FOX AVENUE

Correlations made with top of clay in site 30 RI (Bechtel, 2005)

Clay with Sand

Clayey Sand

Clayey Sand

PW-12

3103 M25-07 3.5
3147 1.0
3101 2.5
3149 3.5
3104 6.5
3144 5.5
3102 4.25
3105 4.0
3134 6.5
M25-01
3138 5.5
3145 4.0
3146 6.0
3113 5.0
3107 5.0
3106 7.0
3118 5.0
3117 7.0
3116 5.0
3119 5.0
3121 5.0
3120 5.0
3140 6.5
3125
3124 9.5
3142 11.5
3111 6.0
3135 6.5
3115
7.5
3133
3143 5.5
3130 6.0
3109 6.0
3112 5.5
3139 6.5
3150 M25-06
3110
3108
3137 8.0
3136 7.0
3148 6.0
3114 6.0
M25-09 9.0
3132
3131
3141 4.0
3129 NM
3128 9.5
3126 8.0
3122 10.5
3123 9.5
3127 10.5

Legend

Approximate Former Building Location

Buildings (Removed)

Buildings (Present)

IR Site 31

Site 31 Sampling Locations (05 Sampling)

Direct Push Locations

Monitoring Well

Ft. Elevation AMSL of dark gray lean clay (medium stiff)

Feet
0 100 200 400
1 inch equals 150 feet

Remedial Investigation at IR Site 31
Figure 2-10
Top of Clay Elevation Map

Alameda, California

CDM

Date: 6/12/07
File No.: 0601010
Job No.: 6218-086
Rev No.: A

Document: C:\alameda\avquery\MXD\FigureX-X_05SamplingLocations.mxd (W:\PROJECTS\48072\Figure2-9_Top of Clay Elev Map.ai 02/02/06 JJT)

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
6	**hydrogeology**	**Section 2.2**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 2.4, Pages 2-6 to 2-8, Figures 2-1 and 2-11. CDM 2007.

through 2-9) demonstrate that the clay is a recognizable horizon separating older dredged harbor fill from newer, more oxidized, and imported construction fill. The figures show that the elevation of the top of the clay is undulating with inconsistent directional slope.

2.4 Hydrogeology

This subsection discusses regional hydrogeology at Alameda Point and site-specific hydrogeology at IR Site 31.

2.4.1 Regional

Alameda Island is underlain by two primary regional aquifers, the shallow Merritt Sand aquifer that yields brackish-to-very-saline water (20,000 to 35,000 milligrams per liter [mg/L] total dissolved solids) (TtEMI 2000) and the deeper Alameda aquifer that yields freshwater. The generalized hydrogeologic units are shown on Figure 2-1. These aquifers are separated by the regional San Antonio aquitard, which is approximately 55 to 90 feet thick beneath Alameda Point and comprises three parts (TtEMI 1999a):

- Yerba Buena Mud;
- Other estuarine deposits; and
- The upper clay-rich portion of the Alameda Formation.

The Merritt Sand aquifer is a semi-confined aquifer with potentiometric head elevations from 0 foot to 6 feet AMSL at Alameda Island (TtEMI 1999a). Groundwater was observed in November 2005 (Figure 2-11) at elevations ranging from 1 to 4 feet AMSL (depths varying from 5 to 9 feet bgs in 20 feet deep monitoring wells) on IR Site 31. These water levels are consistent with previous regional groundwater mapping for the IR Site 25, 30, and 31 group in base-wide monitoring (ITSI 2007a) in that levels are at 4 feet AMSL or higher on the east side of IR Site 31 and drop to 1 foot AMSL on the west side of IR Site 31. As shown on Figure 2-11, the general groundwater gradient in the FWBZ is from the northeast to southwest across the western half of IR Site 31.

Regionally, groundwater recharge occurs in outcrop areas of the Merritt Sand Formation located in the southeastern portion of Alameda Point, as well as east of Alameda Point. This groundwater recharge is from irrigation, precipitation, and possibly leaking water-supply lines, sewer lines, and storm drains. There is no hydraulic association between the shallow aquifer systems on Alameda Island and the Oakland mainland because of the barrier created by the Oakland Inner Harbor. The Merritt Sand aquifer beneath Alameda Island is hydraulically isolated from mainland aquifers (TtEMI 1999a).

The Alameda aquifer is the principal regional aquifer. Depth to the top of the Alameda aquifer ranges from 180 feet bgs at Alameda Point to 220 feet beneath the surface of the sediment in Oakland Inner Harbor. The thickness of the formation is between 230 and 800 feet. The Alameda aquifer is recharged by rainfall in the Berkeley Hills that seeps through stream channels west of the Hayward Fault and flows through fractures in the bedrock of the Franciscan Formation east of the Hayward Fault (Hickenbottom and Muir 1988).

2.4.2 Alameda Point and IR Site 31

The hydrostratigraphic units at Alameda Point and beneath IR Site 31 have been divided into the following four hydrogeologic units (Figure 2-1):

- FWBZ – imported fill material;
- Semi-permeable aquitard – Young Bay Mud of the BSU;
- Second water-bearing zone (SWBZ) – lower BSU, Merritt Sand Formation, and Upper San Antonio Formation; and
- Regional aquitard – Lower San Antonio Formation, including Yerba Buena Mud.

The FWBZ is typically unconfined and extends to depths of up to 40 feet bgs in the western portion of Alameda Point. This FWBZ in the fill layer is a local feature of Alameda Point and is not present regionally (TtEMI 1999a). Figures 2-4 and 2-5 show the local findings for the shallow subsurface geology at the shallower depths, which is approximately at a vertical extent of 30 feet bgs. In the vicinity of IR Site 31, the imported fill material (dredged fill) appears to extend to depths of 10 to 24 feet bgs where the marsh crust was encountered during previous investigations (Neptune et al. 2002). Previous investigation results indicate that the marsh crust is directly underlain by the Young Bay Mud portion of the upper BSU (PRC and Versar 1993). The Young Bay Mud portion of the upper BSU acts as a semi-permeable aquitard between the FWBZ and the SWBZ, with a thickness at Alameda Point of 25 to 80 feet, as characterized during previous investigations (Neptune et al. 2002).

Throughout Alameda Point, the SWBZ is semi-confined and occurs within the lower BSU, Merritt Sand Formation, and Upper San Antonio Formation (TtEMI 1999a). There is limited hydraulic connection between the FWBZ and the SWBZ where the BSU consists of low permeability clayey layers, such as those reported at IR Site 31. At IR Site 31, the SWBZ is reported to occur within the lower BSU and Upper San Antonio Formation, as generalized on Figure 2-1. The Merritt Sand is absent beneath IR Site 31 due to removal by erosion. The paleochannel underlying the site at depths from 60 to 95 feet bgs marks the erosional unconformity (PRC and Versar 1993; Subsurface Consultants, Inc. 1999). Historically, the paleochannel eroded through the Merritt Sand and the Upper San Antonio Formation and into the top but did not bisect the Yerba

Buena Mud. The paleochannel was filled with low-permeability silts and clays with discontinuous layers of poorly graded sands associated with the BSU (TtEMI 1999a). Previous investigations suggest that the SWBZ in the vicinity of IR Site 31 is 40 to 50 feet thick and would be encountered at a depth of 36 to 55 feet bgs (TtEMI 1999a, PRC and Versar 2003).

Throughout Alameda Point, the SWBZ is subject to saltwater intrusion due to direct hydraulic connection with the Oakland Inner Harbor and the San Francisco Bay (TtEMI 2000). The SWBZ is underlain by the Yerba Buena Mud of the lower San Antonio Formation, which is thick and continuous, forming a regional aquitard (TtEMI 1999a).

Groundwater in the FWBZ at IR Site 31 was typically first encountered at 3.8 to 7 feet bgs in RI soil borings, which correlates to water table elevations between 3.3 feet AMSL (western portion of the site) and 8.6 feet AMSL (eastern portion of the site). In shallow IR Site 25 monitoring wells (generally screened at 10 to 20 feet bgs) located in the area surrounding IR Site 31, water table elevations vary seasonally and range from less than 1 to more than 10 feet AMSL (ITSI 2007a). At IR Site 31, the continuous clay layer separates the upper portion of the FWBZ (above 16 feet bgs) from the lower portion of the FWBZ (16 to 20 feet bgs). Nearby, IR Site 25 monitoring well D-02 is screened in the SWBZ at 95 to 105 feet bgs in the lower BSU. The cross-sections of Figures 2-4 through 2-9 show the differentiation of soil type at the shallower depth, which is approximately at a vertical extent of 30 feet bgs. Water levels for this well range from 4.8 to 6.7 feet MSL (ITSI 2007a). No paired wells are available to interpret potential vertical gradient between the FWBZ and SWBZ.

2.4.3 Surface Water Drainage System

Because there are no natural streams or ponds on Alameda Island, precipitation evaporates into the atmosphere, runs off in the storm drain network, or infiltrates to groundwater. Most of the ground surface at IR Site 31 is covered with buildings, concrete, or asphalt (Figure 1-3). Although ponding may occur in some areas at IR Site 31, precipitation is generally collected in catch basins that connect to main storm drain lines and discharge into the Oakland Inner Harbor at outfalls.

2.5 Ecological Habitats

IR Site 31 is a 25-acre property with approximately 300 residential houses with extensive paved roads and parking areas. Urban and barren habitat occurs at IR Site 31 and on adjacent land at Alameda Point and in the cities of Oakland and Alameda as ornamental shrubs, trees, and landscaped areas. Urban habitat generally supports few wildlife species due to human disturbances and limited vegetation. Urban habitat is the current and expected future habitat condition for IR Site 31. The following ecological habitats are known to occur in the vicinity of Alameda Point.

TOP OF UNIT (IN FEET BELOW GROUND SURFACE)	STRATIGRAPHIC UNITS			HYDROGEOLOGIC UNITS
0	FILL (UNDERLAIN BY MARSH CRUST AT SOME LOCATIONS)			WATER TABLE AQUIFER - NOT A PRIMARY AQUIFER (FWBZ)
10-35	BAY SEDIMENT UNIT (BSU)			AQUITARD
3-45	MERRITT SAND FORMATION			MERRITT SAND AQUIFER - A PRIMARY AQUIFER (SWBZ)
60-80	SAN ANTONIO FORMATION	UPPER UNIT	ALLUVIAL DEPOSITS	
80-110		LOWER UNIT	YERBA BUENA MUD	AQUITARD
			OTHER ESTUARINE DEPOSITS	
100-200	ALAMEDA FORMATION	UPPER CLAY-RICH PORTION		
180-220		ALLUVIAL DEPOSITS		ALAMEDA AQUIFER - PRINCIPAL REGIONAL AQUIFER
400-800	FRANCISCAN FORMATION			

NOTES:

FWBZ – FIRST WATER-BEARING ZONE

SWBZ – SECOND WATER-BEARING ZONE

SOURCES:

TETRA TECH EM, INC. 1999. OU-2 RI REPORT DRAFT, ALAMEDA POINT, ALAMEDA, CALIFORNIA. PREPARED FOR THE UNITED STATES DEPARTMENT OF THE NAVY, ENGINEERING FIELD ACTIVITY WEST, NAVAL FACILITIES ENGINEERING COMMAND, SAN BRUNO, CALIFORNIA. JUNE 29.

SHAW ENVIRONMENTAL, INC. 2004. FINAL WORK PLAN BASEWIDE GROUNDWATER MONITORING PROGRAM. ALAMEDA POINT, ALAMEDA, CALIFORNIA. FEBRUARY 6

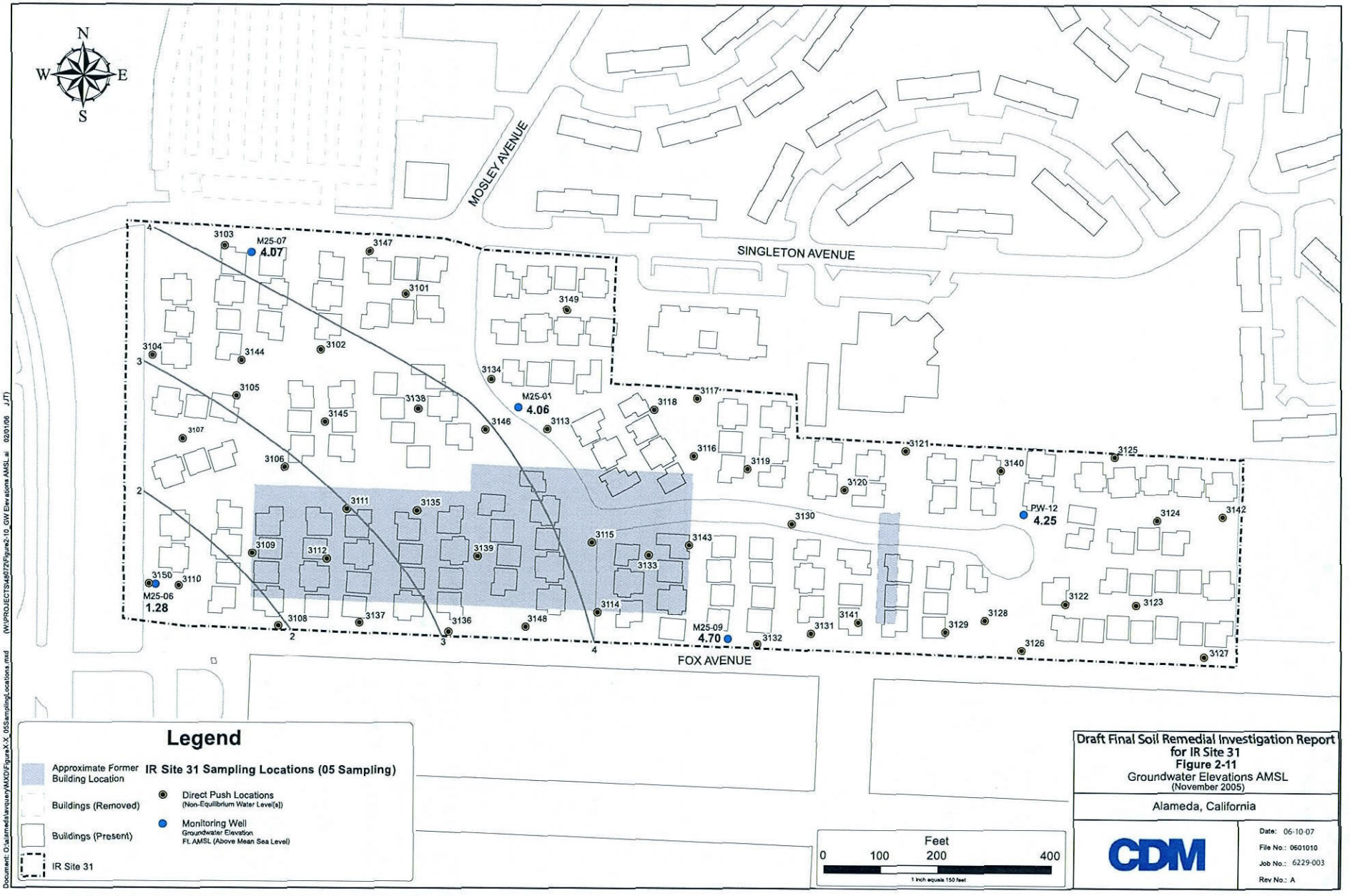
Draft Final Soil Remedial Investigation Report
for IR Site 31

Figure 2-1

Generalized Stratigraphic and Hydrologic Units at Alameda Point

Alameda, California

CDM



Legend

- Approximate Former Building Location
- Buildings (Removed)
- Buildings (Present)
- IR Site 31

IR Site 31 Sampling Locations (05 Sampling)

- Direct Push Locations (Non-Equilibrium Water Level[s])
- Monitoring Well Groundwater Elevation Ft. AMSL (Above Mean Sea Level)

Feet
0 100 200 400
1 inch equals 150 feet

Draft Final Soil Remedial Investigation Report for IR Site 31
Figure 2-11
Groundwater Elevations AMSL
(November 2005)

Alameda, California

CDM

Date: 06-10-07
File No.: 0601010
Job No.: 6229-003
Rev No.: A

Document: O:\alameda\arquery\MXD\FigureX-X_05SamplingLocations.mxd (W:\PROJECTS\48072\Figure2-10_GW Elevations AMSL.ai 02/01/06 JJT)

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
7	investigations	Section 2.3	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.3.5, Pages 1-12 to 1-17, Tables 3-2 to 3-4, Figures 1-3 and 4-1. CDM 2007.

of Building 369, which was located on IR Site 31, all of these warehouse buildings were located on FISCA IR-01. The warehouse area was historically used by DRMO for materials screening and storage and later by the Fleet Support Hospital for packing and shipping operations.

Historically, the northern portion of the warehouse area was mostly unpaved (present-day location of IR Site 31, U.S. Coast Guard Housing), and the southern portion of the warehouse area (around the warehouses themselves) was paved (ERM-West 1988). FISCA IR Site 01 is no longer Navy-owned property.

Surface soil samples collected during environmental investigations conducted prior to the construction of military housing at the warehouse area were found to contain high concentrations of chromium and nickel. These samples were collected in the northern portion of the former warehouse area (southwest of IR Site 31). Concentrations of benzene and naphthalene were reported above detection limits in groundwater samples, with the highest concentrations occurring on site, immediately downgradient of the DRMO Scrapyard (FISCA IR Site 02). The reports from these investigations concluded that no discrete areas with large amounts of contaminants in soil existed. However, broad areas existed in which concentrations of contaminants in soil were present at concentrations greater than the regulatory criteria.

1.3.5 Previous Investigations at IR Site 31

The former economic development conveyance (EDC) Parcel 21 was designated as IR Site 31 because groundwater beneath the site is impacted by the OU-5/IR-02 groundwater plume. Prior to being designated an IR site, historic investigations took place for adjacent areas and involved some sampling within the boundary of current IR Site 31. This subsection provides information from previous and concurrent investigations conducted at IR Site 31. A summary of data collected during these investigations and a discussion of the usability of the data for purposes of the RI at IR Site 31 are included. Tables 3-2, 3-3, and 3-4 show the number of usable samples (i.e., samples for which data were validated and verified) collected at IR Site 31 presented according to analyses and investigation.

1.3.5.1 1989 Shallow Soil Gas Investigation

A soil gas investigation was conducted in 1989 (PRC 1990) at environmental baseline survey (EBS) Parcels 178, 179, and 180 to evaluate the possibility of locating housing in this area. Parcel 178 is located in IR Site 31. The 1989 investigation included the collection of soil gas samples from shallow soil to evaluate the extent of benzene contamination in groundwater. Five out of 41 soil gas samples collected in these three parcels had detectable concentrations of benzene (PRC 1990). Depth to groundwater at the time the samples were collected is not known (but is now known to be generally

7 feet bgs). Detected soil gas concentrations ranged from 0.3 to 0.04 micrograms per liter (µg/L) for benzene, with the highest concentration near the 3102 location sampled in 2005. Because of the shallow water table, indoor and outdoor air concentrations were modeled using shallow groundwater data collected on site; these soil gas data were not used for the RI at IR Site 31.

1.3.5.2 Environmental Baseline Survey Investigations

In 1993, the EBS program was initiated at Alameda Point to facilitate property transfer. Initially, NAS Alameda was divided into 209 EBS parcels. Figure 1-3 shows the two EBS parcels (Parcels 178 and 184) located within the boundaries of IR Site 31 as well as buildings, structures, open space, and underground utilities.

The EBS investigation was implemented in two phases. Phase 1 provided an assessment of the environmental impacts due to base operations and included site visits, employee interviews, historical research, and an inventory of all property on a parcel by-parcel basis (ERM-West 1994). For the two EBS parcels in IR Site 31, the Phase 1 EBS investigation found no evidence of activities or operations that could have resulted in a release within the two parcels.

Fourteen soil samples were collected from 10 locations in March 1987 and analyzed for pesticides, PCBs, and metals (ERM-West 1987). Groundwater samples were collected from two monitoring wells between March 1987 and January 1988 (ERM-West 1988). The 1987 study indicated that concentrations of metals exceeded criteria in the northern portion of the warehouse area, and the study recommended additional soil samples be collected and analyzed for metals. In 1988, additional soil sampling was conducted, and analytical data indicated high levels of nickel and chromium in the northern portion of the site and in the background soil (ERM-West 1988). It was recommended that replacing the top 6 inches to 1 foot of soil in the northern portion of the site would reduce potential risks associated with direct contact with soil at the housing development in the northern portion of the warehouse area.

1.3.5.3 Zone Evaluation Data Summary, Zone 16: Housing Zone

Three surface soil samples plus two soil gas samples were collected from five locations across IR Site 31 (Zone 16 - EBS Parcel 178; IT 2001). The three soil-sampling locations are identified as 178-Z16-001 through 178- Z16-003 on Figure 4-1. The surface soil samples were analyzed for pesticides and PCBs; the soil gas samples were analyzed for VOCs. The soil sample results were incorporated into this RI for use in the risk assessments. The details are clarified in Section 4 on page 4-2.

1.3.5.4 Residential Risk Evaluation for United States Coast Guard Housing

A risk evaluation was conducted in 2002 (TtEMI 2002a) to evaluate the potential health risks associated with living at the U.S. Coast Guard housing areas located in IR Sites 25 and 31. The risk evaluation included indoor air modeling and the collection of ambient air samples to conduct an indoor air quality assessment.

Analytical data used in the indoor air modeling included samples collected during the OU-5 RI (Neptune et. al 2002) and consisted of groundwater samples collected from monitoring wells and HydroPunch borings, as well as soil vapor samples. Using all VOCs reported above detection limits, a screening-level risk evaluation was conducted. Results of the risk evaluation indicated that the cancer risks and noncancer hazards were below the threshold values (hazard index [HI] of 1 and cancer risk of 1×10^{-5}) for predicted indoor air concentrations based on both soil vapor and HydroPunch groundwater data. Threshold values were exceeded only when predicted indoor air concentrations were based on groundwater data from samples collected at monitoring wells.

Additional indoor and outdoor air samples were collected in IR Sites 25 and 31 to verify the indoor air modeling results. Samples were collected from crawl spaces, indoor locations, and outdoor locations; analyzed for VOCs; and compared to ambient air measurements collected by the California Air Resources Board (CARB).

Findings from statistical analysis showed that the indoor air VOC concentrations in occupied homes were higher than in unoccupied homes, reflecting the use of household VOC products and circulation with outdoor ambient air.

Also the indoor air VOC concentrations (except methyl-tertiary-butyl-ether [MTBE]) for units with vapor barriers (Marina Housing in IR Site 31) were no different than for units without vapor barriers (North Housing and Kollman Circle in IR Site 25). MTBE concentrations were higher during the February sampling of the North Housing than during the April and May sampling of the other units.

The indoor air quality assessment concluded that:

1. VOC concentrations in crawl spaces did not differ from those in indoor air.
2. VOC concentrations in indoor air were consistent with outdoor air concentrations and ambient measurements collected by CARB.
3. "The risks to residents of the U.S. Coast Guard housing areas are not likely any different from those of other individuals residing in the Bay Area" (TtEMI 2002a).

1.3.5.5 2002 Polynuclear Aromatic Hydrocarbon Assessment

An assessment of PAHs was conducted in 2002 (reported in Appendix D to the Final RI Report Transfer Parcel EDC-5, Dated March 2005) to examine the potential presence of PAHs in fill material at eight transfer parcels where no PAH release or disposal had been documented (BEI 2005b). Forty-six soil samples (including four duplicates) were collected from direct push borings at 12 locations in IR Site 31 in June 2002 (BEI 2002). The 12 borings are identified as 32EDC-21-1 through 32EDC-21-12 on Figure 4-1. PAHs reported in the soil samples were expressed as a calculated B[a]P equivalent concentration. Appendix B Figure B2 shows B[a]P equivalents. The maximum concentration was 680 micrograms per kilogram (µg/kg), whereas all other concentrations were below the Alameda Point criteria of 620 µg /kg. The individual PAH values were used in estimating the human health risk for this RI. This sampling effort was largely duplicated and superseded in a 2003 PAH assessment by Bechtel (2004a).

1.3.5.6 2003 Polynuclear Aromatic Hydrocarbon Assessment

A total of 648 normal soil samples collected from 163 borings were analyzed for PAHs during the 2003 PAH assessment. The quality assurance (QA) parameters were not broken out for portions of the data on IR Site 31; however, out of the whole data set, which included 3,401 samples collected from 19 IR Sites and 3 EBS parcels, 66 samples had 15 analytes that were considered unusable. The 2003 PAH assessment data are therefore considered 98 percent usable and have been included in the RI data set for IR Site 31; these data are discussed further in Section 4.

PAHs reported in the soil samples were expressed as a calculated B[a]P equivalent concentration (BEI 2004a) and compared to the Alameda Point-specific screening criterion of 620 µg/kg. The individual PAH values were used in estimating the human health risk for this RI.

1.3.5.7 Remedial Investigations at Operable Unit 5

Two RIs that included discussions of environmental conditions at IR Site 31 were conducted adjacent to the site at IR Site 25: the OU-5 RI completed in July 2002 (Neptune et al. 2002) and the IR Site 25/IR-02 groundwater RI/FS issued as a final report in October 2004 (Engineering Remediation Resources Group, Inc. [ERRG] 2004).

2002 OU-5 Remedial Investigation

Environmental samples of soil gas and groundwater were collected at IR Site 31 in May 2001 in support of the RI for OU-5 (Neptune et al. 2002). The May 2001 soil gas sampling event included the collection of samples at two depths: 2 feet bgs and 5 to 7 feet bgs. Soil gas samples were collected at shallow depths from four locations and

analyzed for VOCs, including naphthalene (using EPA Method TO-15). Saturated soil conditions precluded collection of deeper samples at all IR Site 31 locations. Benzene was reported in one of the four samples at a concentration of 8 micrograms per cubic meter ($\mu g/m^3$). Naphthalene was reported in four of the four samples at a maximum concentration of 22 $\mu g/m^3$. Other VOCs reported in at least one of the soil gas samples included the chlorinated compounds 1,1,1-trichloroethane, chloroethane, and trichloroethene (TCE) (none of which have been reported in IR Site 31 soil or groundwater samples); fuel related compounds, including ethylbenzene and xylenes, which may be related to the OU-5/IR-02 groundwater plume; and common laboratory contaminants, including 2-butanone, 4-methyl-2-pentanone, 2-hexanone, acetone, methylene chloride, and vinyl acetate. Because the shallow depth to groundwater may have compromised the representativeness of the soil gas data from the OU-5 RI, these data are not included in the data set for IR Site 31. For the IR Site 31 RI, indoor and outdoor air concentrations were modeled using recently collected soil and groundwater data.

As part of the OU-5 RI, six discrete groundwater samples were collected at depths ranging from 6 to 20 feet bgs from five locations at IR Site 31 (Figure 4-1). These groundwater samples were analyzed for VOCs, PAHs, and MTBE. These data are considered usable, have been included in the RI for IR Site 31, and are discussed in Section 4.2. The OU-5 RI report concluded that benzene and naphthalene were the only two contaminants consistently reported at concentrations above drinking water action levels and therefore were the primary risk drivers in the groundwater ingestion exposure pathway. In addition, the OU-5 RI report concluded that the contaminant concentrations appear to be co-located and increase with distance between the top of the water table and the subsurface lithological unit referred to as the marsh crust (Neptune et al. 2002).

2004 Site 25/IR-02 Groundwater Remedial Investigation and Feasibility Study

An RI/FS was conducted to address benzene and PAH (most notably naphthalene) contamination in shallow groundwater in the vicinity of IR Site 25 and the FISCA IR Site 02. Since these sites are near IR Site 31, the report also included an assessment of groundwater underlying portions of IR Sites 30 and 31 (ERRG 2004). The RI/FS report analyzed previously collected data; no additional fieldwork was conducted. The report concluded that the groundwater contamination is no longer migrating laterally and that natural degradation has been occurring; however, the rate of natural degradation has slowed as dissolved oxygen has been consumed and site conditions have become predominantly anaerobic.

Computer-generated contour maps created during the IR Site 25/IR-02 RI/FS show benzene and naphthalene in shallow groundwater within the eastern portions of IR Site 31 at depths of approximately 20 feet bgs. These maps show that the highest

reported concentrations reported in samples collected from monitoring wells are located in three plume centers: immediately east of IR Site 31 (near the Kollman Circle in IR Site 25); directly north of IR Site 31 (near the intersection of Singleton Avenue and the western end of Annapolis Circle); and to the southeast of IR Site 31 (near the former FISCA IR Site 02). Results of HydroPunch sampling indicated that the concentrations of benzene and naphthalene increased with increased depth to approximately 20 feet bgs. The lower limit of the vertical extent of contamination at 20 feet bgs is likely due to the presence of the Young Bay Mud at 25 feet bgs, which limits the downward migration of contaminants.

The RI/FS report identified the following four possible sources for the groundwater contamination (ERRG 2004):

- Previous point-source discharges;
- Contaminated fill material;
- Buried inclusions of high-concentration material trapped near the marsh crust surface; and
- The marsh crust itself.

An HHRA performed during the RI/FS found that the only exposure pathway that posed a risk greater than the EPA's risk management range was the groundwater ingestion pathway. The remedial alternatives recommended in the RI/FS report will apply to all areas of contaminated groundwater in the vicinity of IR Site 25 (including IR Site 31). The RI/FS report concluded that additional sampling was needed to better define the benzene and naphthalene concentrations along the eastern and western edges of the groundwater plume. The OU-5/IR-02 Groundwater Proposed Plan completed public review in April2006. The proposed plan presents the preferred alternative as the Navy's risk management decision to reduce the mass of contaminants in groundwater by facilitating the biodegradation of benzene and naphthalene and preventing potential future unacceptable exposures in the unlikely event that the groundwater may be used for drinking water in the future. The preferred alternative consists of biosparging with soil vapor extraction, nutrient/microorganism enhancement, as required, monitoring, and institutional controls. The preferred alternative applies institutional controls to restrict access to groundwater during the approximate 8 years estimated to achieve remedial goals. Therefore, the IR Site 31 RI does not characterize groundwater for remedial decision purposes.

1.3.5.8 Storm Drain Investigation

A series of reports have documented the extent and layout of the storm drain system at the former NAS Alameda and identified the system as a potential transport pathway for chemicals to reach surface water and sediment in the San Francisco Bay (TtEMI 2000

Table 3-2
Analytical Soil Samples Collected
IR Site 31 Alameda Point, Alameda, California

Sample Location ID	VOCs			Title 22 Metals and Iron			SVOCs (non-PAHs)			PCBs			Pesticides		
	Sample Depth Interval (feet bgs)														
	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6
3101	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3102	X	X		X	X		X	X		X	X		X	X	
3103	X	X	X[1]	X	X	X[1]	X	X	X[1]	X	X	X[1]	X	X	X[1]
3104	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3105	X	X	XX	X	X	XX	X	X	XX	X	X	XX	X	X	XX
3106	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3107	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3108	XX	X	**X[2]**	XX	X	**X[2]**	XX	X	**X[2]**	XX	X	**X[2]**	XX	X	**X[2]**
3109	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3110	X	X[3]	X[1]	X	X[3]	X[1]	X	X[3]	X[1]	X	X[3]	X[1]	X	X[3]	X[1]
3111	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3112	X	X	XX[1]	X	X	XX[1]	X	X	XX[1]	X	X	XX[1]	X	X	XX[1]
3113	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3114	X	X	**X[2]**	X	X	**X[2]**	X	X	**X[2]**	X	X	**X[2]**	X	X	**X[2]**
3115	X	X	XX	X	X	XX	X	X	XX	X	X	XX	X	X	XX
3116	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3117	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3118	XX	X		XX	X		XX	X		XX	X		XX	X	
3119	X	X		X	X		X	X		X	X		X	X	

Table 3-2 (continued)
Analytical Soil Samples Collected
IR Site 31 Alameda Point, Alameda, California

Sample Location ID	VOCs			Title 22 Metals and Iron			SVOCs (non-PAHs)			PCBs			Pesticides		
	Sample Depth Interval (feet bgs)														
	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6
3120	X	X	X[4]	X	X	X[4]	X	X	X[4]	X	X	X[4]	X	X	X[4]
3121	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3122	X	XX		X	XX		X	XX		X	XX		X	XX	
3123	X	X		X	X		X	X		X	X		X	X	
3124	X	X		X	X		X	X		X	X		X	X	
3125	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3126	XX	X		XX	X		XX	X		XX	X		XX	X	
3127	X	X		X	X		X	X		X	X		X	X	
3128	X			X			X			X			X		
3129	X			X			X			X			X		
3130	X	X		X	X		X	X		X	X		X	X	
3131	X	X		X	X		X	X		X	X		X	X	
3132	X	XX	X[5]	X	XX	X[5]	X	XX	X[5]	X	XX	X[5]	X	XX	X[5]
3133	X	X	X[5]	X	X	X[5]	X	X	X[5]	X	X	X[5]	X	X	X[5]
3134	X	X	X[1]	X	X	X[1]	X	X	X[1]	X	X	X[1]	X	X	X[1]
3135	X	X		X	X		X	X		X	X		X	X	
3136	X	X	XX	X	X	XX	X	X	XX	X	X	XX	X	X	XX
3137	X	X		X	X		X	X		X	X		X	X	
3138	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 3-2 (continued)
Analytical Soil Samples Collected
IR Site 31 Alameda Point, Alameda, California

Sample Location ID	VOCs			Title 22 Metals and Iron			SVOCs (non-PAHs)			PCBs			Pesticides		
	Sample Depth Interval (feet bgs)														
	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6
3139	X	X		X	X		X	X		X	X		X	X	
3140	X	X		X	X		X	X		X	X		X	X	
3141	X	X	XX	X	X	XX	X	X	XX	X	X	XX	X	X	XX
3142	X	X		X	X		X	X		X	X		X	X	
3143	X	X		X	X		X	X		X	X		X	X	
3144	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3145	X	**X**	XX	X	**X**	XX	X	**X**	XX	X	**X**	XX	X	**X**	XX
3146	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3147	X	X		X	X		X	X		X	X		X	X	
3148	X	X		X	X		X	X		X	X		X	X	
3149	X	X		X	X		X	X		X	X		X	X	
3150	X	XX		X	XX		X	XX		X	XX		X	XX	
	50	**48**	**28**	**50**	**48**	**28**	**50**	**48**	**28**	**50**	**48**	**28**	**50**	**48**	**28**

Notes:
XX - Field duplicate taken
Bold **X** - MS/MSD sample taken
1- Sample depth 4.5 to 6.5 feet bgs
2- Sample depth 4 to 7 feet bgs
3- Sample depth 3 to 4 feet bgs
4- Sample depth 4 to 6.5 feet bgs
5- Sample depth 5 to 7 feet bgs

ID= Identification
VOCs= Volatile Organic Compounds
SVOCs= Semivolatile Organic Compounds
PAHs= Polychlorinated Aromatic Hydrocarbons
PCBs= Polychlorinated Biphenyls
bgs= below ground surface

Table 3-3
Analytical Geotechnical Soil Samples Collected
IR Site 31 Alameda Point, Alameda, California

Sample Location ID	Sample ID	Total Organic Carbon			Density and Moisture			Grain Size			Hydraulic Conductivity			Air Permeability		
		Sample Depth Interval (feet below ground surface)														
		0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6	0-2	2-4	4-6
3102	31144	X			X			X			X			X		
3102	31145		X			X			X			X			X	
3104	31007	X			X			X			X			X		
3104	31008		X			X			X			X			X	
3104	31009			X			X			X			X			X
3113	31037	X			X			X			X			X		
3113	31038		X			X			X			X			X	
3113	31039			X			X			X			X			X
3122	31066	X			X			X			X			X		
3122	31068		X			X			X			X			X	
3127	31081	X			X			X			X			X		
3127	31082		X			X			X			X			X	
3132	31087	X			X			X			X			X		
3132	31088		X			X			X			X			X	
3132	31090			X[1]			X[1]			X[1]			X[1]			X[1]
	TOTALS	**6**	**6**	**3**	**6**	**6**	**3**	**6**	**6**	**3**	**6**	**6**	**3**	**6**	**6**	**3**

1- Sample depth 5 to 7 feet bgs
ID= Identification

Table 3-4
Groundwater Samples and Analyses by Location
IR Site 31 Alameda Point, Alameda, California

Sample Location ID	Sample ID	SDG	Matrix	Screened Interval (Feet bgs)	Sample Depth (Feet bgs)	VOCs	Title 22 Metals and Iron	SVOCs (PAHs)	PCBs	Pesticides
Discrete Groundwater Samples Collected from Temporary Wells										
3119	31171	4742	WG	7 - 12	9.5	X	NA	NA	NA	NA
3119	31172	4742	WG	11 - 16	13.5	X	X	X	X	X
3141	31123	4702	WG	15 - 20	17.5	X	X	X	X	X
3142	31125	4702	WG	14 - 19	16.5	X	X	X	X	X
3142	31126	4702	WG	18 - 23	20.5	X	X	X	X	X
3143	31127	4724	WG	12 - 17	14.5	X	X	X	X	X
3144	31167	4743	WG	15 - 20	17.5	X	X	X	NA	NA
3145	31165	4743	WG	13 - 18	15.5	X	X	X	X	X
3145	31166	4743	WG	9 - 14	11.5	X	NA	NA	NA	NA
3147	31164	4743	WG	9 - 14	11.5	X	X	X	X	X
3148	31162	4743	WG	6 - 11	8.5	X	NA	NA	NA	NA
3148	31163	4743	WG	10 - 15	12.5	X	X	NA	X	X
3149	31169	4742	WG	9 - 14	11.5	X	X	X	X	X
3149	31170	4742	WG	5 - 10	7.5	X	NA	NA	NA	NA
3150	31173	4743	WG	9 - 14	11.5	X	X	NA	NA	NA
3146*	31148	4724	WG	9.5 - 14.5	12.0	X	X	X	X	X
Groundwater Monitoring Wells										
M25-01	31129	4702	WG	9.95 - 19.95	14.95	np	X	X	X	X
M25-06	31146	4724	WG	10 - 19.5	14.75	np	X	X	X	X
M25-07	31147	4724	WG	10 - 19.5	14.75	np	X	X	X	X
M25-09	31131	4702	WG	10 - 19.5	14.75	np	X	X	X	X
PW-12	31130	4702	WG	12 -17	14.5	np	X	X	X	X
				Totals:		**16**	**17**	**15**	**15**	**15**

* - Field duplicate collected at location 3146, duplicate not included in total sample analyses count
np = not planned for analyses, see section 3.2.2
NA = no analyses owing to field conditions, see Section 3.2.2 and 3.3.2
ID = Identification
SDG = Sample Delivery Group
bgs = below ground surface
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls

Legend

- SITE 31
- 181 EBS Parcel Boundary with Parcle Number
- Buildings (Removed)
- Communication Lines
- Electric Lines
- Gas Line
- Roads
- Sanitary Sewer Line
- Storm Drain
- Catch Basin
- Manhole *

N
W E
S

Feet
0 2550 100 150 200 250

1 inch equals 250 feet

Aerial Photo Source: USGS, High Resolution Orthoimage
0.3 Meter (1 Foot) resolution
San Francisco-Oakland, CA, 2004

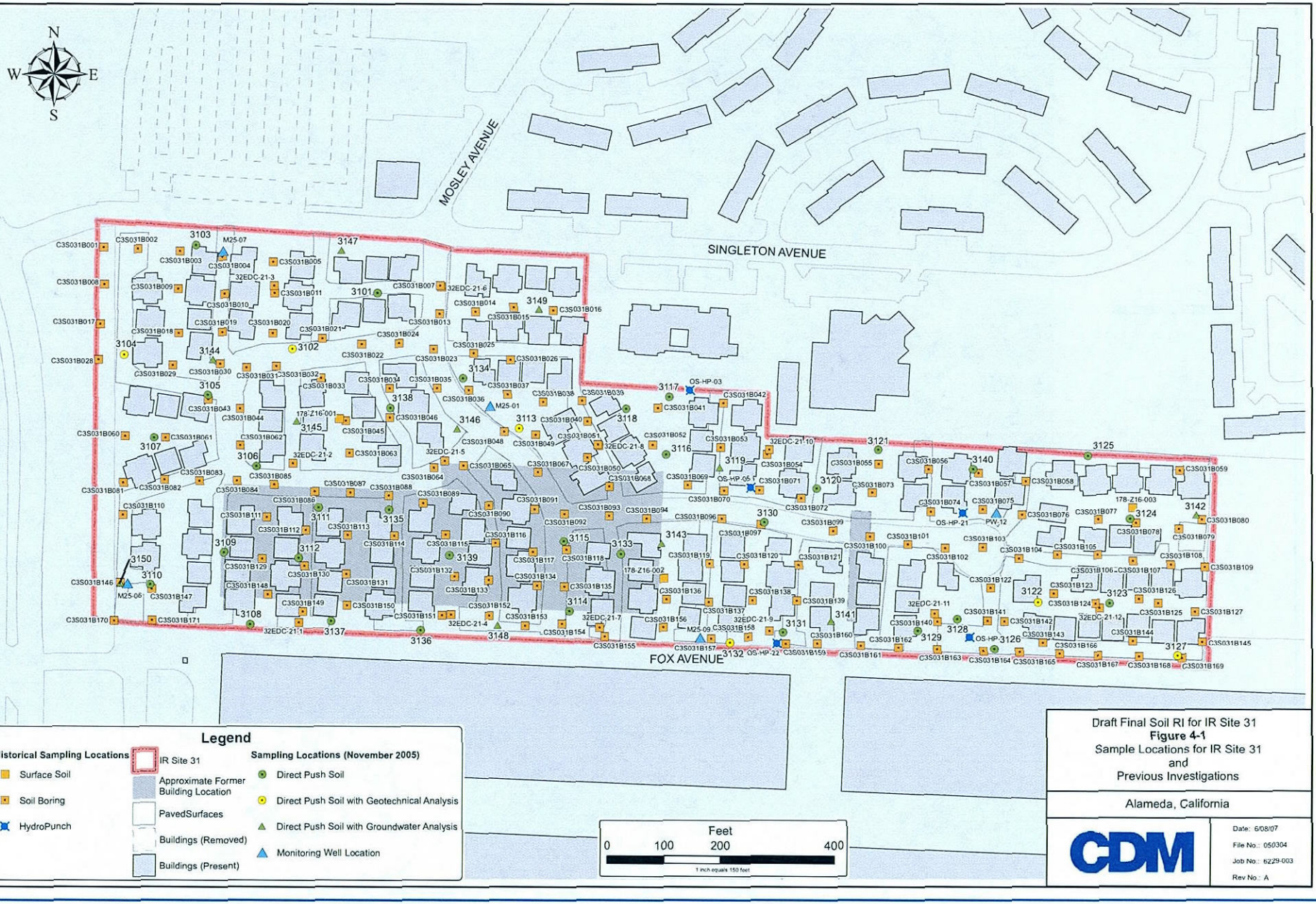
Draft Final Soil Remedial Investigation
for IR Site 31
Figure 1-3
Site Features Map

Alameda, California

CDM

Date: 6/07/07
File No.: 060119
Job No.: 6229-003
Rev No.: A

Document: M:\alameda\avquerv\RI Figures\060119_Figure1-3SiteFeaturesMap.mxd


N
W
E
S
MOSLEY AVENUE
SINGLETON AVENUE
FOX AVENUE
Legend
Historical Sampling Locations
Surface Soil
Soil Boring
HydroPunch
IR Site 31
Approximate Former Building Location
PavedSurfaces
Buildings (Removed)
Buildings (Present)
Sampling Locations (November 2005)
Direct Push Soil
Direct Push Soil with Geotechnical Analysis
Direct Push Soil with Groundwater Analysis
Monitoring Well Location
Feet
0 100 200 400
1 inch equals 150 feet
Draft Final Soil RI for IR Site 31
Figure 4-1
Sample Locations for IR Site 31
and
Previous Investigations
Alameda, California
CDM
Date: 6/08/07
File No.: 050304
Job No.: 6229-003
Rev No.: A
Document: M:\alameda\ayuury\RI_Figures\Revised\A\061030_Figure4-1_AllHistSamples.mxd

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
8	RI	Section 2.3	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 1.1, Pages 1-2 to 1-3. CDM 2007.

- Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities. Final Policy. Human and Ecological Risk Division (HERD), Cal/EPA February 1997;
- Navy Policy for Conducting Ecological Risk Assessments (Department of the Navy [DON] 1999); and
- Navy Guidance for Conducting Ecological Risk Assessments (ERA) (DON 2001a).

1.1 Purpose

The purpose of this RI is to use analytical results from soil and groundwater samples collected at IR Site 31 during the RI and previous investigations to:

- Characterize the nature and extent of contaminants in soil, if any, that resulted from previous site activities for the purpose of supporting human health and ecological risk assessments;
- Assess human health and ecological risk related to human exposure to site soil and indoor air and ecological exposure to site soil; and
- Evaluate if groundwater beneath IR Site 31 has characteristics consistent with the known contaminants of the Operable Unit (OU)-5/IR-02 groundwater plume, or if the data indicate a site-specific release has occurred and has contributed unique contaminants to groundwater, which are related specifically to previous IR Site 31 activities.

The objective of the RI is to collect and evaluate soil data to support a Navy recommendation of no further action or progression to a feasibility study (FS) to evaluate remedial alternatives. The OU-5/IR-02 groundwater is progressing through the remedial decision process independently from the IR Site 31 Soil RI. Public review for the OU-5/IR-02 groundwater proposed plan, which identifies the preferred remedial alternative, was completed in April 2006 (CDM 2005b). This document focuses on soil contamination and is not the RI report for IR Site 31 groundwater.

The scope of this RI is to collect and conduct chemical analyses on soil samples from 50 direct push borings and perform geotechnical analyses on samples from 10 of these 50 locations. Further descriptions of the scope tasks completed for this soil RI are listed below:

- Characterize the nature and extent of chemicals in soil at IR Site 31 using analytical results of samples collected from 50 direct push sample locations with horizontal and vertical distribution adequate to address the exposure scenarios evaluated in the human health and ecological risk assessments;

- Collect and analyze groundwater samples from two discrete depths at 11 direct push locations;
- Provide useable data for the risk assessments by performing laboratory analyses of soil and groundwater samples using analytical methods adequate to achieve reporting limits that are compatible with the planned statistical evaluations;
- Identify physical properties of the soil based upon samples from 10 (of the 50) direct push soil sample locations;
- Use the analytical results of groundwater samples from direct push and existing onsite monitoring wells to assess the nature of chemicals in groundwater at IR Site 31 to determine whether there has been a chemical release to groundwater that is unique to IR Site 31 and unrelated to the OU-5/IR-02 groundwater plume;
- Use analytical results of volatile organic compounds (VOCs) in shallow groundwater samples to provide input to the Johnson and Ettinger model to estimate the migration of vapors to indoor air in support of the human health risk assessment (HHRA);
- Complete a soil baseline HHRA using analytical results of samples collected in this RI and historic analytical results of polynuclear aromatic hydrocarbons (PAHs) in soil to determine the likelihood that exposure to chemicals in soil or air at IR Site 31 could pose a threat to human health; and
- Complete a screening-level ecological risk assessment to evaluate whether potential chemical releases to soil from past activities at IR Site 31 pose a hazard to potential ecological receptors.

1.2 Report Organization

This RI report is organized into the following sections and appendices:

- Section 1 discusses the purpose and organization of the RI; describes the site, previous operations, and the regulatory framework; and summarizes previous investigations and future use of the site.
- Section 2 describes the physical and environmental setting of Alameda Point and IR Site 31.
- Section 3 discusses the investigation approach and scope, including data quality objectives (DQOs), the RI sampling program, and deviations from the work plan (CDM 2005a).
- Section 4 presents results of the RI sampling and describes the nature and extent of soil contamination at the site and presents a comparative evaluation of groundwater sample results from the RI to the known characteristics of the OU-5/IR-02 VOC plume in groundwater beneath IR Site 31.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
9	**OU-5/IR-02 Groundwater ROD**	**Section 2.3**	Final Record Of Decision for Operable Unit 5/IR-02 Groundwater. Section 12. August 2007.

12.0 SELECTED REMEDY

Based on the RI/FS (ERRG, 2004) and Administrative Record (Appendix A) for OU-5/IR-02 as well as an evaluation of all comments (Appendix D) on the Proposed Plan (DON, 2006) submitted by interested parties during the public comment period, the DON has selected Alternative 4 as the remedy for groundwater. Alternative 4 includes the following components:

- Introducing air as an oxygen source (biosparging) to accelerate biodegradation of contaminants;
- Capturing and treating potential escaping vapors by SVE during biosparging to prevent site occupants from being exposed to vapors;
- Nutrient/Microorganism injection to enhance the natural degradation process, as required;
- MNA to track the biodegradation; and
- Land use controls to limit the potential exposure of property users to groundwater contamination and maintain the integrity of the remedial action until risk-based remedial goals have been achieved.

The DON, in coordination with the regulatory agencies, has made a risk management decision that remedial action is warranted for shallow groundwater at OU-5/IR-02, and accordingly, the DON selected Alternative 4 because it reduces the mobility, toxicity, and volume of VOCs in the groundwater by implementing an expedient and proven treatment strategy. The cleanup goals selected for the project are risk-based remedial goals, which are equivalent to the state MCL for benzene and the EPA Health Advisory for naphthalene. Alternative 4 has a relatively low cost, high effectiveness, and moderate implementability while fully protecting human health and the environment and complying with all environmental regulations and laws. As estimated within the RI/FS (ERRG, 2004), Alternative 4 is expected to achieve the RAOs within approximately eight years. During that time, ICs will be implemented to protect human health. Figure 12-1 shows the area requiring ICs and is based on available HydroPunch® and well data through May 2006. The IC boundary may be updated throughout the remedial program based on additional data collection. The data and the basis for the IC boundary will be presented in the RD and other pertinent documents, as appropriate.

The remediation costs (approximately $8 million) for Alternative 4, which includes capital costs and operation and maintenance costs, are presented as Table 12-1.

12.1 BIOSPARGING

Biosparging is an in-situ remediation technology that uses indigenous microorganisms to biodegrade organic constituents in the saturated zone. Biosparging involves the controlled injection of a flow of air (or oxygen) and nutrients (if needed) into the saturated zone to enhance the biological activity of the indigenous microorganisms. Biosparging can be used to reduce concentrations of petroleum constituents that are dissolved in groundwater, adsorbed to soil below the water table, and within the capillary fringe.

At OU-5/IR-02, benzene and naphthalene are the groundwater contaminants. They are petroleum hydrocarbon constituents, which have been shown to be readily biodegradable given oxygen sources and subsurface microbes and nutrients.

Because air injection rates are optimized to promote biodegradation in the saturated zone, fugitive emissions are minimized. However, due to the proximity to site residents, vapor extraction/recovery and treatment will be implemented at OU-5/IR-02 to ensure protection of the nearby residents from potential fugitive emissions.

A pilot study will be performed to provide system design criteria and estimates of time required until remedial goals are achieved. Once a biosparging system has been designed and modified to optimize site conditions, the total time required for contaminant remediation can be better estimated.

The goal at OU-5/IR-02 is to reach remedial goals in eight years or less with a combination of an active biosparge/SVE system and MNA. To achieve this goal, the active system will be optimized and operated for as long as required to reduce contaminant concentrations to the point where the active system can be shut off and MNA used to achieve the remedial goals within the eight-year period.

Following implementation of the selected remedy, the DON, in collaboration with the regulatory agencies, will determine if the performance objectives (including the RAOs) have been achieved. If it is determined the RAOs have not been achieved, and that treatment is no longer cost-effective, the DON will conduct a remedy performance analysis and restoration timeframe analysis to evaluate the practicability of continued groundwater restoration. This remedy performance analysis could include:

- Data and information on source removal and reduction;
- Groundwater data collected from sources inside and outside the plume to evaluate mass reduction and plume migration or containment;
- Operations history of the treatment system;

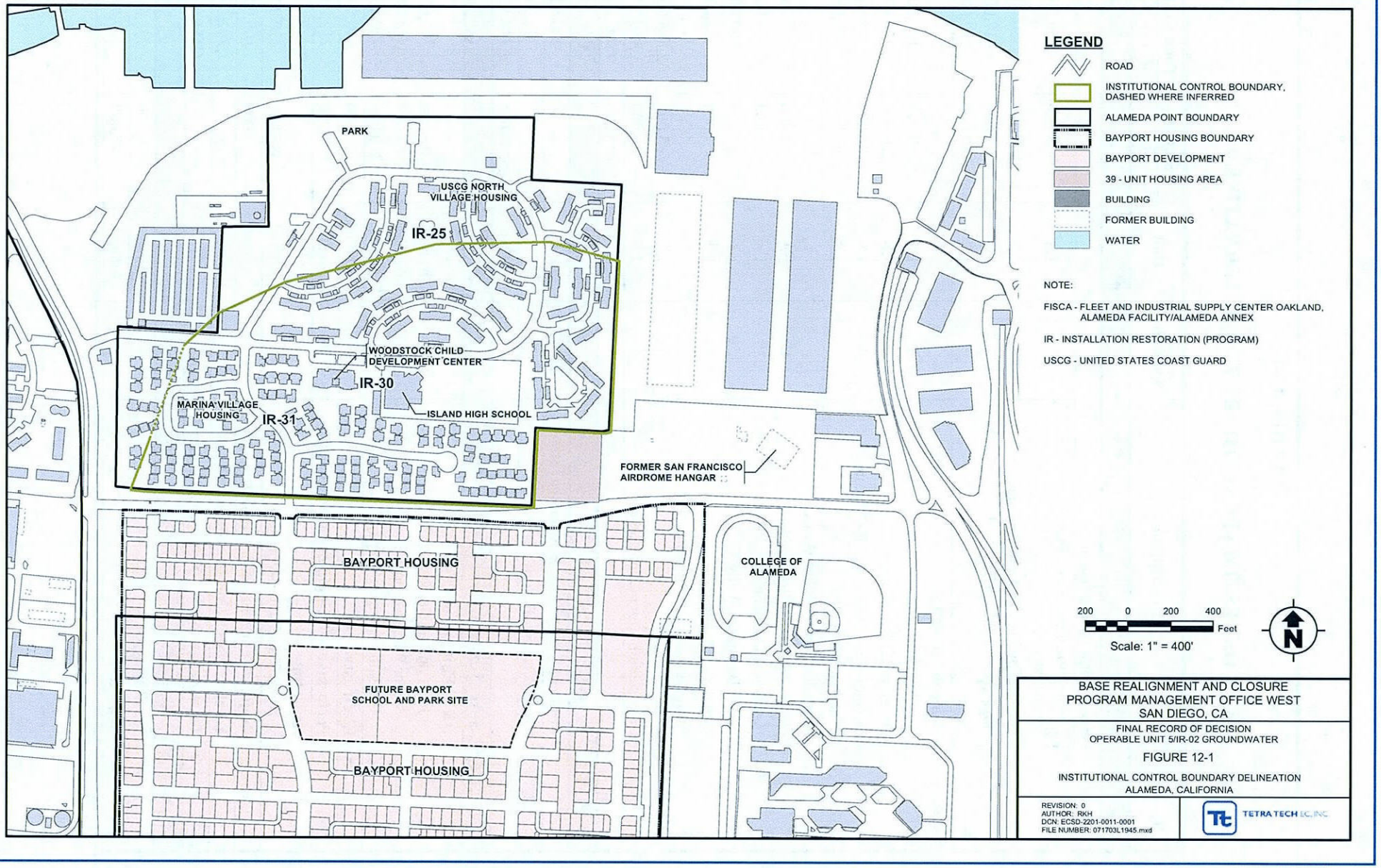

PARK
USCG NORTH VILLAGE HOUSING
IR-25
WOODSTOCK CHILD DEVELOPMENT CENTER
IR-30
MARINA VILLAGE HOUSING
IR-31
ISLAND HIGH SCHOOL
FORMER SAN FRANCISCO AIRDROME HANGAR
BAYPORT HOUSING
COLLEGE OF ALAMEDA
FUTURE BAYPORT SCHOOL AND PARK SITE
BAYPORT HOUSING
LEGEND
ROAD
INSTITUTIONAL CONTROL BOUNDARY, DASHED WHERE INFERRED
ALAMEDA POINT BOUNDARY
BAYPORT HOUSING BOUNDARY
BAYPORT DEVELOPMENT
39 - UNIT HOUSING AREA
BUILDING
FORMER BUILDING
WATER
NOTE:
FISCA - FLEET AND INDUSTRIAL SUPPLY CENTER OAKLAND, ALAMEDA FACILITY/ALAMEDA ANNEX
IR - INSTALLATION RESTORATION (PROGRAM)
USCG - UNITED STATES COAST GUARD
200 0 200 400
Feet
Scale: 1" = 400'
N
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CA
FINAL RECORD OF DECISION
OPERABLE UNIT 5/IR-02 GROUNDWATER
FIGURE 12-1
INSTITUTIONAL CONTROL BOUNDARY DELINEATION
ALAMEDA, CALIFORNIA
REVISION: 0
AUTHOR: RKH
DCN: ECSD-2201-0011-0001
FILE NUMBER: 071703L1945.mxd
TETRA TECH EC, INC

TABLE 12-1

COST ESTIMATE SUMMARY FOR ALTERNATIVE 4

Item No.	Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
DIRECT COSTS					
1	**Pre-Design Investigation**				
	Develop Pre-Design and Pilot Test Work Plans	1	LS	260,000	260,000
	Pre-Design Sampling and Analysis	1	LS	550,000	550,000
	Biosparge/SVE Pilot Test	1	LS	417,000	417,000
	Reporting	1	LS	80,000	80,000
2	**Remedial Design**				
	Develop Work Plans	1	LS	140,000	140,000
	Develop RD/RA Plans	1	LS	220,000	220,000
	Develop Post Closure MNA Program	1	LS	80,000	80,000
	Establish ICs (LUCIP)	1	LS	90,000	90,000
3	**Remedial Action Field Work**				
	Install Additional Monitoring Wells	10	EA	2,400	24,000
	Install Soil Gas Monitoring Probes	30	EA	800	24,000
	Install Biosparge Wells	150	EA	1,200	180,000
	Install SVE Wells	45	EA	1,000	45,000
	Biosparge and SVE Equipment & Installation	1	LS	2,665,000	2,665,000
	Construction Completion Report	1	LS	130,000	130,000
				Subtotal:	*4,905,000*
INDIRECT COSTS					
1	**Project Management & Administration**	10%			490,500
2	**Legal, License, Permits**	1%			49,050
				Capital Costs Total:	***5,444,550***
O&M COSTS Active Treatment (2 years)					
1	**O&M Equipment (3 systems)**				
	Parts and Equipment	2	Annual	36,000	72,000
	Vapor Phase Carbon	2	Annual	24,000	48,000
	Operator/ Sampler/ Repair Tech	2	Annual	210,000	420,000
2	**Electricity**	2	Annual	90,000	180,000
3	**Performance/Compliance Monitoring**	2	Annual	106,000	212,000
4	**Reporting**				
	Annual (includes 5-yr review)	2	Annual	85,000	170,000
5	**Project Management & Administration**	2	Annual	50,000	100,000
	Total Active O&M - Unadjusted (2 years)				***1,202,000***
	Total Active O&M - Net Present Value (2 years):[1]				***1,155,000***
MNA COSTS (6 years)					
1	**Monitoring/ ICs**	6	Annual	38,000	***228,000***
2	**Reporting**	6	Annual	45,000	***270,000***

TABLE 12-1

COST ESTIMATE SUMMARY FOR ALTERNATIVE 4

Item No.	Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
3	**Project Management**	6	Annual	15,000	***90,000***
	Total MNA - Unadjusted (6 years)				***588,000***
	Total MNA – Net present value (6 years):[1]				***508,000***
	Well Abandonment at Completion – Net Present Value (8 years)[1]				
	Biosparge Wells	150	EA	1,200	180,000
	SVE Wells	45	EA	800	36,000
	Vapor Probes	30	EA	200	6,000
	Monitoring Wells	10	EA	1,200	12,000
	Subtotal O&M, MNA, and Well Abandonment Net Present Value and Capital Cost				***7,341,550***
	10% Contingency				***734,155***
	TOTAL PRESENT VALUE COST OF ALTERNATIVE				***8,075,705***

Notes:

[1] Nominal discount rate of 2.7% per OMB Circular A-94.

Abbreviations and Acronyms:
EA - each
IC - institutional control
LS - lump sum
LUCIP - Land Use Control Implementation Plan
MNA - monitored natural attenuation
O&M - operation and maintenance
RA - remedial action
RD - remedial design
SVE - soil vapor extraction
YR - year

- A projected timeframe for achieving the remedial goal by continuing treatment;
- Estimates of cost to continue treatment;
- Determination whether there is another alternative that is more cost-effective; and/or
- Whether further remedial actions are necessary to protect human health and the environment.

The DON, in collaboration with the regulatory agencies, will develop an Explanation of Significant Differences or a ROD amendment if the analysis shows it is still practicable to continue groundwater restoration but any further remedial action might represent a significant or fundamental change in the cleanup approach for OU-5/IR-02. If it is determined that it is not practicable to continue groundwater restoration, the DON, in collaboration with the regulatory agencies will develop alternative remedial strategies that meet the remedial action objective. This decision will be made in accordance with EPA's *Guidance for Evaluating Technical Impracticability of Ground-water Restoration* (EPA, 1993).

To estimate the timing for ceasing active biosparge/SVE and switching to MNA, modeling will be performed shortly after system startup and approximately semi-annually to annually thereinafter using the current site monitoring data. Appropriate models include, but are not limited to the following:

- The United States Geologic Survey (USGS) ModFlow transport model coupled with the MT3D or RT3D contaminant module to estimate the fate and transport of benzene and naphthalene within the fill aquifer. This model can be used to estimate the amount of time the biosparge system will run to reduce concentrations to a specific concentration.
- The Virginia Tech/USGS Natural Attenuation Software can be used to estimate the amount of time necessary for MNA to reduce the in-situ residual concentrations to the remedial goals.

Field data input values, required to run the model and calculate when biosparging can be terminated, will be collected during pre-design sampling. The results will be provided in the RD.

12.2 SOIL VAPOR EXTRACTION

Alternative 4 includes a vapor extraction and treatment system to mitigate potential human health risk from possible fugitive emissions during biosparging, although this risk is minimal based on benzene and naphthalene concentrations in groundwater and the low pressure of the injected air. The SVE system will operate when the biosparging system is operating.

12.3 NUTRIENT/MICROORGANISM ENHANCEMENT

Nutrient/microorganism enhancement introduces microorganisms and/or nutrients into contaminated areas to stimulate and accelerate natural biodegradation processes that degrade (metabolize) subsurface contaminants. The addition of inoculated microorganisms and nutrients can be conducted on an as-needed basis by injecting a liquid base. The liquid can be injected through specially designed wells or with direct push technology. Other amendments may be added to the liquid base to enhance bioremediation and contaminant desorption from subsurface materials.

Nutrient/microorganism enhancement will be performed at OU-5/IR-02 as appropriate based on site-specific conditions. During the pre-design sampling event, biomarker analysis will be conducted to evaluate the effectiveness of nutrient or microbial enhancement.

12.4 MONITORED NATURAL ATTENUATION

MNA will be conducted as part of the OU-5/IR-02 remedy to track the biodegradation. MNA will be used to evaluate the natural attenuation progress and contaminant reductions due to natural attenuation and the biosparging/SVE. The objective at OU-5/IR-02 is to reach the remedial goals in eight years or less with a combination of an active biosparge/SVE system and MNA.

12.5 INSTITUTIONAL CONTROLS

ICs are legal and administrative mechanisms used to implement land use and access restrictions that are used to limit the exposure of future landowner(s) and/or user(s) of the property to hazardous substances and to maintain the integrity of the remedial action until remediation is complete and remedial goals have been achieved. Legal mechanisms include proprietary controls such as restrictive covenants, negative easements, equitable servitudes, lease restrictions, and deed notices. Administrative mechanisms include notices, adopted local land use plans and ordinances, construction permitting, or other existing land use management systems that may be used to ensure compliance with use restrictions. Monitoring and inspections are conducted to assure that the ICs are being followed.

ICs shall limit the exposure of user(s) of the property to hazardous substances and protect and maintain the integrity of the remedial action until remediation is complete and remedial goals are achieved. The IC objectives are to prevent access or use of the groundwater until cleanup levels are met and to maintain the integrity of any current or future remedial or monitoring system, such as monitoring wells, injection and vapor extraction wells, etc.

The ICs will remain in place until the following risk-based remedial goals have been achieved:

- Benzene – 1 µg/L
- Naphthalene – 100 µg/L

The area requiring ICs at OU-5 is shown on Figure 12-1. The groundwater being remediated underlies: 1) property currently owned by DON at Alameda Point (OU-5), and 2) property adjacent to Alameda Point formerly but no longer owned by DON and known as FISCA (IR-02). The groundwater being remediated may also underlie property never owned by the federal government (College of Alameda). It is necessary to use differing approaches to institutional controls for each of these three scenarios.

The first subsection 12.5.1 below addresses Existing Institutional Controls for Alameda Point property that is still owned and controlled by the Navy as well as property already conveyed to non-federal entities at FISCA. The following subsection 12.5.2 addresses Future Institutional Controls to be established at the time of conveyance of Alameda Point property to both non-federal and federal entities and to potentially address non-federal property owned by the College of Alameda.

12.5.1 Existing Institutional Controls for Alameda Point

The following Existing Institutional Controls are currently in force and effect pursuant to specific DON and DTSC legal instruments. They are incorporated into this ROD as an integral component of this final CERCLA remedial action and to confirm that they are sufficiently protective to serve as components of this final CERCLA ROD and remedial action and otherwise comply with CERCLA and the NCP.

12.5.1.1 Interim Lease to City of Alameda and USCG Use Agreement

Currently the three IR sites (Sites 25, 30, and 31) overlaying OU-5 are occupied as described in Section 1.3. Site 30 is currently leased to the City of Alameda School District (DON, 1997) with planned final conveyance taking place by means of a Public Benefit Conveyance through the United States Department of Education. Site 31 comprises housing occupied by USCG personnel, and Site 25 housing is vacant. An Interim Use Agreement for property being used by the USCG is in place and contains provisions consistent with the ICs for the selected remedial alternative.

The DON has determined that it will rely upon proprietary controls in the form of lease restrictions in the lease to the school district and the USCG Interim Use Agreement until the property is conveyed to either a federal or non-federal entity (see below). These controls will

continue until the property is conveyed to either a non-federal entity with environmental restrictive covenants as provided in the "Memorandum of Agreement Between the United States Department of the Navy and the California Department of Toxic Substances Control" (hereinafter referred to as "Navy/DTSC MOA") (DON and DTSC, 2000) and attached covenant models or to a federal entity pursuant to a MOA with the federal transferee or a similar agreement. More specifically, the lease and Use Agreement will serve as interim ICs between the time the ROD is signed and the date upon which the Navy transfers the property. Through the lease and Use Agreement, the Navy will maintain conditions that are consistent with the IC objectives for the chosen remedial alternative.

Currently the lease contains provisions that the Alameda School District shall not conduct operations, nor make any alterations, that would interfere with or otherwise restrict DON operations or environmental clean-up or restoration actions by the DON, the EPA, the State of California, or their contractors. In addition, the Alameda School District lease incorporates the environmental restrictions set forth in the DON's Finding of Suitability to Lease (FOSL) for the property (DON, 1996b). Specific pertinent provisions of the FOSL include restrictions against using the groundwater for any purpose without prior approval from the DON and the Water Board (restriction no. 5, page 8) as well as any form of digging soil or disturbing soil or pavement without prior approval from the DON (restriction no. 3, page 8). Finally, the lease states that the DON's and regulators' environmental clean-up activities take priority over the users' activities on the property when a conflict arises between the two. In summary, the lease prohibits any activity that could result in exposure to contaminated soil or groundwater, unless the DON is contacted and approves that activity with appropriate protective measures so that human health and the environment are protected. Therefore, the lease is fully protective of the health of property users and the environment. No revisions of the lease are necessary.

The Interim Use Agreement contains provisions that prohibit any land disturbing activity without written approval from the DON and prohibit any alteration, disturbance or removal of any component of a response or cleanup. There are currently no groundwater wells on this portion of the property (other than monitoring wells); therefore, the prohibition on land-disturbing activities will serve to prevent access to or use of the groundwater until cleanup levels are met.

12.5.1.2 Institutional Controls at Former DON Property Adjacent to Alameda Point

In the summer of 2000, the DON transferred to the City of Alameda, two parcels of land managed by the DON and commonly known as FISCA and East Housing. These two parcels abut Alameda Point property, which is currently owned by the DON. The groundwater plume addressed in the OU-5/IR-2 ROD extends beneath both Alameda Point and FISCA.

The FISCA deed recorded as Document No. 2000215933, July 20, 2000, (City of Alameda, 2000b) was subject to a deferral of Section 120(h)(3)(C) of CERCLA. The deed contains a groundwater use restriction consisting of a prohibition against constructing any wells screened to the shallow aquifer and another prohibition against using groundwater for anything other than construction dewatering, irrigation, or emergency use such as firefighting. Any groundwater collected from dewatering is subject to any Water Board requirements before being disposed. The FISCA deed prevents the property owner from engaging in activities that will disrupt required remedial actions or oversight activities on the property.

In addition, the FISCA deed contains a restriction covering Area 1 (generally known as IR-02). This restriction states that "Area 1 shall not be used for residential purposes and construction activities shall not begin until the DON and DTSC determine that soils having polychlorinated biphenyls and cadmium concentrations do not pose an unacceptable risk to human health or safety or the environment..."

The groundwater use restriction and the limitations on residential housing construction in Area 1 contained in the FISCA deed were further buttressed by an "Interim Covenant to Restrict the Use of Property" (DON, 2001) recorded as Document No. 2000 215932, July 20, 2000. This Interim Covenant entered into by the DON and DTSC provided DTSC with the authority to protect human health and the environment.

Also, on the same day, DTSC entered into a "Covenant to Restrict the Use of Property (Environmental Restrictions)", which was recorded as Document No. 2000215936, July 20, 2000, (City of Alameda, 2000a). This covenant between DTSC and the City of Alameda and its reuse authority covered both parcels of land transferred by deed and contained groundwater-related restrictions. These prohibitions include a ban on well construction for wells screened to the shallowest groundwater zone. Extraction of groundwater from the same zone was prohibited for all uses except irrigation and emergency firefighting. Groundwater flowing from construction site activity was subject to Water Board requirements prior to any disposal.

On October 3, 2006, DTSC concurrently released 2.51 acres located in the western one-third of IR-02 from the Interim Covenant, and entered into another Covenant with the Community Improvement Commission of the City of Alameda (DTSC, 2006). This new covenant prohibits buildings from being constructed on the [property] unless the owner has certified to DTSC that a sub-slab depressurization system (SSDS), identified in the Removal Action Work Plan, has been installed and is operating properly. Further, the covenant prohibits the owner from disabling or altering any component of the SSDS without approval, except for maintenance.

In parallel with DTSC's release of the October 3, 2006 covenant, the Navy executed an amendment to the FISCA deed in accordance with Paragraphs II.F.4.a and II.F.4.a.ii.(d) of the deed. The amendment covered a 2.5-acre parcel on the western one-third of IR02. The amendment required that prior to any residential use of the parcel, the property owner must certify the installation and proper operation of a passive sub-slab depressurization system for the 39-unit residential structure planned for the parcel. The specific components of this requirement were provided in DTSC's Removal Action Work Plan, dated October 3, 2006.

During September 2006, public comment on the Draft Removal Action Work Plan was solicited, and a public meeting to discuss the Plan was held on September 21, 2006. The Removal Action Work Plan included the following:

- An initial gas barrier membrane placed on the soil sub grade
- A continuous gravel blanket beneath the floor slab and continuous interior footings
- Inlet pipes to allow fresh air to enter the gravel blanket
- Outlet pipes to collect fresh air from the inlet pipes and soil gas and direct it to the roof
- A membrane constructed on top of the floor slab to mitigate the potential for gas movement into the living spaces
- A concrete topping slab to protect the membrane, and
- Wind-driven turbines

Based on the groundwater restrictions in the FISCA deed and the restrictions contained both in the covenants between DTSC and the DON and DTSC and the City of Alameda, as well as the current enforcement of the groundwater restrictions, the DON finds that the existing controls currently in place meet the objectives of protecting future residents and users on the former DON property at FISCA and East Housing from unacceptable risk to human health, safety, or the environment due to exposures to contaminated soils on the property or contaminated groundwater while the OU5/IR-02 response action is being undertaken. No additional institutional controls are necessary.

12.5.2 Future Institutional Controls

12.5.2.1 Conveyance to a Non-federal Entity

When the Alameda Point property is to be transferred to a non-federal entity, the IC objectives to be achieved through land use restrictions for this site will be incorporated into the following legal mechanisms:

1. If the property is transferred, restrictive covenants will be included in one or more Quitclaim Deeds from the DON to the property recipient.
2. Restrictive covenants will be included in a "Covenant to Restrict Use of Property"[1] entered into by the DON and DTSC as provided in the Navy/DTSC MOA (Navy and DTSC, 2000) and consistent with the substantive provisions of Title (tit.) 22 Cal. Code Regs. Section 67391.1.

The "Covenant to Restrict Use of Property" will incorporate the land use restrictions into environmental restrictive covenants that run with the land and that are enforceable by DTSC and the DON against future transferees. The Quitclaim Deed(s) will include the identical land use restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the DON against future transferees.

Detailed land use restrictions will be set forth in the remedial design consistent with the following:

1. New construction in the OU-5 area subject to ICs shall not be for any of the following purposes until the risk-based remedial goals in the ROD have been reached unless otherwise approved by the DON and FFA signatories:
    a. A residence, including any mobile home or factory-built housing, constructed or installed for use as residential human habitation;
    b. A hospital for humans;
    c. A school for persons under 21 years of age;
    d. Daycare facility for children; or
    e. Any permanently occupied human habitation other than those used for commercial or industrial purposes
2. Within the OU-5 area the installation of new groundwater wells of any type will be prohibited without prior review and written approval from the DON, DTSC, EPA, and Water Board until cleanup objectives have been achieved.
3. Also prohibited will be the installation of any well that has the potential to affect plume migration.
4. The alteration, disturbance, or removal of Navy groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated piping and equipment, to include any component of the remedial action, will be prohibited

[1] See "Memorandum of Agreement Between the United States Department of the Navy and the California Department of Toxic Substances Control, Use of Model 'Covenant to Restrict Use of Property' at Installations Being Closed and Transferred by the United States Department of the Navy" dated March 10, 2000.

without prior review and written approval from the DON, DTSC, EPA, and Water Board.

12.5.2.2 Conveyance to a Federal Department or Agency

If the property within OU-5 is, in the future, transferred by the DON to a federal department or agency, the IC objectives/land use restrictions set forth in Section 12.5.2.1 will be incorporated into a Memorandum of Agreement or similar agreement.

12.5.2.3 Potential Groundwater Plume Off-Station at the College of Alameda

Currently there is no information to indicate that any institutional controls are necessary to protect future residents and visitors on the College of Alameda property from unacceptable risk to human health, safety, or the environment due to exposure to groundwater. The DON agrees to implement ICs consistent with those for the OU-5 area, in consultation with the FFA signatories, if data collected in support of the remedial design indicates ICs are required. There are currently no existing groundwater wells on College of Alameda property. If future groundwater sampling documents a need for CERCLA institutional controls to prevent exposure to the groundwater, DON will rely on the local permit programs administered by the Alameda County Public Works Agency ("ACPWA") to regulate access to and use of the groundwater. This agency requires that any person planning to construct a water well in the city limits of Alameda must apply to the ACPWA and obtain a permit for construction of such well. The ACPWA is also authorized to include any necessary conditions in the permit to assure adequate protection of public health.

If institutional controls are determined to be necessary, the DON will provide ACPWA with copies of the maps that delineate the off-station groundwater plume. The DON will work with ACPWA to provide updated information annually until cleanup objectives have been achieved.

The ACPWA shall have the lead in assuring that appropriate permits are obtained for construction of new water wells overlying the groundwater plume and taking any necessary enforcement action to assure that such permits are obtained and complied with.

12.5.3 IC Implementation and Oversight

The DON and FFA signatories and their authorized agents, employees, contractors and subcontractors shall have the right to enter upon the OU-5/IR-02 area in order to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary under the cleanup program, including but not limited to monitoring wells, pumping wells, and treatment facilities. These access restrictions

will be included in the deed and covenant for property conveyed to a non-federal entity and in the MOA if property is conveyed to a federal entity.

The DON shall address IC implementation and maintenance actions including periodic inspections in the preliminary and final RD Reports to be developed and submitted to the FFA signatories for review and approval pursuant to the FFA (see "Navy Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions" attached to January 16, 2004 DoD Memorandum titled "Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Record of Decision (ROD) and Post-ROD Policy"). The Preliminary and Final RD Reports are primary documents as provided in Section 10.3 of the FFA. The Preliminary and Final RD Reports shall include a land use control (LUC) RD section to describe required IC implementation actions including:

- Requirements for CERCLA five-year remedy review;
- Frequency and requirements for periodic monitoring or visual inspections and reporting results from monitoring and inspections;
- Notification procedures to the regulators for planned property conveyance, changes, and/or corrective action required for the remedy;
- Development of wording for land use restrictions and parties to be provided copies of the deed language once executed;
- Identification of responsibilities for DON, EPA, DTSC, Water Board, other government agencies, and the new property owner for implementation, monitoring, reporting, and enforcement of ICs;
- A list of ICs with their expected duration; and
- Maps identifying where ICs are to be implemented.

The DON shall be responsible for implementing, inspecting, reporting, maintaining, and enforcing the necessary ICs described in this ROD in accordance with the approved RD Reports. Although the DON may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or other means, the DON shall retain ultimate responsibility for remedy integrity. Should any of the ICs fail, the DON shall ensure that appropriate actions are taken to reestablish protectiveness of the remedy and may initiate legal action to either compel action by a third party(ies) and/or recover the DON's costs for mitigating any discovered IC violation(s). The ICs will remain in place until the concentrations of benzene and naphthalene in groundwater have been reduced to levels that achieve risk-based remedial goals in this ROD and allow for unrestricted site use and exposure.

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
10	human health risk assessment	Section 2.5.1	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 6.1, Pages 6-1 to 6-15, Tables 6-1 to 6-11, Figure 6-1. CDM 2007.

Section 6
Human Health and Ecological Risk Assessments

A baseline HHRA and a Tier 1 screening-level ERA (consisting of Steps 1 and 2 of the Navy policy for conducting ERAs) were performed to assess potential impacts on human health and environmental receptors from exposure to chemicals at IR Site 31 in the absence of any remedial actions. For this RI, refined exposure assessments per Step 3a of Navy policy were also included in the ERA. The HHRA and Tier 1 screening-level ERA methodologies and results are presented in Appendices I and J, respectively.

Both the HHRA and the ERA evaluate current and future potential human health risks and ecological impacts, respectively, with the assumption that concentrations of chemicals in soil and groundwater remain unchanged from current conditions. The results of the risk assessments provide information for making decisions concerning the necessity for action to reduce exposure.

6.1 Human Health Risk Assessment

The baseline HHRA was conducted in accordance with guidelines published by EPA in the Risk Assessment Guidance for Superfund Part A (EPA 1989), Part B (EPA 1991b) and Part E (EPA 2004a) and supporting documents and guidelines published by Cal/EPA. Tables summarizing the results of the HHRA are presented in this section, and the details and supporting calculations are presented in Appendix I.

6.1.1 Conceptual Site Model

The CSM summarizes the physical characteristics, distribution of chemicals, and migration pathways at IR Site 31. The most frequently identified chemicals are metals and PAHs. VOCs, SVOCs (other than PAHs), pesticides, and PCBs were reported in 10 percent or fewer of the soil samples (Figure 6-1).

As reported in Section 4 and Appendix H2, statistical analysis using DTSC policy for arsenic, cadmium, chromium, and vanadium shows that these metals, and likely iron, represent ambient populations. IR Site 31 was originally included in the area covered by the Alameda Point pink background (TtEMI 2001). Therefore, in accordance with the typical process at Alameda Point, metal concentrations at IR Site 31 were also compared to those in the pink background. A total of 15 of 17 metals were found to exceed Alameda Point pink background population concentrations (Appendix H1). The evaluation in this report indicates that the Alameda Point pink background is not applicable at IR Site 31 as was also concluded for adjacent IR Site 25 in the 2002 final OU5 RI report (Neptune 2002).

The finding that the metals are ambient is consistent with the absence of a pattern in the distribution of metals in soil related to former Navy activities as discussed in Section 4. There are elevated metals beneath the footprint of the former warehouse as well as outside this footprint. The upper 2 to 4 feet is fill soil imported in the early 1990s for construction of the Marina's Village Housing. The placement and thickness of fill is described in the final construction design drawings in Appendix K.

Using the B[a]P equivalent value, the concentrations greater than the comparison level of 620 µg/kg (see Section 4.1.3.2) are mainly found in the 4- to 8-foot depth interval with a few exceptions (BEI 2004a). Also, the locations with B[a]P equivalent concentrations greater than 620 µg/kg are much more prevalent in the western half of IR Site 31. The distribution of PAH concentrations as represented by the B[a]P equivalent values, and supporting discussions are presented in Section 4.1.3.2.

The groundwater in the vicinity, and directly beneath IR Site 31, is impacted by benzene and naphthalene. The nature of VOCs and naphthalene in groundwater beneath IR Site 31 is similar to the OU-5/IR-02 groundwater plume. There is no evidence in soil or groundwater sample results of an impact specifically related to past activity at IR Site 31. As discussed in Section 4.2, the concentrations of benzene and naphthalene in shallow groundwater are substantially less than the concentrations in deeper water, probably due to natural degradation processes in shallow groundwater.

The chemical migration pathways for IR Site 31 include the migration of vapors from soil and groundwater into indoor and outdoor air. In addition, particles of soil could become airborne and be inhaled in outdoor air although there is a limited amount of exposed soil at IR Site 31.

6.1.2 Data Evaluation

This section presents the data evaluation process used to select data for inclusion in the risk assessment and for identification of COPCs. In addition to the data collected for this RI, the data from the following investigations were also included in this risk assessment:

- VOCs, non-PAH SVOCs, PCBs, and pesticides from soil sample data at 50 soil sample locations for this RI (November 2005);
- VOCs from groundwater sample results from 11 temporary well locations for this RI (November 2005);
- PAH soil data from the 2002 PAH assessment (BEI 2004a);
- PAH soil data from the 2003 PAH assessment (BEI 2004b);
- PAH soil data from the OU-5 RI (Neptune et al. 2002);

- Surface soil sample data, from the 2001 parcel assessment (IT 2001) (3 locations); and
- VOC groundwater data from 5 HydroPunch® locations sampled during the 2001 Parcel 178 assessment (IT 2001).

All validated and verified data from these investigations were used. Manganese was not included in the work plan but was extrapolated by CDM from the raw data packages. The results are unverified by the laboratory and are estimated. The health risks associated with manganese are presented in Section 6.1.6.5.

In previous investigation data, there are 648 soil samples analyzed for PAHs from over 160 locations. From this RI, there are 120 samples analyzed for metals, VOCs, non-PAH SVOCs, PCBs, and pesticides from 50 locations (see Section 3 for sample analyses summaries). There are three additional analyses of pesticides and PCBs from three surface soil samples collected as part of a Zone 16 - EBS Parcel 178 investigation (IT 2001). These three soil sampling locations are identified as 178-Z16-001 through 178-Z16-003 on Figure 4-1. There are 16 shallow groundwater samples from 16 locations with analyses for VOCs that are used in the risk assessment. Table 3-4 has the details of samples and analyses by location. Attachment I1 presents the samples used for the risk assessment.

All chemicals reported in at least one sample at concentrations greater than the sample quantitation limit were included as COPCs (Table 6-1). No chemicals were excluded based on comparison to background concentrations. Screening criteria were not applied to eliminate or screen out analytes from the risk assessment.

For estimating the migration of vapors from groundwater, the data from shallow groundwater collected in this RI and the OU-5 RI (Neptune et al. 2002) investigation are used. COPCs identified in groundwater are presented in Table 6-1. For estimating the risks for future residential use of groundwater, completed risk calculations from the Final Groundwater RI/FS for IR Site 25/IR-02 were used (ERRG 2004).

6.1.3 Exposure Assessment

IR Site 31 is currently used for Coast Guard housing, and this use is likely to continue for the foreseeable future. The homes were constructed in the early 1990s and vapor barriers were included to address any potential concerns with VOCs in the OU-5/IR-02 groundwater plume.

Currently residents are drinking water supplied by the East Bay Municipal Utility District. It is unlikely that residents would drink groundwater in the future; however, in accordance with input from the regulatory agencies, groundwater use for drinking water is included in the evaluation of future residential use of IR Site 31.

Several exposure pathways (routes) for current and future residential and construction scenarios at IR Site 31 are considered complete for this risk assessment. The exposure pathways, scenarios, and receptors are shown on the Conceptual Site Exposure Model of Figure 6-1 and summarized below:

- **Current Residential.** Residential exposure routes include incidental soil ingestion, dermal contact with soil, inhalation of particulates and vapors from soil in outdoor air, inhalation of vapors from soil and groundwater in indoor air, and ingestion of produce grown in local soil. Current exposure is assumed to occur to COPCs in the upper 2 feet of soil except for vapors to indoor air where all soil samples are included.
- **Future Residential.** Residential exposure routes include incidental soil ingestion, dermal contact with soil, inhalation of particulates and vapors from soil in outdoor air, inhalation of vapors from soil and groundwater in indoor air, ingestion of groundwater, inhalation while showering with groundwater, and ingestion of produce grown in local soil. Future exposure is assumed to occur to COPCs in soil from 0- to 7-foot depth because future construction could bring deeper soil to the surface.
- **Construction.** Construction exposure routes include incidental soil ingestion, dermal contact with soil, inhalation of particulates from soil in outdoor air, and inhalation of vapors in outdoor air. Construction worker exposure is assumed to occur to COPCs in soil from 0- to 7-foot depth.

The risks for residential use of groundwater were taken from the Final Groundwater RI/FS for IR Site 25/IR-02 (ERRG 2004). Dermal contact with groundwater by construction or utility workers is considered to be an incomplete or insignificant pathway and details of the rationale are included in Appendix I.

In soil, the exposure point concentration (EPC) was the lower of the 95 percent UCL of the average chemical concentration or the maximum detected concentration. The Student's t-test was used to calculate the EPC for normal data, the Land equation for lognormal data, and the gamma value for data that fit a gamma distribution. The approximate Chebyshev limit was used for nonparametric data. The distributions were determined with EPA software, ProUCL. Tables I4-2 and I4-3 in Appendix I summarize the soil EPCs used for the risk assessment for 0- to 2-foot depth and 0- to 7-foot depth, respectively.

In shallow groundwater, the EPC for vapor migration modeling is the maximum concentration found in any sample. One hypothetical sample was created that consisted of the maximum concentrations for the volatile COPCs and was assumed to be representative of all groundwater. Table I4-4 in Appendix I summarizes the groundwater EPCs used for the risk assessment.

6.1.4 Toxicity Assessment

Toxicological effects fall into two categories: (1) those that could potentially cause cancer (carcinogens) and (2) those that cause other types of adverse health effects (non carcinogens). The toxicity value for carcinogenic effects is called a cancer slope factor (CSF), and the toxicity value for noncarcinogenic effects is called a reference dose (RfD).

Lead is evaluated with a site-specific DTSC value for lead in soil of 184 mg/kg with a scenario including ingestion of homegrown produce and 322 mg/kg without ingestion of homegrown produce calculated using local concentrations for lead in outdoor air and drinking water supply (Cal/EPA 1999b).

The toxicity values were obtained from the table of PRGs published by EPA Region 9 (EPA 2004b) and confirmed by a review of the EPA Integrated Risk Information System (IRIS) database (EPA 2004a). PRGs based on provisional toxicity values cannot be confirmed as these data are not available to the public.

Total chromium analytical results were evaluated with a slope factor modified in accordance with the EPA Region 9 PRGs to account for the presence of hexavalent chromium. The health effects of iron are not considered additive with those for other metals. Iron has a provisional toxicity value that has not been accepted by EPA or Cal/EPA. Iron is thought to be a concern for blood overload, which is a unique target organ compared to the other non-carcinogens. Also, there is evidence that increased exposure to iron may not result in adverse health effects.

Toxicity values developed by Cal/EPA were also used in the risk assessment. The Navy agrees at this time to evaluate Cal/EPA toxicity values but clearly and expressly reserves the right to evaluate the legal and technical justification for these values and accept or reject them before or at the time of the Navy cleanup decisions.

6.1.5 Risk Characterization

The risk characterization combines the amount of exposure with the toxicity value into a numerical risk estimate. EPA and Cal/EPA risk estimates do not predict actual health effects but are a tool for risk managers in these agencies to help them make decisions on whether action should be taken to reduce exposure. Risk assessment calculations are intentionally designed so that the actual risk will be less than the risk calculated in the risk assessment, and could be zero.

6.1.5.1 Overview of Interpreting Risk Characterization Results

The risk estimate for potential carcinogenic effects is an individual excess cancer risk. This represents the probability that an individual could have an increased risk of cancer above his/her background risk. A risk of 1×10^{-6} means that each individual has a 1 in

1,000,000 probability that his/her risk of incurring cancer will increase above the baseline cancer risk.

In accordance with EPA OSWER Directive 9355.0-30, the risk management range is between 10^{-6} and 10^{-4}.

- Cancer risks below 10^{-6} are considered insignificant.
- Cancer risks within the risk management range (10^{-6} to 10^{-4}) are evaluated based on site-specific factors to determine if steps are needed to reduce exposure. The site-specific information that could be considered by risk managers is discussed in Section I7, Uncertainty Analysis.
- Cancer risks above 10^{-4} could require action to prevent unacceptable exposure from occurring now or in the future.

Noncancer adverse health effects for individual chemicals are expressed as hazard quotients (HQs) or hazard index (HI) values when HQ values are added together. HI values above 1 are evaluated closely and could warrant action to reduce exposure.

The cancer risks are total cumulative estimates and include metals present at concentrations below background. However, EPA and Cal/EPA do not require remediation of metals at concentrations below background and make risk management decisions considering cancer risk without metals at ambient concentrations. Arsenic and cadmium are removed from risk estimates based upon being ambient concentrations per the DTSC policy and are not associated with a release from Navy activities (Section 4.1.1 and Appendix H2).

The following tables are referenced in this section:

- Table 6-2 - Total EPA and Cal/EPA, plus site-specific cancer risk and noncancer hazard by receptor;
- Table 6-3 - Total EPA and Cal/EPA cancer risk and noncancer hazard by receptor and exposure pathway;
- Tables 6-4 to 6-6 - Current Resident: EPA and Cal/EPA cancer risk and noncancer hazard risk drivers;
- Tables 6-7 to 6-9 - Future Resident: EPA and Cal/EPA cancer risk and noncancer hazard risk drivers; and
- Tables 6-10 and 6-11 - Future Construction Worker: EPA and Cal/EPA cancer risk drivers.

6.1.5.1.1 Cancer Risks – Current Residential Scenario

The total reasonable maximum exposure (RME) cancer risks (including ambient metals) for EPA and Cal/EPA are 6×10^{-5} and 4×10^{-4}, respectively (see current residential scenario in Table 6-2). The total RME cancer risks rank-ordered by exposure pathway (Table 6-3) for EPA and Cal/EPA, respectively, are as follows:

- Ingestion of soil (3×10^{-5} and 2×10^{-4});
- Ingestion of homegrown produce (2×10^{-5} and 1×10^{-4});
- Dermal contact with soil (4×10^{-6} and 2×10^{-5});
- Inhalation of vapors in indoor air (8×10^{-7} and 1×10^{-5}); and
- Inhalation of particulates/vapors in outdoor air (3×10^{-7} and 5×10^{-7}).

The majority of the cancer risk (about 90 percent) for EPA and Cal/EPA is associated with arsenic in soil. The total cancer risk for arsenic is 5×10^{-5} for EPA (Table 6-4) and 3×10^{-4} for Cal/EPA (Table 6-5). Cadmium has a Cal/EPA cancer risk of 2×10^{-6}. These metals are present at ambient concentrations (Appendix H2).

Chemicals contributing to the residual cancer risk include PCBs, the pesticide dieldrin, and benzo[a]pyrene. These chemicals were rarely detected. The risk assessment assumes that these chemicals are present at every location when in fact all these chemicals were rarely detected (i.e., 1 to 8 percent of the samples). The few locations where these chemicals were found are dispersed, and there is no specific area of impact.

- A PCB (Aroclor 1016 for Cal/EPA only) was reported in 1 of 123 samples and does not represent a widespread concern (EPA 1989).
- A PCB (Aroclor 1260) was reported in 9 of 123 samples and does not represent a widespread concern (EPA 1989).
- Dieldrin was reported in 1 of 123 samples and does not represent a widespread concern (EPA 1989).
- Benzo[a]pyrene, a PAH, was associated with a cancer risk of 1×10^{-5}, which is in the risk management range.

Most of the risk for organic chemicals is associated with the homegrown produce. There are no community gardens in the Marina Village Housing now, and it is unlikely that there will be in the future because open land is limited to recreational uses.

In indoor air, the EPA risk (8×10^{-7}) is below the risk management range, and Cal/EPA risk (1×10^{-5}) is within the range. The majority (90 percent) of the Cal/EPA risk is due to naphthalene in shallow groundwater at the maximum concentration found in any sample. However, independent of any decisions made for IR Site 31, the concentrations

of benzene and naphthalene in groundwater will be reduced as part of the preferred alternative presented in the Final Proposed Plan for OU 5/IR-02 Groundwater (CDM 2005b). When the remedial goals for groundwater are met, within 8 to 10 years, the indoor air risks for EPA and Cal/EPA will be well below 1×10^{-6}. Also, the cancer risk is based on 30 years of exposure, adding to the level of confidence that the current and future cancer risks via inhalation of vapors from groundwater in the indoor air are well below the risk management range.

The total EPA and Cal/EPA central tendency exposure (CTE) cancer risks (including background risks) for the current residential scenario are 1×10^{-5} and 8×10^{-5}, respectively. The respective CTE risks are shown on Table 6-2.

6.1.5.1.2 Cancer Risks - Future Residential Scenario

The total RME and CTE cancer risks (including ambient metals) for both EPA and Cal/EPA are 2×10^{-2} (Table 6-2). Exposure pathways with cancer risks above the risk management range include residential use of groundwater (ingestion and inhalation while showering), ingestion of homegrown produce (Cal/EPA only), and ingestion of soil (Cal/EPA only) (Table 6-3). Most of the total cumulative risk (99 percent) is associated with benzene in groundwater. The risks for residential use of groundwater were taken from the Final Groundwater RI/FS for Site 25/IR-02 (ERRG 2004). Therefore, the risks are not shown on the calculation of percents by risk driving chemicals in Tables 6-7 and 6-8. However, independent of any decisions made for IR Site 31, the concentrations of benzene and naphthalene in groundwater will be reduced as part of the preferred alternative agreed and presented in the Draft Final Proposed Plan for OU 5/IR-02 Groundwater (CDM 2005b).

The remaining cancer risks are generally identical to those for the current resident, with the minor exceptions of slight increases in EPA risks for dermal contact with soil and inhalation of outdoor air from dust for COPCs in the 0 to 7 foot depth interval.

6.1.5.1.3 Cancer Risks - Construction Worker Scenario

The RME EPA and Cal/EPA cancer risks are 2×10^{-6} and 6×10^{-6}, respectively (Table 6-2). For EPA, chromium has the highest individual cancer risk at 1×10^{-6} (Table 6-10). The Cal/EPA risk drivers are arsenic (4×10^{-6}) and chromium (2×10^{-6}) (Table 6-11).

6.1.5.1.4 Cancer Risks - Without Ambient Metals

The statistical evaluation of metals data (Appendix H2) shows that the arsenic and cadmium concentrations at IR Site 31 are ambient and not the result of a release by Navy activities. Arsenic and cadmium are the only two risk driver ambient metals

included in the cancer risk calculations. Therefore, it is appropriate to consider the cancer risk without these metals.

- The current residential cancer risk, without arsenic and cadmium in soil, is within the risk management range, with an EPA cancer risk of 7×10^{-6} and a Cal/EPA cancer risk of 3×10^{-5} (Table 6-2).
- The future residential cancer risk, without residential use of groundwater and without arsenic and cadmium in soil, is within the risk management range, with an EPA cancer risk of 1×10^{-5} and a Cal/EPA cancer risk of 4×10^{-5} (Table 6-2).

The Navy agrees at this time to evaluate Cal/EPA toxicity values but expressly reserves the right to evaluate the legal and technical justification for these values and accept or reject them before or at the time of the Navy cleanup decisions.

Risks from exposure to PAHs are within the acceptable risk management range.

6.1.5.1.5 Noncancer Hazards and Lead Results

This section presents the noncancer hazard and lead results for current and future residential and construction scenarios at IR Site 31.

The RME HI values for current and future residential scenarios are 5 and 149 (Table 6-2), respectively. The noncancer hazard values are based on the most sensitive receptor, a child from 0 to 6 years of age. Noncancer hazard values are the same for EPA and Cal/EPA. The RME HI values including metals at ambient concentrations for the current and future residential scenario are as follows:

- Residential use of groundwater (145 for future residents only);
- Ingestion of soil (4 for both current and future residents);
- Inhalation of vapors indoor air (0.4 for both current and future residents);
- Homegrown produce (0.3 for both current and future residents);
- Dermal contact with soil (0.1 for both current and future residents); and
- Inhalation of particulates and vapors in outdoor air (0.02 for both current and future residents).

The hazard value for ingestion of soil is 4, associated with several metals with individual HQ values of less than 1 except iron with an HI of 2. However, iron toxicity is not considered additive with the other non-carcinogens, and there is evidence that there may not be any adverse health effects from increased exposure to iron in soil or food. Also, statistical evaluation using DTSC policy for arsenic, cadmium , chromium, and vanadium indicates that these metals, and likely iron, are ambient and not the

result of a release from Navy activities (Appendix H2). Without these metals, the HI is below 1.

The EPC for lead is well below the site-specific DTSC residential value.

The RME and CTE HI values for construction scenarios are 0.2 and well below the risk management level of 1.

The lead EPCs of 61.5 and 40.6 mg/kg for the 0 to 2 foot and 0 to 7 foot depth intervals, respectively, are well below the site-specific residential PRGs for lead in soil for children (184 mg/kg for a scenario including ingestion of homegrown produce and 322 mg/kg for a scenario without ingestion of homegrown produce). The maximum concentration in any sample of 168 mg/kg is also below the PRGs calculated in Appendix I.

6.1.6 Uncertainty Analysis

Varying degrees of uncertainty exist in each step of the risk assessment process. To compensate for these uncertainties, EPA has developed toxicity values and exposure parameters that will not underestimate the risk, if in fact, any risk exists. The following subsections present the uncertainties specific to the HHRA conducted for IR Site 31 and evaluate the potential impact of the uncertainties on the calculated risk estimates.

6.1.6.1 Data Evaluation

The data are considered adequate to support the risk assessment. For this 24.9-acre site, there are 646 soil samples for PAHs from over 160 locations. There are 120 samples for metals and 123 samples for VOCs, SVOCs, metals, PCBs, and pesticides from 50 locations (see Section 3 for sample analyses summaries). There are 16 shallow groundwater samples from 16 locations with analyses for VOCs although some samples have fewer analytes.

Appendix I, Section 17.1 presents information to show that six soil samples that were not included in the EPC calculations would have no impact on the risk findings. Also, Appendix I discusses the uncertainty associated with four chemicals that had reporting (or sample quantitation) limits below risk-based screening levels that were not identified in any of the 120 samples and thus not included as COPCs. Appendix I also discusses manganese noncancer of 0.2, which is below the risk management level of 1.

6.1.6.2 Exposure Assessment

Uncertainties are also associated with the parameters presented as exposure and in the quantification of exposure. In risk assessment, the actual exposure concentration is the average concentration that an individual could be exposed to over his or her lifetime. In soil, the 95 percent UCL is used as the EPC. However, for migration of vapors from

groundwater to indoor air, the maximum concentration of each chemical found in any sample from any location was used.

Each exposure assumption is designed to estimate the potential risk protectively. In this risk assessment, for example, it was assumed that residents would engage regularly in activities that would result in exposure to site COPCs over 30 years. It was also assumed that the individual would be exposed for 24 hours per day and 350 days per year for the entire 30-year duration. Although this scenario is highly unlikely, due to frequency of relocation and time spent indoors, it provides a protective estimate of exposure that would overestimate any actual risk.

Current residential exposure by Coast Guard personnel is likely to be substantially less than 30 years. The reduction in risk due to shorter residency periods is roughly proportional. For example, if a more typical exposure period for Coast Guard personnel is 6 years, then the total EPA and Cal/EPA cancer risks will be 1/5th that estimated using the standard assumption of 30 years of exposure. In this case, all cancer risks would be well within the risk management range.

In comments in the Draft RI - Revision 1, DTSC requested that the exposure assumptions presented in a recent DTSC note for military sites be used for IR Site 31 (Cal/EPA 2005). The residential exposure assumptions were reviewed because residential risk is typically used as the initial basis for risk management decisions. The DTSC note recommends a surface area for children that is 10 percent greater than that used in the HHRA. The greatest change would be a 10 percent increase in the noncancer risk, which would not change the risk assessment results or recommendations. Also, the DTSC note states that these assumptions do not necessarily apply to non-military facilities, which is the case for IR Site 31.

6.1.6.3 Indoor Air Exposure Assessment

Exposure via vapor migration from VOCs in groundwater may also be overestimated because the risk is based on a hypothetical sample that includes the maximum concentration of each chemical found in any sample. High concentrations of naphthalene (2,030 and 1,700 µg/L) were found at two locations in the OU-5/IR-02 groundwater plume. The other nine samples of shallow groundwater had much lower concentrations. The Johnson and Ettinger model could overestimate the concentrations in indoor air because the maximum concentrations are assumed to remain unchanged for 30 years. In fact, remedial actions unrelated to IR Site 31 will result in decreasing concentrations that could reach the cleanup level in 10 years. In addition, groundwater concentrations within the shallow aquifer are lower near the groundwater table than at depth.

A study conducted by the Coast Guard on housing immediately to the north of IR Site 31 at Parcel 181 concluded that there was no evidence of vapor migration into indoor air above ambient air concentrations. Indoor and outdoor air samples were collected in 2002 from the Coast Guard housing area, including North Housing located in Parcel 181 of OU-5 (TtEMI 2002a). Outdoor air samples were collected from five locations in Parcel 181. Indoor air samples, including samples collected from crawl spaces, were collected from both occupied and unoccupied residences located in Parcel 181. Indoor air was sampled at 17 locations, and crawl-space air was sampled at 12 locations.

Statistical analyses of the indoor and outdoor air data were performed to compare indoor air with outdoor air and crawl-space air with indoor air. Conclusions of this study are as follows:

- The benzene concentrations in the crawl-space air were lower than in indoor air. If groundwater is a source of benzene, it would be expected that concentrations of VOCs in the crawl spaces would exceed the concentrations in the indoor air.
- VOC concentrations in indoor air were consistent with both outdoor air concentrations and ambient air measurements for benzene in the San Francisco Bay Area issued by the California Air Resources Board.

These conclusions suggest that although portions of the housing area in Parcel 181 are located over groundwater plumes containing benzene and naphthalene, the concentrations of these chemicals in indoor air are not above ambient conditions for the San Francisco Bay Area. Risks to human health at OU-5 and adjacent areas are thus not likely to differ from risks to human health in other areas of the San Francisco Bay Area.

6.1.6.4 Arsenic Risk Characterization

Arsenic concentrations at IR Site 31 are ambient in accordance with DTSC policy (Appendix H2). Therefore, as discussed in Section 4.1.4, arsenic is not considered above background in the site-specific risk calculations.

This section presents other information on the toxicity of arsenic that is relevant to the risk management decisions and suggests that it is likely that the cancer risk for arsenic calculated for this HHRA is an overestimate.

Studies of children exposed to arsenic in soil indicate that the assumptions used in this HHRA likely overestimate exposure. This HHRA assumed that children (0 to 6 years of age) ingest 200 milligrams of soil daily and that the arsenic in the soil is 100 percent biologically available. However, more than 24 studies on arsenic in soil show that only 10 to 50 percent (with an average of 30 percent) of the arsenic is actually transferred into the body (EPA 1996, Ruby et al. 1999, Rodriguez and Basts 1999, Roberts et al. 2002).

Similar concentrations of arsenic are also found in other areas of Alameda Point. The exposure point concentration for arsenic at IR Site 31 of 11.7 mg/kg (0-8 feet bgs) is similar to the Alameda Point yellow background data set (which is remote from IR Site 31) at 11.9 mg/kg and lower than that for the adjacent East Housing Area of 16.3 mg/kg.

Decisions on concentrations of arsenic found acceptable by EPA and DTSC at other sites are specific to those sites and the agencies may have considered other factors besides health risk. However, for perspective on the concentrations at IR Sites 31, information on these decisions is included. In 2004, DTSC agreed to a cleanup level of 36 mg/kg for arsenic, which was above the background level of 5.4 mg/kg at Village at Green Hill, Newcastle, Placer County, California (Montgomery Watson Harza [MWH] 2004). In 1996 EPA, agreed to a soil cleanup level for arsenic of 250 mg/kg for a residential neighborhood in Montana based on 28 percent bioavailability (EPA 1996).

6.1.7 Final Groundwater RI/FS for Site 25/IR-02 Risk Assessment Results

The RME cancer risk from the groundwater RI/FS for ingestion of groundwater and inhalation while showering is 2×10^{-2}, and the HI value is 145 based on the Final Groundwater RI/FS for IR Site 25/IR-02 (ERRG 2004). There is uncertainty in using these estimates as representative of residential use of groundwater at IR Site 31, but none of the aspects of this uncertainty would likely result in lower risks. The ERRG cancer risk is based on benzene and did not consider naphthalene a carcinogen. Also, ERRG did not include dermal exposure to groundwater while showering. However, these omissions would only increase the cumulative risk. Appendix I presents additional information comparing the concentrations of benzene and naphthalene used in the Final Groundwater RI/FS for Site 25/IR-02 and those found in groundwater at IR Site 31.

The concentration of benzene in the groundwater used in the ERRG risk assessment of 494 µg/L is similar to the maximum concentration of benzene in all groundwater samples, shallow and deep, at IR Site 31 of 480 µg/L. The concentration of naphthalene used in the IR Site 25/IR-02 RI risk assessment (4,171 µg/L) is similar to the maximum concentration of naphthalene in all groundwater samples, shallow and deep, at IR Site 31 (4,910 µg/L). This suggests that cancer risk estimated based on data from groundwater at IR Site 31 health effects using a 95 percent UCL for residential use of groundwater could be lower than those estimated in the ERRG risk assessment.

6.1.8 Conclusion

The EPA and Cal/EPA cancer risks and noncancer hazards are above the risk management range when residential use of groundwater is considered. However, it is unlikely that groundwater will be used as a source of drinking water because the groundwater is too shallow to meet the sanitary requirements for a drinking water well,

total dissolved solids are high, and the residents are supplied with drinking water from an offsite source. In addition, remediation of the groundwater is being conducted as part of the OU5/IR-02 plume, and the final remedy for OU-5 groundwater prohibits the domestic use of groundwater until remedial goals are met.

Without residential use of groundwater, the cancer risks and noncancer hazards for current and reasonable future use are associated with exposure to chemicals in soil and indoor and outdoor air. The cancer risk and noncancer hazards without residential use of groundwater are discussed below.

EPA and Cal/EPA make risk management decisions considering risk without ambient metals, so it is appropriate to present the risk without metals present at ambient concentrations. The statistical evaluation of arsenic and select other metals in soil shows that arsenic, cadmium, chromium, vanadium and likely iron are ambient and not the result of releases from Navy activities (Appendix H2).

The cancer risks without ambient metals (arsenic and cadmium) are below 10^{-4} and range from 7×10^{-6} for current residential users for EPA to 4×10^{-5} for reasonable future residential users for Cal/EPA. The remaining cancer risk above 10^{-6} is associated with benzo[a]pyrene, PCBs, and dieldrin in soil, and VOCs in groundwater. The factors which reduce or eliminate concerns for these chemicals are as follows:

- Benzo[a]pyrene - cancer risks are within the risk management range at 1×10^{-5}.
- Three other chemical compounds with risks above 1×10^{-6} were rarely detected and do not represent a widespread exposure or threat to humans; they are PCBs (Aroclor 1016 in 1 of 123 samples, Aroclor 1260 in 9 of 123 samples) and dieldrin in 1 of 123 samples (EPA 1989). The risk assessment assumes that these chemicals are present at every location when in fact all these chemicals were rarely detected (i.e. 1 to 8 percent of the samples). The few locations where these chemicals were found are dispersed, and there is no specific area of impact.
- Benzene, naphthalene and other VOCs in groundwater that contribute to vapors in indoor air will be remediated as part of the OU-5/IR-02 groundwater plume.

As summarized in the bullets above, EPA and Cal/EPA cancer risks are at or below the 1×10^{-6} for current and reasonable future exposure pathways when evaluations are made following EPA guidance for addressing infrequently detected COCs and following EPA and Navy policy for ambient metals. PAHs are within the acceptable risk management range for Alameda Point.

Without iron and ambient metals, the HI is below 1. Iron in soil accounts for the majority of the HI value (38 percent) for soil pathways. There is evidence that there are not any adverse health effects from increased exposure to iron in soil and food.

The EPC for lead is well below the site-specific DTSC residential values.

For construction exposure scenarios at IR Site 31, the cancer risks and noncancer hazard values are within the risk management range.

6.2 Screening-Level Ecological Risk Assessment

A screening-level ERA was conducted by the Navy for this RI to estimate the potential impacts of chemicals reported at concentrations above detection limits in soil at IR Site 31. The screening-level ERA is Tier 1 (Steps 1 and 2) of the Navy policy for conducting ERAs (DON 1999, 2001b) and employs existing data and conservative assumptions regarding contaminant exposure to evaluate whether additional assessment is warranted. Step 1 develops the screening-level conceptual model through problem formulation and toxicity evaluation. Step 2 prepares the exposure estimates and risk calculations. The ERA process of the Navy policy is substantially identical to the ERA Guidance for Superfund of EPA (1997a) and functionally equivalent to the ERA guidance documents for the State of California.

This ERA also includes an evaluation of refined exposure estimates described by EPA guidance (EPA 1997a) and Step 3a of Navy policy (DON 1999, 2001b). The supplemental refined evaluation is presented in addition to the screening-level ERA (rather than as part of the screening-level ERA) and as an aid to the risk managers. The refined exposure estimates use exposure factors that are more realistic for the site than the most-conservative values used in Steps 1 and 2. This step provides a refined list of chemicals of potential ecological concern (COPECs).

A summary of the ERA is presented in this subsection, and complete details of the ERA are presented in Appendix J. An ERA based on chemicals reported in groundwater is not included in this report; this information is included in other reports (PRC and Versar 1996, ERRG 2004).

6.2.1 Problem Formulation

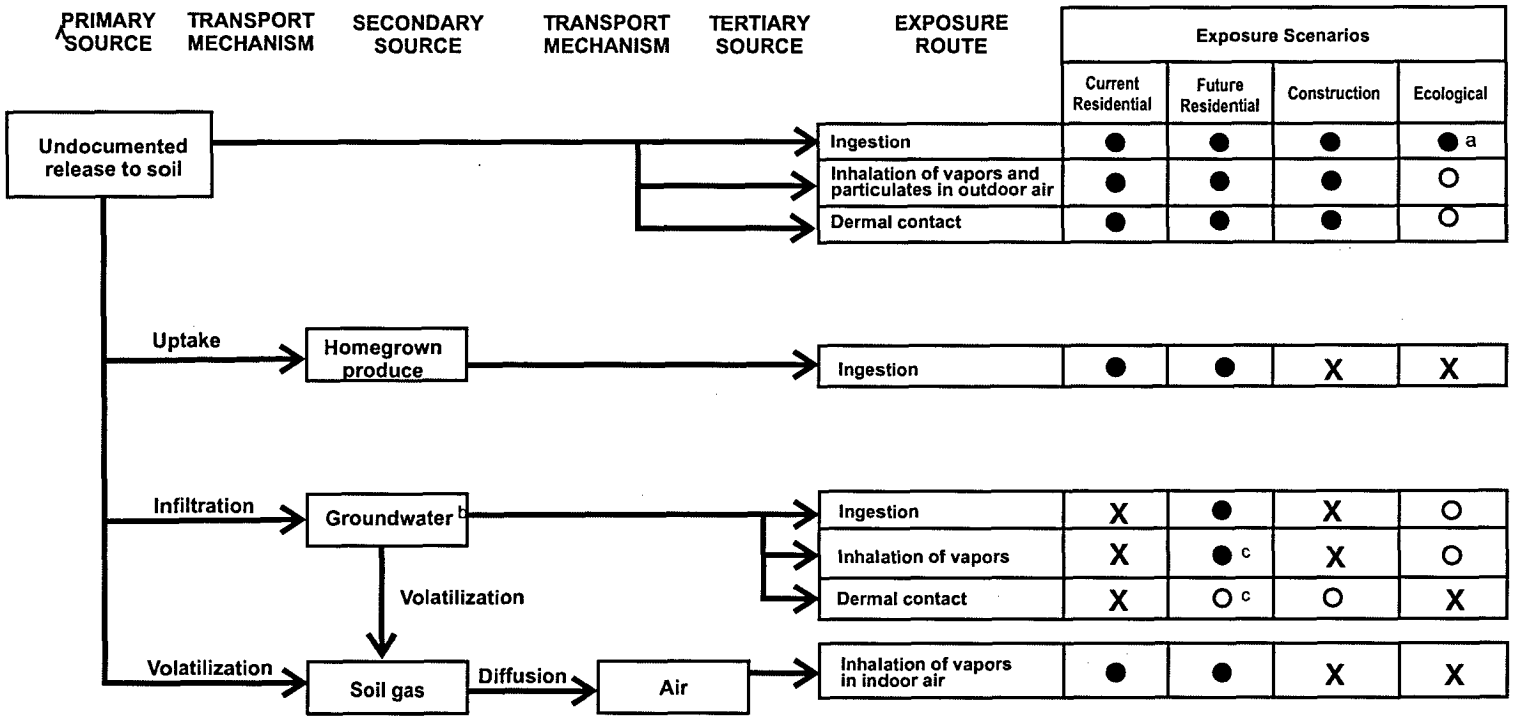
The problem formulation evaluates potential exposure pathways between COPECs and ecological receptors based on considerations for site characteristics, COPECs, and representative organisms.

6.2.1.1 Facility Location and Description

IR Site 31 is located at the eastern end of Alameda Point and is bounded to the north by IR Sites 25 and 30 and to the east and south by non-Navy property (the former FISCA and Alameda Facility). The site is currently a residential setting. Adjacent land is residential and schools. The Navy formerly used this site for residential purposes as well as for parking and storage. The site includes 24.9 acres of land and is primarily

Table 6-1
Chemicals of Potential Concern in Soil and Groundwater

Chemical	Surface Soil (0-2 feet bgs)	Vadose Zone Soil (0-7 feet bgs)	Shallow Groundwater
Volatile Organic Compounds			
Acenaphthene	✔	✔	✔
Acenaphthylene	✔	✔	✔
Acetone			✔
Anthracene	✔	✔	✔
Benzene		✔	✔
Benzo(g,h,i)Perylene	✔	✔	✔
Carbon disulfide			✔
Dibenzofuran			✔
1,2-Dichloroethane			✔
Dichloromethane	✔	✔	✔
Ethylbenzene			✔
Fluorene	✔	✔	✔
4-Isopropyltoluene			✔
Methane			✔
Methylnaphthalene			✔
2-Methylnaphthalene	✔	✔	
MTBE			✔
Naphthalene	✔	✔	✔
Phenanthrene	✔	✔	✔
Pyrene	✔	✔	✔
Styrene			✔
Toluene			✔
1,2,4-Trimethylbenzene			✔
1,3,5-Trimethylbenzene			✔
Xylenes (total)	✔	✔	✔
Semivolatile Organic Compounds			
Benzo(a)Anthracene	✔	✔	
Benzo(a)Pyrene	✔	✔	
Benzo(b)Fluoranthene	✔	✔	
Benzo(k)Fluoranthene	✔	✔	
1,2-Benzphenanthracene	✔	✔	
Dibenz(A,H)Anthracene	✔	✔	
Fluoranthene	✔	✔	



LEGEND

● = COMPLETE EXPOSURE PATHWAY

X = INCOMPLETE EXPOSURE PATHWAY

O = COMPLETE EXPOSURE PATHWAY BUT NOT CONSIDERED A SIGNIFICANT SOURCE OF RISK. SEE TEXT FOR RATIONAL

NOTES

[a] Ingestion of soil and prey tissue potentially containing site-related contaminants

[b] Health risks are taken from the IR Site 25 Groundwater RI/FS (ERRG 2004)

[c] During showering

IR - INSTALLATION RESTORATION (PROGRAM)
FS - FEASBILITY STUDY
RI - REMEDIAL INVESTIGATION

Draft Final Soil RI Report for IR Site 31

Figure 6-1

Conceptual Site Model

Alameda, California

CDM

Date: 2-1-06
File No.
Job No. 127896-400-001-1044
Rev No.

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
11	**ecological risk assessment**	**Section 2.5.2**	Final Soil Remedial Investigation Report for IR Site 31 Marina Village Housing. Section 6.2, Pages 6-15 to 6-24, Tables 6-12 to 6-16. CDM 2007.

For construction exposure scenarios at IR Site 31, the cancer risks and noncancer hazard values are within the risk management range.

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This ERA also includes an evaluation of refined exposure estimates described by EPA guidance (EPA 1997a) and Step 3a of Navy policy (DON 1999, 2001b). The supplemental refined evaluation is presented in addition to the screening-level ERA (rather than as part of the screening-level ERA) and as an aid to the risk managers. The refined exposure estimates use exposure factors that are more realistic for the site than the most-conservative values used in Steps 1 and 2. This step provides a refined list of chemicals of potential ecological concern (COPECs).

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6.2.1 Problem Formulation

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6.2.1.1 Facility Location and Description

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covered by pavement and buildings (Figure 1-3). A portion of the site is occupied by landscaped vegetation, such as shrubs and grass lawns.

The ground surface at IR Site 31 is flat, with an approximate elevation of 10 feet AMSL. Depth to groundwater at the site ranges from 5 to 9 feet bgs. No naturally occurring surface water bodies exist on Alameda Point.

6.2.1.2 Ecological Habitats at IR Site 31

Four ecological habitats occur within 1 mile of IR Site 31: barren habitat, urban habitat, nonnative grassland habitat, and estuarine habitat. Urban habitat, as residential housing, is the current and expected future habitat condition for IR Site 31.

Barren habitat occurs at IR Site 31 as bare soil, paved areas, and buildings. Barren habitat also occurs on adjacent land at Alameda Point and in the cities of Oakland and Alameda. Barren habitat generally offers little value to wildlife; it may serve as a corridor between other habitats or as a place of brief resting, but it is not a significant place of shelter.

Urban habitat occurs at IR Site 31 and on adjacent land at Alameda Point and in the cities of Oakland and Alameda as ornamental shrubs, trees, and landscaped areas. Urban habitat generally supports few wildlife species due to human disturbances and limited vegetation. Urban habitat is the current and expected future habitat condition for IR Site 31.

Nonnative grassland habitat occurs on Alameda Point far to the west of IR Site 31. Nonnative grassland habitat offers shelter, forage, and nesting opportunities for a variety of birds and small mammals.

Estuarine habitat occurs as intertidal and subtidal zones of the San Francisco Bay, such as those at the Oakland Inner Harbor to the north of Alameda Point, Seaplane Lagoon to the southwest of IR Site 31, and the main San Francisco Bay to the south of Alameda Point. The estuarine habitat supports submerged aquatic vegetation, such as eelgrass, numerous invertebrates, such as worms and small crustaceans, fish, birds, and marine mammals.

6.2.1.3 Threatened, Endangered, and of-Concern Species

Special-status species for IR Site 31 are those plant and animal species that are classified as threatened, endangered, or species-of-concern by state or federal agencies and that are known to occur or have the potential to occur in the terrestrial or aquatic habitats in the vicinity of IR Site 31 (California Department of Fish and Game [CDFG] 2004a,b,c,d). Five plant species, 6 fish species, and 23 avian, mammalian, and reptilian species (including the American peregrine falcon, western snowy plover, California brown

pelican, and California least tern) were identified as threatened, endangered, or species-of-concern that occur or have the potential to occur in the vicinity of IR Site 30 (Table 6-12). Local environmental impact reports were used to evaluate the likelihood of these species occurring at or in the vicinity of Alameda Point (LSA 2001; Wallace, Roberts & Todd, LLC [WRT] 2002). Because of the barren and urban habitats at IR Site 31, the listed species are unlikely to occur at the site.

6.2.1.4 Identification of Chemicals of Potential Ecological Concern

The results of investigations at IR Site 31 indicate the presence of various organic and inorganic chemical compounds in soil. Soil samples have been analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Most of the SVOCs reported in soil samples were PAHs. Any chemical reported in at least one soil sample collected at IR Site 31 was included as a COPEC.

COPECs in soil were identified using analytical data collected from soil samples located between 0 foot and 8 feet bgs. Average sample depths for samples that were homogenized over a depth range did not exceed 6 feet. The initial COPEC list for soil includes all chemicals that were reported at least once at a concentration greater than the detection limit (Table 6-13).

6.2.1.5 Exposure Pathway Analysis

Exposure pathway analysis evaluates the potential for contact between the chemicals reported in IR Site 31 soil and the ecological receptors that are representative of the ecosystem at (or potentially at) the site.

Exposure of terrestrial organisms to soil at IR Site 31 is considered a potential occurrence. Potential exposure of terrestrial organisms to chemicals may occur by direct contact, inhalation, incidental soil ingestion, and ingestion of food items that have absorbed site contaminants. Exposure by direct (e.g., dermal) contact and inhalation is not readily estimated or evaluated for ecological receptors; exposure by ingestion is assumed to be a more significant contributor to total exposure than exposure by direct contact or inhalation. Therefore, direct contact and inhalation exposures for terrestrial receptors were not evaluated in this risk assessment.

6.2.1.6 Conceptual Site Model

The CSM can be described as a representation of the known, expected, and/or predicted relationships between site COPECs and ecological receptors (Figure 6-1). The CSM is based on current knowledge about IR Site 31. Urban habitat, as residential housing, is the current and expected future habitat condition for IR Site 31.

IR Site 31 investigations have reported the presence of VOCs, SVOCs (including PAHs), pesticides, PCBs, and metals in soil. These are potential contaminants that could affect the ecological habitats and associated organisms occurring in the vicinity of IR Site 31.

Fate and transport mechanisms exist that provide models for potential exposure of terrestrial organisms to COPECs. Soil COPECs generally maintain persistent forms and stable concentrations by bonding with soil particles and materials. These soil COPECs may migrate with soil erosion patterns and may bioaccumulate in local biota. The transfer of soil COPECs to the biota of lower trophic levels (e.g., vegetation, invertebrates, and small mammals) is estimated using bioaccumulation factors (BAFs). A BAF is a ratio of the concentration of a chemical compound in biota (e.g., plants) to the concentration in soil. Transfer to biota of higher trophic orders (e.g., predators) is estimated using receptor-specific exposure factors.

Representative terrestrial receptors for IR Site 31 were selected based on a conservative review of current site conditions, reuse plans, and potential habitat. The site is presently residential and is currently covered primarily by paved surfaces. The City of Alameda General Plan Amendment Environmental Impact Report (LSA 2002) has designated the future use of the site as "medium-density residential" (LSA 2002). Adjacent sites of Alameda Point have been identified as residential. No native or natural habitat occurs or is expected to occur at IR Site 31 due to human activities.

Receptors that would be representative of lower trophic levels, such as plants or soil invertebrates, are not expected to occur at IR Site 31 because the current and expected site conditions do not include habitat areas for these receptors. Current and expected vegetation would be limited to small landscaped areas.

This screening-level risk assessment evaluates birds and mammals of the major terrestrial feeding guilds as potential ecological receptors. The deer mouse (*Peromyscus maniculatus*) is a representative species for omnivorous mammals. The California ground squirrel (*Spermophilus beecheyi*) is a representative species for herbivorous mammals. The Alameda song sparrow (*Melospiza melodia pusillula*) is a representative species for avian receptors that feed on a combination of invertebrates and plant material. The American robin (*Turdus migratorius*) is a representative species for avian receptors that feed primarily on terrestrial invertebrates. The red-tailed hawk (*Buteo jamaicensis*) is a representative species for avian predators (raptors) that feed on small mammals.

The CSM presents a model for evaluation based on a potential, but improbable, return of IR Site 31 to native habitat. Since the current and expected use of IR Site 31 is not as native habitat but as urban habitat, this model is designed to present a conservative over-estimation of site-specific potential risk. A qualitative evaluation of the potential

risk related to current and expected future site use is discussed with other uncertainties in Section 6.2.5.

6.2.2 Ecotoxicity of Chemicals of Potential Ecological Concern

COPECs identified in soil are chemicals known or suspected to cause various adverse responses in terrestrial wildlife. Guideline toxicity reference values (TRVs) originally prepared by the Navy and the EPA Region 9 Biological Technical Assistance Group (BTAG) (ERM-West 1998) are included in ERA guidance documents by Cal/EPA (Cal/EPA 2000, 2002b). Wildlife TRVs are presented as an upper estimate and a lower estimate of effect thresholds. The low-TRV, based on no-observed-adverse-effect-level (NOAEL) data, represents a threshold below which no adverse effect is expected. The high-TRV, based on an approximate midpoint of the range of effect levels, represents a threshold at which an adverse effect is likely to occur. TRVs used in this screening-level ERA are low-TRVs.

For compounds without a Navy-BTAG TRV, a TRV was selected from the scientific literature. If literature-based values were not chronic NOAEL values, a factor of 0.1 was used to convert to a chronic value, and a factor of 0.1 was used to convert to a NOAEL value, as necessary (Calabrese and Baldwin 1993). If an avian TRV was unavailable for a COPEC, the mammalian TRV was used with an adjustment factor of 0.1. An allometric adjustment was applied to a TRV if the difference in body weight was more than two orders of magnitude (Cal/EPA 1999a) between test species (usually standard laboratory animals) and selected ecological receptors for the site.

6.2.3 Exposure Estimates

Exposure estimates represent the quantity of COPECs to which the representative ecological receptors are exposed. Soil exposure estimates are evaluated as a daily dose for ingestion from soil.

6.2.3.1 Terrestrial Exposure Model

Exposure estimates for wildlife were developed from reported soil concentrations for COPECs at IR Site 31. The wildlife exposure estimate was based on an ingestion-exposure pathway. Maximum concentrations reported for each soil COPEC were assumed to represent the concentration throughout the site. Soil COPECs for IR Site 31 are listed in Table 6-13.

Tissue residue concentrations of the COPECs in prey species at IR Site 31 were estimated using soil-to-plant, soil-to-invertebrate, and soil-to-small-mammal BAFs.

Table 6-1 (continued)
Chemicals of Potential Concern in Soil and Groundwater

Chemical	Surface Soil (0-2 feet bgs)	Vadose Zone Soil (0-7 feet bgs)	Shallow Groundwater
Indeno(1,2,3-C,D)Pyrene	✔	✔	
Phenol		✔	
Pesticides/Polychlorinated Biphenyls			
Aroclor 1016	✔	✔	
Aroclor 1260	✔	✔	
4,4-DDD	✔	✔	
4,4-DDE	✔	✔	
4,4-DDT	✔	✔	
Dieldrin	✔	✔	
Endosulfan Sulfate	✔	✔	
Heptachlor		✔	
Metals			
Antimony	✔	✔	
Arsenic	✔	✔	
Barium	✔	✔	
Beryllium	✔	✔	
Cadmium	✔	✔	
Chromium	✔	✔	
Cobalt	✔	✔	
Copper	✔	✔	
Iron	✔	✔	
Lead	✔	✔	
Mercury	✔	✔	
Molybdenum	✔	✔	
Nickel	✔	✔	
Selenium	✔	✔	
Thallium	✔	✔	
Vanadium	✔	✔	
Zinc	✔	✔	

bgs – below ground surface
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
MTBE – methyl tert-butyl ether

Table 6-2
Human Health Risk Assessment by Receptor

Exposure Scenario		Total Cancer	Cancer[1]	Hazard Index
CURRENT RESIDENTIAL				
EPA	RME	6E-05	7E-06	3[1,3]
	CTE	1E-05		2
Cal/EPA	RME	4E-04	3E-05	3[1,3]
	CTE	8E-05		2
FUTURE RESIDENTIAL (Including residential use of groundwater)				
EPA[2]	RME	2E-02	1E-05[4]	149
	CTE	2E-02		147
Cal/EPA	RME	2E-02	4E-05[4]	149
	CTE	2E-02		147
CONSTRUCTION				
EPA	RME	2E-06	3E-07	0.2
	CTE	2E-06		0.2
Cal/EPA	RME	6E-06	4E-07	0.2
	CTE	6E-06		0.2

Notes:

[1] Does not include ambient metals (arsenic, cadmium, chromium and vanadium) in soil, see Section 4.1.4

[2] Cal/EPA toxicity values were used in the calculation of cancer risk for residential use of groundwater (ERRG 2004)

[3] Without iron, Hazard Index = 1. Toxicological evidence indicates that a hazard value for iron of 2 does not pose a health concern.

[4] This cancer risk value does not include residential use of groundwater

Acronyms/Abbreviations:

Cal/EPA – California Environmental Protection Agency
CTE – central tendency exposure
ERRG – Engineering/Remediation Resources Group, Inc.
RME – reasonable maximum exposure
EPA – U.S. Environmental Protection Agency

Table 6-3
Human Health Risk Assessment by Pathway
Reasonable Maximum Exposure

Exposure Pathway	EPA Cancer	Cal/EPA Cancer	Hazard Index
CURRENT RESIDENTIAL			
Ingestion of soil	3E-05	2E-04	4
Dermal contact with soil	4E-06	2E-05	0.1
Direct Contact with Soil Subtotal	**4E-05**	**2E-04**	**4**
Inhalation of vapors in indoor air from soil	5E-08	5E-07	0.02
Inhalation of vapors in indoor air from groundwater	8E-07	1E-05	0.4
Indoor Air Subtotal	**8E-07**	**1E-05**	**0.4**
Inhalation of vapors in outdoor air from soil	4E-09	3E-08	0.001
Inhalation of particulates in outdoor air from soil	3E-07	5E-07	0.01
Outdoor Air Subtotal	**3E-07**	**5E-07**	**0.02**
Ingestion of homegrown produce	2E-05	1E-04	0.3
Total without residential use of groundwater	**6E-05**	**4E-04**	**5**
Ingestion of groundwater and inhalation of vapors while showering*	–	–	–
Total	**6E-05**	**4E-04**	**5**
FUTURE RESIDENTIAL			
Ingestion of soil	3E-05	2E-04	4
Dermal contact with soil	5E-06	2E-05	0.1
Direct Contact with Soil Subtotal	**4E-05**	**2E-04**	**4**
Inhalation of vapors in indoor air from soil	5E-08	5E-07	0.02
Inhalation of vapors in indoor air from groundwater	8E-07	1E-05	0.4
Indoor Air Subtotal	**8E-07**	**1E-05**	**0.4**
Inhalation of vapors in outdoor air from soil	4E-09	3E-08	0.001
Inhalation of particulates in outdoor air from soil	4E-07	6E-07	0.02
Outdoor Air Subtotal	**4E-07**	**6E-07**	**0.02**
Ingestion of homegrown produce	2E-05	1E-04	0.3
Total without residential use of groundwater	**6E-05**	**4E-04**	**4**
Ingestion of groundwater and inhalation of vapors while showering*	**2E-02**	**2E-02**	**145**
Total with residential use of groundwater	**2E-02**	**2E-02**	**149**

Table 6-3 (continued)
Human Health Risk Assessment by Pathway
Reasonable Maximum Exposure

Exposure Pathway	EPA Cancer	Cal/EPA Cancer	Hazard Index
CONSTRUCTION			
Ingestion of soil	6E-07	3E-06	0.07
Dermal contact with soil	2E-07	1E-06	0.009
Direct Contact with Soil Subtotal	**8E-07**	**4E-06**	**0.07**
Inhalation of vapors in outdoor air from soil	2E-11	1E-10	0.000009
Inhalation of particulates in outdoor air from soil	1E-06	2E-06	0.1
Outdoor Air Subtotal	**1E-06**	**2E-06**	**0.1**
Total	**2E-06**	**6E-06**	**0.2**

* Cal/EPA toxicity values were used in the calculation of cancer risk for residential use of groundwater (ERRG 2004)

Cal/EPA - California Environmental Protection Agency
ERRG - Engineering/Remediation Resources Group, Inc.
EPA - U.S. Environmental Protection Agency

Reference:
ERRG 2004. Groundwater Remedial Investigation/Feasibility Study. Alameda Point Site 25/Annex IR-02. Final. October

Table 6-4
Summary of Cancer Risk for Risk Drivers
Reasonable Maximum Exposure - EPA (Current Residential)

Scenario Time Frame: Current
Exposure Point: IR Site 31
Receptor Population: Residential
Receptor Age: Child/Adult

		EPC		CANCER RISK							
Exposure Medium	Chemical	Direct Contact[a]	Indoor Vapor[b]	Ingestion	Dermal Contact	Inhalation of Dust	Ingestion of Homegrown Produce	Inhalation of Indoor Air	Inhalation of Outdoor Air	Exposure Route Total	Percent of Total
0–2 feet bgs	**Semivolatile Organic Compounds**										
Soil	Benzo(a)Pyrene	9.53E-02	–	1E-06	5E-07	8E-11	1E-07			2E-06	3%
	Pesticides/Polychlorinated Biphenyls										
	Aroclor 1260	1.92E-02	–	6E-08	3E-08	4E-12	1E-06			1E-06	2%
	Dieldrin	5.00E-04	–	1E-08	4E-09	9E-13	1E-06			1E-06	2%
	Metals										
	Arsenic	1.25E+01	–	3E-05	3E-06	2E-08	2E-05			5E-05	88%
	Risk Drivers Across Soil			**3E-05**	**3E-06**	**2E-08**	**2E-05**	**0E+00**	**0E+00**	**6E-05**	
Risk Drivers Across Groundwater				**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	
Total Risk Across All Media and All Exposure Routes				**3E-05**	**4E-06**	**3E-07**	**2E-05**	**8E-07**	**4E-09**	**6E-05**	

[a] Units for soil concentrations are milligrams per kilogram (mg/kg)
[b]Units for vapor phase are milligrams per cubic meter (mg/m^3)

bgs – below ground surface
EPC – exposure point concentration
IR – Installation Restoration
EPA – U.S. Environmental Protection Agency

Table 6-5
Summary of Cancer Risk for Risk Drivers
Reasonable Maximum Exposure - Cal/EPA (Current Residential)

Scenario Time Frame: Current
Exposure Point: IR Site 31
Receptor Population: Residential
Receptor Age: Child/Adult

		EPC		CANCER RISK							
Exposure Medium	Chemical	Direct Contact[a]	Indoor Vapor[b]	Ingestion	Dermal Contact	Inhalation of Dust	Ingestion of Homegrown Produce	Inhalation of Indoor Air	Inhalation of Outdoor Air	Exposure Route Total	Percent of Total
0–2 feet bgs	**Semivolatile Organic Compounds**										
Soil	Benzo(a)Pyrene	9.53E-02	–	2E-06	9E-07	4E-11	2E-07			3E-06	1%
	Pesticides/Polychlorinated Biphenyls										
	Aroclor 1016	2.12E-02	–	2E-07	8E-08	5E-12	1E-05			1E-05	3%
	Aroclor 1260	1.92E-02	–	1E-07	7E-08	4E-12	3E-06			3E-06	1%
	Dieldrin	5.00E-04	–	1E-08	4E-09	9E-13	1E-06			1E-06	0.3%
	Metals										
	Arsenic	1.25E+01	–	2E-04	2E-05	2E-08	1E-04			3E-04	91%
	Cadmium	3.90E-01	–	2E-07	7E-10	7E-10	2E-06			2E-06	1%
	Risk Drivers Across Soil			**2E-04**	**2E-05**	**2E-08**	**1E-04**	**0E+00**	**0E+00**	**3E-04**	
Groundwater	**Volatile Organic Compounds**										
	Benzene	1.37E-01	1.84E-04					3E-06		3E-06	1%
	Naphthalene	2.03E+00	5.26E-04					9E-06		9E-06	3%
Risk Drivers Across Groundwater				**0E+00**	**0E+00**	**0E+00**	**0E+00**	**1E-05**	**0E+00**	**1E-05**	
Total Risk Across All Media and All Exposure Routes				**2E-04**	**2E-05**	**5E-07**	**1E-04**	**1E-05**	**3E-08**	**4E-04**	

[a] Units for soil concentrations are milligrams per kilogram (mg/kg); units for groundwater concentrations are milligrams per liter (mg/L)
[b] Units for vapor phase are milligrams per cubic meter (mg/m^3)
bgs – below ground surface
Cal/EPA – California Environmental Protection Agency
EPC – exposure point concentration
IR – Installation Restoration

Table 6-6
Summary of Hazard Index for Risk Drivers
Reasonable Maximum Exposure - EPA (Current Residential)

Scenario Time Frame: Current
Exposure Point: IR Site 31
Receptor Population: Residential
Receptor Age: Child

		EPC		HAZARD INDEX							
Exposure Medium	Chemical	Direct Contact[a]	Indoor Vapor[b]	Ingestion	Dermal Contact	Inhalation of Dust	Ingestion of Homegrown Produce	Inhalation of Indoor Air	Inhalation of Outdoor Air	Exposure Route Total	Percent of Total
0–2 feet bgs	Metals										
Soil	Arsenic	1.25E+01	–	5E-01	5E-02	–	1E-01			7E-01	14%
	Chromium	5.39E+01	–	2E-01	6E-03	1E-02	–			2E-01	5%
	Iron	4.13E+04	–	2E+00	5E-02	–	–			2E+00	38%
	Thallium	1.69E+00	–	3E-01	9E-03	–	–			3E-01	7%
	Vanadium	5.79E+01	–	7E-01	2E-02	–	–			8E-01	16%
Risk Drivers Across Soil				**4E+00**	**1E-01**	**1E-02**	**1E-01**	**0E+00**	**0E+00**	**4E+00**	
Risk Drivers Across Groundwater				**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	
Hazard Index Across All Media and All Exposure Routes				**4E+00**	**1E-01**	**1E-02**	**3E-01**	**4E-01**	**1E-03**	**5E+00**	

[a] Units for soil concentrations are milligrams per kilogram (mg/kg)
[b] Units for vapor phase are milligrams per cubic meter (mg/m^3)

bgs – below ground surface
EPC – exposure point concentration
IR – Installation Restoration
EPA – U.S. Environmental Protection Agency

Table 6-7
Summary of Cancer Risk for Risk Drivers
Reasonable Maximum Exposure - EPA (Future Residential)

Scenario Time Frame: Future
Exposure Point: IR Site 31
Receptor Population: Residential
Receptor Age: Child/Adult

		EPC		CANCER RISK							
Exposure Medium	Chemical	Direct Contact[a]	Indoor Vapor[b]	Ingestion	Dermal Contact	Inhalation of Dust	Ingestion of Homegrown Produce	Inhalation of Indoor Air	Inhalation of Outdoor Air	Exposure Route Total	Percent of Total
0-7 feet bgs	**Semivolatile Organic Compounds**										
Soil	Benzo(a)Pyrene	3.41E-01		4E-06	2E-06	3E-10	5E-07			6E-06	10%
	Pesticides/Polychlorinated Biphenyls										
	Aroclor 1260	1.91E-02		6E-08	3E-08	4E-12	1E-06			1E-06	2%
	Dieldrin	5.00E-04		1E-08	4E-09	9E-13	1E-06			1E-06	2%
	Metals										
	Arsenic	1.17E+01		3E-05	3E-06	2E-08	2E-05			5E-05	79%
Risk Drivers Across Soil				**3E-05**	**4E-06**	**2E-08**	**2E-05**	**0E+00**	**0E+00**	**6E-05**	
Risk Drivers Across Groundwater				**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	**0E+00**	
Total Risk Across All Media and All Exposure Routes				**3E-05**	**5E-06**	**4E-07**	**2E-05**	**8E-07**	**4E-09**	**6E-05**	

[a] Units for soil concentrations are milligrams per kilogram (mg/kg)
[b] Units for vapor phase are milligrams per cubic meter (mg/m^3)

bgs – below ground surface
EPC – exposure point concentration
IR – Installation Restoration
EPA – U.S. Environmental Protection Agency

Table 6-8
Summary of Cancer Risk for Risk Drivers
Reasonable Maximum Exposure - Cal/EPA (Future Residential)

Scenario Time Frame: Future
Exposure Point: IR Site 31
Receptor Population: Residential
Receptor Age: Child/Adult

		EPC		CANCER RISK							
Exposure Medium	Chemical	Direct Contact[a]	Indoor Vapor[b]	Ingestion	Dermal Contact	Inhalation of Dust	Ingestion of Homegrown Produce	Inhalation of Indoor Air	Inhalation of Outdoor Air	Exposure Route Total	Percent of Total
0-7 feet bgs	**Semivolatile Organic Compounds**										
Soil	Benzo(a)Pyrene	3.41E-01		6E-06	3E-06	2E-10	8E-07			1E-05	3%
	Pesticides/Polychlorinated Biphenyls										
	Aroclor 1016	1.99E-02		2E-07	7E-08	5E-12	1E-05			1E-05	3%
	Aroclor 1260	1.91E-02		1E-07	7E-08	4E-12	3E-06			3E-06	1%
	Dieldrin	5.00E-04		1E-08	4E-09	9E-13	1E-06			1E-06	0.3%
	Metals										
	Arsenic	1.17E+01		2E-04	2E-05	2E-08	1E-04			3E-04	87%
	Cadmium	3.08E-01		2E-07	6E-10	5E-10	2E-06			2E-06	1%
	Risk Drivers Across Soil			**2E-04**	**2E-05**	**2E-08**	**1E-04**	**0E+00**	**0E+00**	**3E-04**	
Groundwater	**Volatile Organic Compounds**										
	Benzene	1.37E-01	1.84E-04					3E-06		3E-06	1%
	Naphthalene	2.03E+00	5.26E-04					9E-06		9E-06	3%
	Risk Drivers Across Groundwater			**0E+00**	**0E+00**	**0E+00**	**0E+00**	**1E-05**	**0E+00**	**1E-05**	
Total Risk Across All Media and All Exposure Routes				**2E-04**	**2E-05**	**6E-07**	**1E-04**	**1E-05**	**3E-08**	**4E-04**	

[a]Units for soil concentrations are milligrams per kilogram (mg/kg); units for groundwater concentrations are milligrams per liter (mg/L)
[b]Units for vapor phase are milligrams per cubic meter (mg/m^3)
bgs – below ground surface
Cal/EPA – California Environmental Protection Agency
EPC – exposure point concentration
IR – Installation Restoration

Table 6-9
Summary of Hazard Index for Risk Drivers
Reasonable Maximum Exposure - EPA (Future Residential)

Scenario Time Frame: Future
Exposure Point: IR Site 31
Receptor Population: Residential
Receptor Age: Child

		EPC		HAZARD INDEX							
Exposure Medium	Chemical	Direct Contact[a]	Indoor Vapor[b]	Ingestion	Dermal Contact	Inhalation of Dust	Ingestion of Homegrown Produce	Inhalation of Indoor Air	Inhalation of Outdoor Air	Exposure Route Total	Percent of Total
0-7 feet bgs	**Metals**										
Soil	Arsenic	1.17E+01		5E-01	4E-02	–	1E-01			6E-01	15%
	Chromium	6.38E+01		3E-01	8E-03	1E-02	–			3E-01	7%
	Iron	3.86E+04		2E+00	5E-02	–	–			2E+00	38%
	Thallium	1.23E+00		2E-01	7E-03	–	–			2E-01	6%
	Vanadium	5.12E+01		7E-01	2E-02	–	–			7E-01	15%
	Risk Drivers Across Soil			**3E+00**	**1E-01**	**1E-02**	**1E-01**	**0E+00**	**0E+00**	**4E+00**	
Groundwater	**Volatile Organic Compounds**										
	Naphthalene	2.03E+00	5.26E-04					4E-01		4E-01	9%
	Risk Drivers Across Groundwater			**0E+00**	**0E+00**	**0E+00**	**0E+00**	**4E-01**	**0E+00**	**4E-01**	
Hazard Index Across All Media and All Exposure Routes				**4E+00**	**1E-01**	**2E-02**	**3E-01**	**4E-01**	**1E-03**	**4E+00**	

[a]Units for soil concentrations are milligrams per kilogram (mg/kg); units for groundwater concentrations are milligrams per liter (mg/L)
[b]Units for vapor phase are milligrams per cubic meter (mg/m^3)
bgs – below ground surface
EPC – exposure point concentration
IR – Installation Restoration
EPA – U.S. Environmental Protection Agency

Table 6-10
Summary of Cancer Risk for Risk Drivers
Reasonable Maximum Exposure - EPA (Construction)

Scenario Time Frame: Future
Exposure Point: IR Site 31
Receptor Population: Construction
Receptor Age: Adult

		EPC		CANCER RISK					
Exposure Medium	**Chemical**	**Direct Contact[a]**	**Outdoor Vapor[b]**	**Ingestion**	**Dermal Contact**	**Inhalation of Dust**	**Inhalation of Outdoor Air**	**Exposure Route Total**	**Percent of Total**
0–7 feet bgs	**Semivolatile Organic Compounds**								
Soil	Benzo(a)Pyrene	3.41E-01	–	6E-08	9E-08	9E-10		1E-07	8%
	Metals								
	Arsenic	1.17E+01	–	5E-07	1E-07	6E-08		7E-07	36%
	Chromium	6.38E+01	–	–	–	1E-06		1E-06	51%
Risk from Risk Drivers Across Soil				**6E-07**	**2E-07**	**1E-06**	**0E+00**	**2E-06**	
Total Risk Across All Media and All Exposure Routes				**6E-07**	**2E-07**	**1E-06**	**2E-11**	**2E-06**	

[a] Units for soil concentrations are milligrams per kilogram (mg/kg)
[b] Units for vapor phase are milligrams per cubic meter (mg/m^3)
bgs – below ground surface
EPC – exposure point concentration
IR – Installation Restoration
EPA – U.S. Environmental Protection Agency

Table 6-11
Summary of Cancer Risk for Risk Drivers
Reasonable Maximum Exposure - Cal/EPA (Construction)

Scenario Time Frame: Future
Exposure Point: IR Site 31
Receptor Population: Construction
Receptor Age: Adult

		EPC		CANCER RISK					
Exposure Medium	**Chemical**	**Direct Contact[a]**	**Outdoor Vapor[b]**	**Ingestion**	**Dermal Contact**	**Inhalation of Dust**	**Inhalation of Outdoor Air**	**Exposure Route Total**	**Percent of Total**
0–7 feet bgs	**Metals**								
Soil	Arsenic	1.17E+01	–	3E-06	8E-07	5E-08		4E-06	65%
	Chromium	6.38E+01	–	–	–	2E-06		2E-06	29%
Risk from Risk Drivers Across Soil				**3E-06**	**8E-07**	**2E-06**	**0E+00**	**6E-06**	
Total Risk Across All Media and All Exposure Routes				**3E-06**	**1E-06**	**2E-06**	**1E-10**	**6E-06**	

[a] Units for soil concentrations are milligrams per kilogram (mg/kg)
[b] Units for vapor phase are milligrams per cubic meter (mg/m^3)
bgs – below ground surface
Cal/EPA – California Environmental Protection Agency
EPC – exposure point concentration
IR – Installation Restoration

6.2.3.2 Exposure Factors

Exposure factors for the ingestion pathway for terrestrial wildlife include ingestion rate, body weight, and site-use factors (SUF) (the ratio of the site area to the home range of an ecological receptor). These exposure factors are specific for each ecological receptor evaluated. Fractional intake, the dietary component, is specific for each receptor and ingested medium (food type). Gastrointestinal assimilation efficiency and bioavailability are specific to each receptor, ingested medium, and chemical compound. For this screening-level risk assessment, conservative assumptions are used for assimilation efficiency and site-use factors (values set to 1). The receptors are assumed to experience no reduction in bioavailability and are also assumed to feed only at an area influenced by conditions at IR Site 31.

Exposure factors were selected from available scientific literature, such as the EPA Wildlife Exposure Handbook (EPA 1993b) and the California Wildlife Biology, Exposure Factor, and Toxicity database (Cal/EPA 2002a). Minimum values were used for body weight. Ingestion rates are estimated from body weight with predictive equations.

6.2.4 Risk Estimation

The risk for potential ecological receptors is estimated by the HQ, obtained by dividing the exposure dose estimate by the TRV.

$$\mathbf{HQ} = \frac{\mathbf{Dose}}{\mathbf{TRV}}$$

Where:

HQ = hazard quotient

Dose = daily exposure dose for a COPEC, mg/kg-day

TRV = toxicity reference value, mg/kg-day

HI values were calculated to assess the potential for cumulative effect from multiple COPECs having similar modes of action. The HI was calculated as the sum of all of the individual HQ values for a group of COPECs (e.g., metals and PAHs).

The screening-level risk estimate for IR Site 31 assumes that the site could be occupied by a natural habitat in the future. Table 6-14 lists the HQ (HQ-low based on low-TRV) for each soil COPEC and potential terrestrial wildlife receptor (mammals and birds). Most of the HQ values for organic chemicals are less than or equal to 1, indicating that those COPECs are unlikely to represent an ecological risk for terrestrial wildlife. Nine PAH compounds, two pesticides, and most metals are presented with HQ values exceeding 1, indicating potentially unacceptable ecological risk. The COPECs with the

highest HQ values from the five representative wildlife receptors are lead (HQ 900) and nickel (HQ 800). Potential risk to terrestrial wildlife receptors should be further evaluated with refined EPCs and refined exposure factors for the representative receptors.

6.2.5 Uncertainty Analysis

In general, the risk characterization is more likely to overestimate than underestimate the actual hazard of adverse ecological effects at IR Site 31 because of the conservative nature of the assumptions used. In particular, uncertainties resulting from the extrapolation of literature-based TRVs to the representative ecological receptors for the site are due to differences in exposure scenarios, differential bioavailability, and interspecies sensitivity differences. The risk assessment implemented adjustment factors when these conditions were encountered to minimize the likelihood of underestimating the effects. Therefore, use of the selected TRVs causes an overestimation of the ecological risk.

For COPECs with estimated exposures lower than the toxicity benchmark values, the probability of significant ecological hazard is very low. Potential risk from chemical exposures that exceed the toxicity benchmark values cannot be eliminated from consideration; however, marginal exceedances of the benchmark values would suggest that significant levels of risk at the population or community level are not likely.

The screening-level risk estimate evaluates the potential ecological risk for a future-use scenario in which the entire site is an ecological habitat even though this is an unlikely future condition of the site. Such a risk estimate overestimates the potential risk represented by the existing residential site use. A qualitative evaluation of the current and expected future conditions is presented in the next section (6.3) with the refined exposure estimates.

6.3 Refined Exposure Estimate (Step 3A)

This ERA includes a step for refined exposure estimates described by Step 3a of Navy policy (DON 1999, 2001b) and EPA guidance (EPA 1997a). The refined exposure estimate uses exposure factors that are more realistic for the site than the most conservative values used for Steps 1 and 2. Only COPECs with HQ values exceeding 1 in Step 2 were retained for further risk estimation using refined exposure estimates under Step 3a.

6.3.1 Refined Exposure Factors

The refined EPCs for soil COPECs are the 95 percent UCLs representative of average exposures at IR Site 31 presented in Table 6-13. The 95 percent UCL EPC was calculated for each COPEC using distribution-dependent formulae (Appendix I, Section I4.3.1).

The maximum concentration was used as the refined EPC if the appropriate 95 percent UCL was greater than the maximum concentration. For the calculations, COPECs reported as not present at concentrations exceeding the detection limit were included as values with a concentration of one-half the detection limit.

Exposure factors for terrestrial wildlife were refined to represent average site-specific conditions for IR Site 31. Body weights, ingestion rates, and site-use factors were revised. Mean values for adults were used to estimate ecological receptor body weight and ingestion rate. Mean values were used for ecological receptor home range, which were used to calculate site-specific SUF values (1.0 for deer mouse, ground squirrel, and song sparrow; 0.92 for American robin; and 0.1 for red-tailed hawk).

6.3.2 Refined Risk Estimation

Refined risk estimations were prepared for terrestrial wildlife receptors using the refined exposure estimates.

During the refined risk estimation, inorganic COPECs with concentrations not statistically greater than the Alameda Point background concentrations were eliminated from further evaluation.

Table 6-15 lists the refined HQ for each soil COPEC and potential terrestrial wildlife receptor (mammals and birds). The refined HQ values for all of the PAHs and a few of the metals (arsenic, barium, molybdenum, and thallium) did not exceed 1, indicating that these COPECs are unlikely to represent an ecological risk for terrestrial wildlife. These compounds are eliminated from further evaluation.

One pesticide and 11 metals are presented with refined HQ values exceeding 1, indicating potentially unacceptable ecological risk. The COPECs with the highest HQ values from the five representative wildlife receptors are lead (HQ 200) and nickel (HQ 100). The refined HQ value did not exceed 5 for the other seven metals and the pesticide (4,4'-DDE).

Two inorganic COPECs (antimony and beryllium) were not statistically greater than the Alameda Point background concentrations and were eliminated from further evaluation.

To further compare Alameda Point background exposures to site exposures, refined HQ values for the remaining soil inorganic COPECs (cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, vanadium, and zinc) were prepared for the five representative wildlife receptors based on the 95 percent UCL of the Alameda Point background concentrations. The HQ values for Alameda Point background concentrations suggest that a portion of the potential risk to terrestrial receptors from IR Site 31 soil is accounted for by the Alameda Point background concentrations. Alameda

Point background concentrations of lead represent a maximum refined HQ of 100, which is approximately one-half of the maximum refined HQ calculated for the site. Alameda Point background concentrations of nickel represent a maximum refined HQ of 30, which is approximately one-third of the maximum refined HQ calculated for the site.

Due to the uncertainties in the refined risk estimate, the refined HQ values are expected to overestimate the potential risk characterization for the site-specific conditions. The refined exposure risk estimates more likely overestimate than underestimate the actual hazard of adverse ecological effects at IR Site 31 because of the conservative nature of the assumptions used. A few of the exposure parameters are as likely to overestimate as underestimate the exposure and risk, but the likelihood of overestimating the exposure that is associated with the majority of the exposure parameters leads to an overall likelihood of overestimating the exposure and risk. The conservative estimates of potential toxic effects were the same for the screening-level ERA as for the refined exposure risk estimates.

The refined risk estimate assumes a future site use as entirely an ecological habitat, and therefore, overestimates the site-specific potential ecological risk because the site is currently, and is expected to remain, residential rather than a natural habitat. Ecological receptors would use the site under current and expected future conditions much less than if a natural habitat were in place. To provide an estimate of potential ecological risk relevant to the current site conditions, a SUF of 0.1 can be applied to each representative ecological receptor. HQ values presented in Table 6-15 can be adjusted by a factor of 0.1 to account for this assumption. The SUF value of 0.1 assumes that 10 percent of the residential area is available to ecological receptors for foraging activity. This is similar to the adjacent IR Site 30 at which 13 percent of the site was landscaped (BEI 2005a). Applying the 0.1 SUF to the HQ data in Table 6-15 would eliminate most COPECs from concern. The remaining COPECs would have lower HQ values (lead 20 and nickel 10).

6.3.3 Risk Characterization and Summary

After completion of Tier 1 Steps 1 and 2, this screening-level ERA indicated several organic and inorganic soil compounds as representing potentially unacceptable ecological risk to terrestrial wildlife. Exposure estimates were further analyzed according to the procedures of Step 3a to refine the COPEC list. The refined risk estimates indicated potentially unacceptable ecological risk to terrestrial wildlife receptors from 1 organic and 10 inorganic soil COPECs based on a model of returning the site to native habitat.

Evaluation of the HQ values for Alameda Point background concentrations suggests that a portion of the potential risk to terrestrial receptors from IR Site 31 soil is

accounted for by the background concentrations (Table 6-16). A second statistical analysis using a DTSC policy for arsenic, cadmium, chromium, iron, lead and vanadium shows that arsenic, cadmium, chromium and vanadium are present at ambient concentrations and likely iron as well (Appendix H2). It is possible that other metals not included in the additional statistical analysis are also ambient.

The unacceptable potential ecological risk to terrestrial receptors, as indicated by refined HQs ranging up to 200 for potential risk to the sparrow (due to lead exposure from ingestion of soil invertebrates and incidental soil), may overstate the actual potential for ecological hazards at IR Site 31. Terrestrial receptors, such as the sparrow, were selected as a conservative representation of ecological receptors potentially occurring at the site. The risk characterization would be most applicable if the site were converted to a natural ecological habitat. Continued current site use as residential limits the potential use of the site by ecological receptors because areas characterized by human activity are avoided by ecological receptors, and the site surface is nearly completely paved or occupied by buildings. Ecological risk to current and expected terrestrial receptors is unlikely to exist due to the residential use and the absence of suitable natural habitat.

Due to the overestimation of the potential exposure and ecological effects at the site by this screening-level ERA, as well as the low risk estimates for current and expected future habitat conditions and the unlikelihood of future development of terrestrial habitat at the site, no further investigation or assessment of ecological risk for soil at IR Site 31 is recommended.

Table 6-12
Special-Status Species Occurring or Potentially Occurring in the Habitats of Alameda Point

Scientific Name	Common Name	Status
Plants		
Cordylanthus maritimus palustris	Point Reyes bird's-beak	CNPS-1B
Holocarpha macradenia	Santa Cruz tarplant	FT/SE
Horkelia cuneata sericea	Kellogg's horkelia	CNPS-1B
Lasthenia conjugens	Contra Costa goldfields	FE/CNPS-1B
Sanicula maritime	Adobe sanicle	SR
Fish		
Acipenser medirostris	Green sturgeon	FSC/CSC
Eucyclogobius newberryi	Tidewater goby	FE/CSC
Hypomesus transpacificus	Delta smelt	FT/ST
Oncorhynchus mykiss	Steelhead	FT/CSC
Oncorhynchus tshawytscha	Chinook salmon, winter run	FE/SE
Spirinichus thaleichthys	Longfin smelt	FSC/CSC
Reptiles		
Masticophis lateralis euryxanthus	Alameda whipsnake	FT/ST
Mammals		
Corynorhinus townsendii townsendii	Townsend's western big-eared bat	FSC/CSC
Eumetopias jubatus	Steller sea lion	FT
Eumops perotis californicus	California mastiff bat	FSC/CSC
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	FSC/CSC
Reithrodontomys raviventris	Salt marsh harvest mouse	FE/SE
Scapanus latimanus parvus	Alameda Island mole	FSC/CSC
Sorex vagrans halicoetes	Salt marsh wandering shrew	FSC/CSC
Birds		
Athene cunicularia	Burrowing owl	FSC/CSC
Charadrius alexandrinus nivosus	Western snowy plover	FT/CSC
Circus cyaneus	Northern harrier	CSC
Elanus leucurus	White-tailed kite	FSC/CFP

Table 6-12 (continued)
Special-Status Species Occurring or Potentially Occurring in the Habitats of Alameda Point

Scientific Name	Common Name	Status
Eremophilia alpestris actia	California horned lark	CSC
Birds		
Falco peregrinus anatum	American peregrine falcon	FSC/SE
Geothlypis trichas sinuosa	Salt marsh common yellowthroat	FSC/CSC
Lanius ludovicianus	Loggerhead shrike	FSC/CSC
Laterallus jamaicensis coturniculus	California black rail	FSC/ST
Melospiza melodia pusillula	Alameda song sparrow	FSC/CSC
Pelecanus occidentalis californicus	California brown pelican	FE/SE
Phalacrocorax auritus	Double-crested cormorant	CSC
Rallus longirostris obsoletus	California clapper rail	FE/SE
Sterna antillarum browni	California least tern	FE/SE

1B - plants rare, threatened, or endangered in California and elsewhere
CFP - California Department of Fish and Game - fully protected
CNPS - California Native Plant Society
CSC - California special-concern species
FE- federally listed - endangered
FSC - federal special-concern species
FT - federally listed - threatened
SE - California state listed - endangered
SR - California state listed - rare
ST - California state listed - threatened

Table 6-13
Soil COPECs for IR Site 31

COPEC	Background Comparison	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Mean (mg/kg)	Standard Deviation (mg/kg)	95% UCL (mg/kg)	Refined Exposure Point Concentration[a] (mg/kg)	Frequency of Detection
Volatile Organic Compounds[b]								
benzene	NA	1.00E-03	3.00E-03	2.59E-03	3.55E-04	2.73E-03	2.73E-03	2/120
methylene chloride (dichloromethane)	NA	8.00E-04	2.00E-03	2.55E-03	4.60E-04	2.74E-03	2.00E-03	5/120
xylenes, total	NA	5.00E-04	3.00E-03	5.14E-03	9.16E-04	5.50E-03	3.00E-03	3/120
Semivolatile Organic Compounds[b]								
phenol	NA	2.00E-01	3.00E-01	1.33E+01	3.46E+01	2.70E+01	3.00E-01	2/120
Polynuclear Aromatic Hydrocarbons[b]								
acenaphthene	NA	2.30E-04	2.90E+00	1.87E-02	1.19E-01	3.92E-02	3.92E-02	454/646
acenaphthylene	NA	1.60E-04	1.20E+00	1.86E-02	6.52E-02	2.98E-02	2.98E-02	515/646
anthracene	NA	2.30E-04	5.00E+00	3.15E-02	2.13E-01	6.81E-02	6.81E-02	529/646
benzo(a)anthracene	NA	2.30E-04	1.50E+01	1.03E-01	7.00E-01	2.24E-01	2.24E-01	574/646
benzo(b)fluoranthene	NA	2.30E-04	1.20E+01	1.33E-01	6.26E-01	2.41E-01	2.41E-01	614/646
benzo(k)fluoranthene	NA	2.40E-04	1.30E+01	1.05E-01	6.40E-01	2.15E-01	2.15E-01	560/646
benzo(g,h,i)perylene	NA	3.40E-04	1.30E+01	1.62E-01	7.82E-01	2.96E-01	2.96E-01	596/646
benzo(a)pyrene	NA	1.70E-04	2.10E+01	1.62E-01	1.04E+00	3.41E-01	3.41E-01	600/646
chrysene (1,2-benzphenanthracene)	NA	1.90E-04	1.80E+01	1.49E-01	8.71E-01	2.98E-01	2.98E-01	599/646
dibenz(a,h)anthracene	NA	2.30E-04	1.70E+00	2.91E-02	8.98E-02	4.45E-02	4.45E-02	539/646
fluoranthene	NA	3.80E-04	3.50E+01	2.57E-01	1.93E+00	5.88E-01	5.88E-01	592/646
fluorene	NA	1.70E-04	1.80E-01	1.46E-02	3.56E-02	2.07E-02	2.07E-02	496/646

Table 6-13 (continued)
Soil COPECs for IR Site 31

COPEC	Background Comparison	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Mean (mg/kg)	Standard Deviation (mg/kg)	95% UCL (mg/kg)	Refined Exposure Point Concentration[a] (mg/kg)	Frequency of Detection
indeno(1,2,3-c,d)pyrene	NA	2.70E-04	1.40E+01	1.52E-01	7.82E-01	2.86E-01	2.86E-01	566/646
2-methylnaphthalene	NA	2.40E-04	2.60E-01	1.60E-02	3.69E-02	2.23E-02	2.23E-02	520/646
naphthalene	NA	2.40E-04	1.60E+00	2.33E-02	8.39E-02	3.77E-02	3.77E-02	538/646
phenanthrene	NA	3.10E-04	2.40E+01	1.01E-01	9.55E-01	2.65E-01	2.65E-01	569/646
pyrene	NA	2.90E-04	4.70E+01	3.30E-01	2.64E+00	7.82E-01	7.82E-01	613/646
Pesticides								
4,4'-DDD	NA	4.00E-04	5.00E-03	8.85E-03	7.66E-03	1.19E-02	5.00E-03	3/123
4,4'-DDE	NA	1.00E-04	3.00E-02	8.84E-03	7.88E-03	1.19E-02	1.19E-02	8/123
4,4'-DDT	NA	2.00E-04	2.60E-03	8.96E-03	7.68E-03	1.20E-02	2.60E-03	5/123
dieldrin	NA	5.00E-04	5.00E-04	8.96E-03	7.68E-03	1.20E-02	5.00E-04	1/123
endosulfan sulfate	NA	4.00E-03	4.00E-03	1.49E-02	1.28E-02	2.00E-02	4.00E-03	1/123
heptachlor	NA	5.00E-04	5.00E-04	5.07E-03	4.35E-03	6.78E-03	5.00E-04	1/123
Polychlorinated Biphenyls								
Aroclor 1016	NA	4.70E-02	4.70E-02	1.88E-02	2.87E-03	1.99E-02	1.99E-02	1/123
Aroclor 1260	NA	5.00E-03	2.00E-02	1.79E-02	2.95E-03	1.91E-02	1.91E-02	9/123
Metals								
antimony	<Bkgd	1.40E-01	3.20E+00	1.62E+00	1.19E+00	2.10E+00	2.10E+00	17/120
arsenic	>Bkgd	2.30E+00	4.24E+01	1.06E+01	7.37E+00	1.17E+01	1.17E+01	120/120
barium	>Bkgd	3.09E+01	4.76E+02	1.67E+02	1.05E+02	1.84E+02	1.84E+02	120/120
beryllium	<Bkgd	6.50E-03	6.60E-01	1.98E-01	1.39E-01	2.53E-01	2.53E-01	75/120

Table 6-13 (continued)
Soil COPECs for IR Site 31

COPEC	Background Comparison	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Mean (mg/kg)	Standard Deviation (mg/kg)	95% UCL (mg/kg)	Refined Exposure Point Concentration[a] (mg/kg)	Frequency of Detection
cadmium	>Bkgd	1.70E-02	1.50E+00	2.75E-01	2.19E-01	3.08E-01	3.08E-01	98/120
chromium	>Bkgd	3.00E+00	1.97E+02	5.77E+01	3.86E+01	6.38E+01	6.38E+01	120/120
cobalt	>Bkgd	5.50E+00	2.86E+01	1.49E+01	5.06E+00	1.57E+01	1.57E+01	120/120
copper	>Bkgd	3.60E+00	1.18E+02	3.54E+01	2.09E+01	3.88E+01	3.88E+01	120/120
iron	>Bkgd	1.05E+04	6.70E+04	3.39E+04	1.20E+04	3.86E+04	3.86E+04	120/120
lead	>Bkgd	6.10E+00	1.68E+02	2.84E+01	3.07E+01	4.06E+01	4.06E+01	120/120
mercury	>Bkgd	1.30E-01	2.40E+00	6.24E-01	5.35E-01	7.06E-01	7.06E-01	97/120
molybdenum	>Bkgd	4.70E-01	2.50E+00	1.58E-01	2.77E-01	2.68E-01	2.68E-01	4/120
nickel	>Bkgd	2.40E+00	4.74E+02	9.47E+01	1.02E+02	1.35E+02	1.35E+02	120/120
selenium	>Bkgd	8.80E-01	3.10E+00	5.19E-01	5.88E-01	7.53E-01	7.53E-01	13/120
thallium	>Bkgd	4.80E-01	3.70E+00	8.73E-01	9.07E-01	1.23E+00	1.23E+00	44/120
vanadium	>Bkgd	2.09E+01	1.04E+02	4.85E+01	1.77E+01	5.12E+01	5.12E+01	120/120
zinc	>Bkgd	2.75E+01	9.01E+02	1.03E+02	8.34E+01	1.37E+02	1.37E+02	120/120

[a] refined exposure point concentration, smaller value of the 95 percent UCL and maximum detected concentration
[b] organic compounds are grouped into categories according to toxicity assessment protocols used in the ecological risk assessment

95% UCL – 95 percent upper confidence level of the arithmetic mean, distribution dependent
>Bkgd – site data were statistically greater than the background data; see Appendix H for statistical analyses details
<Bkgd – site data were not statistically greater than the background data; see Appendix H for statistical analyses details
COPEC – chemical of potential ecological concern
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
IR – Installation Restoration (Program)
NA – not analyzed for statistical difference from background
mg/kg – milligrams per kilogram

Table 6-14
Terrestrial Wildlife Receptor-Specific Hazard Quotients (HQ-Low)

COPEC	Deer Mouse	California Ground Squirrel	Alameda Song Sparrow	American Robin	Red-tailed Hawk	Maximum
Volatile Organic Compounds						
benzene	1E-04	4E-05	1E-03	1E-03	1E-04	1E-03
methylene chloride	6E-04	3E-04	4E-03	2E-03	4E-04	4E-03
xylenes, total	8E-03	1E-03	6E-02	7E-02	2E-03	7E-02
Semivolatile Organic Compounds						
phenol	2E-02	5E-03	7E-01	6E-01	3E-02	7E-01
Polynuclear Aromatic Hydrocarbons						
acenaphthene	7E-03	2E-03	3E-01	3E-01	3E-01	3E-01
acenaphthylene	3E-03	9E-04	1E-01	9E-02	1E-01	1E-01
anthracene	1E-02	3E-03	4E-01	4E-01	5E-01	5E-01
benz(a)anthracene	9E-01	2E-01	1E+00	1E+00	**2E+00**	**2E+00**
benzo(b)fluoranthene	6E-01	1E-01	7E-01	8E-01	1E+00	1E+00
benzo(k)fluoranthene	6E-01	1E-01	8E-01	8E-01	**2E+00**	**2E+00**
benzo(g,h,i)perylene	5E-01	1E-01	6E-01	7E-01	**2E+00**	**2E+00**
benzo(a)pyrene	1E+00	3E-01	**2E+00**	**2E+00**	**2E+00**	**2E+00**
chrysene	**2E+00**	3E-01	**2E+00**	**2E+00**	**2E+00**	**2E+00**
dibenz(a,h)anthracene	2E-01	3E-02	2E-01	2E-01	2E-01	2E-01
fluoranthene	**3E+00**	6E-01	**3E+00**	**3E+00**	**4E+00**	**4E+00**
fluorene	3E-04	1E-04	1E-02	1E-02	2E-02	2E-02
indeno(1,2,3-cd)pyrene	1E+00	2E-01	1E+00	1E+00	**2E+00**	**2E+00**
2-methylnaphthalene	5E-04	2E-04	2E-02	2E-02	3E-02	3E-02
naphthalene	5E-03	2E-03	2E-01	1E-01	2E-01	2E-01
phenanthrene	5E-02	1E-02	**2E+00**	**2E+00**	**3E+00**	**3E+00**
pyrene	**4E+00**	9E-01	**4E+00**	**5E+00**	**6E+00**	**6E+00**
Pesticides						
4,4-DDD	8E-03	1E-03	**2E+00**	7E-01	7E-02	**2E+00**
4,4-DDE	5E-02	8E-03	**9E+00**	**4E+00**	4E-01	**9E+00**
4,4-DDT	4E-03	7E-04	8E-01	4E-01	3E-02	8E-01

Table 6-14 (continued)
Terrestrial Wildlife Receptor-Specific Hazard Quotients (HQ-Low)

COPEC	Deer Mouse	California Ground Squirrel	Alameda Song Sparrow	American Robin	Red-tailed Hawk	Maximum
dieldrin	3E-02	5E-03	7E-03	9E-03	8E-04	3E-02
endosulfan sulfate	4E-02	6E-03	4E-04	5E-04	5E-05	4E-02
heptachlor	5E-03	8E-04	2E-04	3E-04	3E-05	5E-03
Polychlorinated Biphenyls						
Aroclor-1016	2E-01	3E-02	5E-01	7E-01	6E-02	7E-01
Aroclor-1260	8E-02	1E-02	2E-01	3E-01	3E-02	3E-01
Metals						
antimony	**7E+00**	1E+00	**6E+01**	**7E+01**	**3E+01**	**7E+01**
arsenic	**9E+00**	**2E+00**	5E-01	5E-01	5E-03	**9E+00**
barium	**6E+00**	**3E+00**	1E+00	1E+00	2E-01	**6E+00**
beryllium	3E-02	1E-02	4E-01	3E-01	1E+00	1E+00
cadmium	**4E+01**	**8E+00**	**2E+01**	**3E+01**	7E-01	**4E+01**
chromium	**5E+00**	1E+00	**2E+01**	**2E+01**	**2E+00**	**2E+01**
cobalt	1E+00	3E-01	**6E+00**	**6E+00**	3E-01	**6E+00**
copper	**7E+00**	**2E+00**	**6E+00**	**7E+00**	1E+00	**7E+00**
iron	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
lead	1E+01	**3E+00**	**9E+02**	**9E+02**	**1E+02**	**9E+02**
mercury	**5E+00**	1E+00	**2E+01**	**2E+01**	4E-01	**2E+01**
molybdenum	**3E+00**	6E-01	1E-01	2E-01	8E-02	**3E+00**
nickel	**8E+02**	**1E+02**	**6E+01**	**8E+01**	**1E+01**	**8E+02**
selenium	**2E+01**	**7E+00**	**4E+00**	**3E+00**	2E-01	**2E+01**
thallium	**2E+00**	4E-01	**2E+00**	**3E+00**	1E-01	**3E+00**
vanadium	**1E+01**	**5E+00**	3E-01	3E-01	2E-02	**1E+01**
zinc	**7E+01**	**1E+01**	**3E+01**	**3E+01**	**5E+00**	**7E+01**
Hazard Indices						
HI VOC	9E-03	1E-03	7E-02	7E-02	3E-03	7E-02
HI SVOC	2E-02	5E-03	7E-01	6E-01	3E-02	7E-01
HI PAH	**1E+01**	**3E+00**	**2E+01**	**2E+01**	**3E+01**	**3E+01**

Table 6-14 (continued)
Terrestrial Wildlife Receptor-Specific Hazard Quotients (HQ-Low)

COPEC	Deer Mouse	California Ground Squirrel	Alameda Song Sparrow	American Robin	Red-tailed Hawk	Maximum
HI Pesticides	1E-01	2E-02	**1E+01**	**5E+00**	5E-01	**1E+01**
HI PCBs	3E-01	4E-02	7E-01	1E+00	9E-02	1E+00
HI Metals	**1E+03**	**1E+02**	**1E+03**	**1E+03**	**2E+02**	**1E+03**

* bold font indicates hazard quotient greater than 1

COPEC – chemical of potential ecological concern
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
HI – hazard index
NA – not available
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyls
SVOC – semivolatile organic compound
VOC – volatile organic compound

Table 6-15
Terrestrial Wildlife Receptor-Specific Refined Hazard Quotients
(Refined HQ-Low)

COPEC	Background Comparison	Deer Mouse	California Ground Squirrel	Alameda Song Sparrow	American Robin	Red-tailed Hawk	Maximum
Polynuclear Aromatic Hydrocarbons							
acenaphthene	NA	4E-05	1E-05	3E-03	2E-03	3E-04	3E-03
acenaphthylene	NA	3E-05	9E-06	2E-03	1E-03	3E-04	2E-03
anthracene	NA	6E-05	2E-05	4E-03	3E-03	5E-04	4E-03
benz(a)anthracene	NA	6E-03	1E-03	1E-02	1E-02	2E-03	1E-02
benzo(b)fluoranthene	NA	5E-03	1E-03	1E-02	1E-02	2E-03	1E-02
benzo(k)fluoranthene	NA	4E-03	9E-04	1E-02	9E-03	2E-03	1E-02
benzo(g,h,i)perylene	NA	5E-03	1E-03	1E-02	1E-02	3E-03	1E-02
benzo(a)pyrene	NA	1E-02	2E-03	2E-02	2E-02	3E-03	2E-02
chrysene	NA	1E-02	2E-03	2E-02	2E-02	3E-03	2E-02
dibenz(a,h)anthracene	NA	2E-03	3E-04	3E-03	3E-03	4E-04	3E-03
fluoranthene	NA	2E-02	4E-03	4E-02	4E-02	5E-03	4E-02
fluorene	NA	2E-05	5E-06	1E-03	9E-04	2E-04	1E-03
indeno(1,2,3-cd)pyrene	NA	9E-03	2E-03	2E-02	2E-02	2E-03	2E-02
2-methylnaphthalene	NA	2E-05	7E-06	2E-03	1E-03	2E-04	2E-03
naphthalene	NA	5E-05	2E-05	4E-03	2E-03	3E-04	4E-03
phenanthrene	NA	2E-04	6E-05	2E-02	1E-02	2E-03	2E-02
pyrene	NA	3E-02	6E-03	6E-02	5E-02	7E-03	6E-02
Pesticides							
4,4-DDD	NA	4E-03	5E-04	1E+00	5E-01	5E-03	1E+00
4,4-DDE	NA	9E-03	1E-03	**3E+00**	1E+00	1E-02	**3E+00**
4,4-DDT	NA	2E-03	3E-04	6E-01	2E-01	2E-03	6E-01
dieldrin	NA	1E-02	2E-03	5E-03	5E-03	6E-05	1E-02
endosulfan sulfate	NA	2E-02	2E-03	3E-04	3E-04	3E-06	2E-02
heptachlor	NA	2E-03	3E-04	2E-04	2E-04	2E-06	2E-03
Metals							
antimony	<Bkgd	**2E+00**	3E-01	**3E+01**	**3E+01**	1E+00	**3E+01**
arsenic	>Bkgd	1E+00	3E-01	1E-01	9E-02	1E-04	1E+00

Table 6-15 (continued)
Terrestrial Wildlife Receptor-Specific Refined Hazard Quotients
(Refined HQ-Low)

COPEC	Background Comparison	Deer Mouse	California Ground Squirrel	Alameda Song Sparrow	American Robin	Red-tailed Hawk	Maximum
barium	>Bkgd	1E+00	4E-01	4E-01	3E-01	4E-03	1E+00
cadmium	>Bkgd	**4E+00**	6E-01	**4E+00**	**4E+00**	1E-02	**4E+00**
chromium	>Bkgd	7E-01	2E-01	**4E+00**	**3E+00**	5E-02	**4E+00**
cobalt	>Bkgd	3E-01	6E-02	**2E+00**	**2E+00**	1E-02	**2E+00**
copper	>Bkgd	9E-01	2E-01	**2E+00**	1E+00	3E-02	**2E+00**
iron	>Bkgd	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
lead	>Bkgd	1E+00	3E-01	**2E+02**	**1E+02**	**3E+00**	**2E+02**
mercury	>Bkgd	6E-01	1E-01	**5E+00**	**4E+00**	8E-03	**5E+00**
molybdenum	>Bkgd	1E-01	3E-02	1E-02	1E-02	6E-04	1E-01
nickel	>Bkgd	**1E+02**	**2E+01**	**1E+01**	**1E+01**	2E-01	**1E+02**
selenium	>Bkgd	**2E+00**	7E-01	7E-01	5E-01	4E-03	**2E+00**
thallium	>Bkgd	3E-01	5E-02	6E-01	6E-01	3E-03	6E-01
vanadium	>Bkgd	**3E+00**	9E-01	1E-01	9E-02	6E-04	**3E+00**
zinc	>Bkgd	**4E+00**	8E-01	**3E+00**	**3E+00**	5E-02	**4E+00**
Hazard Indices							
HI PAH	NA	1E-01	2E-02	2E-01	2E-01	3E-02	2E-01
HI Pesticides	NA	5E-02	6E-03	**5E+00**	**2E+00**	2E-02	**5E+00**
HI Metals	NA	**1E+02**	**2E+01**	**3E+02**	**2E+02**	**4E+00**	**3E+02**

* bold font indicates hazard quotient greater than 1

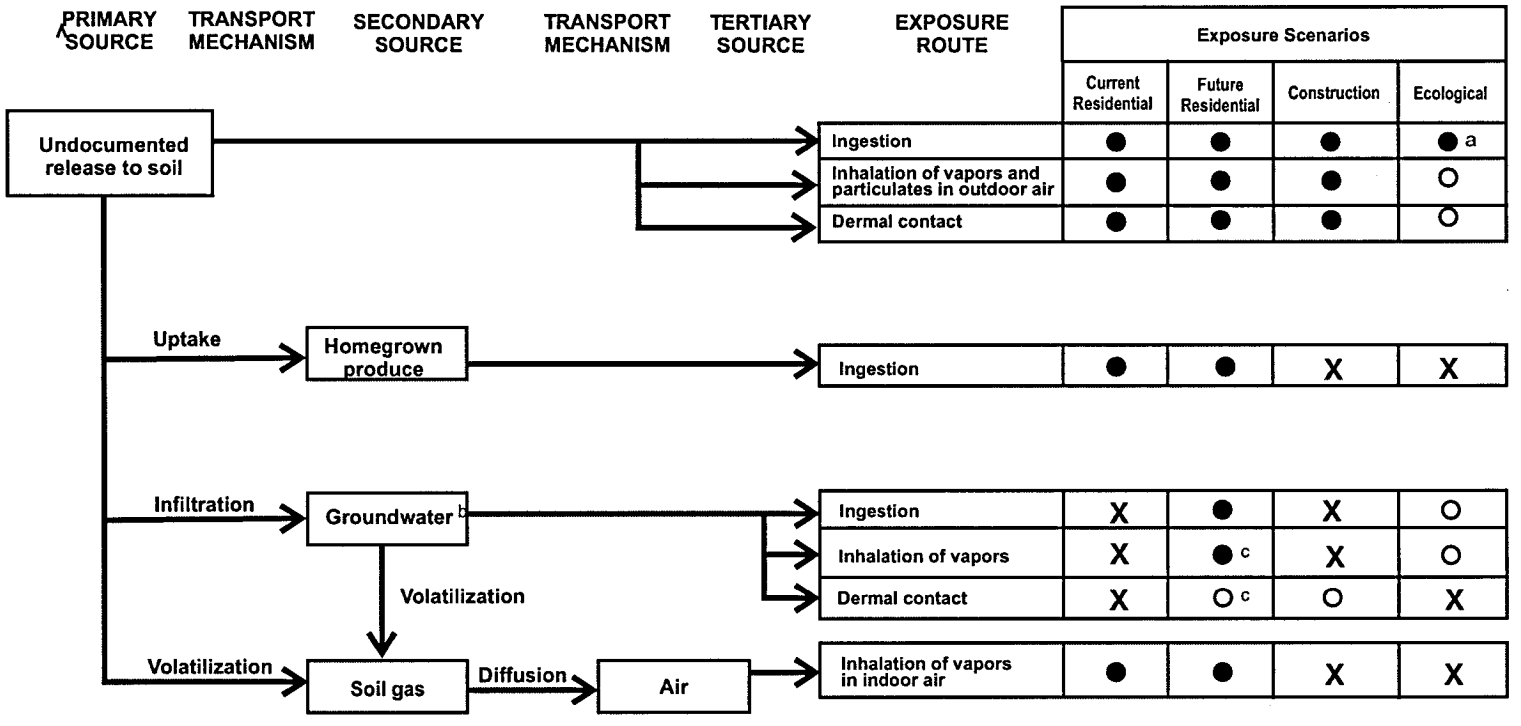
>Bkgd – site data were statistically greater than the background data; see Appendix H for statistical analyses details
<Bkgd – site data were not statistically greater than the background data; see Appendix H for statistical analyses details
COPEC – chemical of potential ecological concern
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
HI – hazard index
NA – not available
PAH – polynuclear aromatic hydrocarbon

Table 6-16
Comparison of Site 31 and Background COPEC Maximum Refined Hazard Quotients (Refined HQ-Low)

COPEC	Background Maximum HQ	Site Maximum HQ
Pesticides		
4,4-DDE	NA	**3E+00**
Metals		
cadmium	**9E+00**	**4E+00**
chromium	**2E+00**	**4E+00**
cobalt	**2E+00**	**2E+00**
copper	7E-01	**2E+00**
iron	NA	NA
lead	**1E+02**	**2E+02**
mercury	**3E+00**	**5E+00**
nickel	**3E+01**	**1E+02**
selenium	NA	**2E+00**
vanadium	1E+00	**3E+00**
zinc	1E+00	**4E+00**

* bold font indicates hazard quotient greater than 1

COPEC – chemical of potential ecological concern
DDE – dichlorodiphenyldichloroethene
NA – not available



LEGEND

● = COMPLETE EXPOSURE PATHWAY

X = INCOMPLETE EXPOSURE PATHWAY

O = COMPLETE EXPOSURE PATHWAY BUT NOT CONSIDERED A SIGNIFICANT SOURCE OF RISK. SEE TEXT FOR RATIONAL

NOTES

[a] Ingestion of soil and prey tissue potentially containing site-related contaminants

[b] Health risks are taken from the IR Site 25 Groundwater RI/FS (ERRG 2004)

[c] During showering

IR - INSTALLATION RESTORATION (PROGRAM)
FS - FEASIBILITY STUDY
RI - REMEDIAL INVESTIGATION

Draft Final Soil RI Report for IR Site 31

Figure 6-1

Conceptual Site Model

Alameda, California

CDM

Date: 2-1-06
File No.
Job No. 127896-400-001-1044
Rev No.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
12	**Administrative Record file**	**Section 2.8.1**	Alameda Point NAS Draft Administrative Record File Index. Pages 1-11.

ALAMEDA POINT NAS

DRAFT ADMINISTRATIVE RECORD FILE INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX FOR IR SITE 31

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 000627 TC.A021.10074 MM N68711-00-D-0005 00021	06-12-2003 12-03-2002 DO 0021	TETRA TECH EM INC. NAVFAC - SOUTHWEST DIVISION	03 DECEMBER 2002 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING SUMMARY (INCLUDES MEETING AGENDA, SIGN-IN SHEETS, AND VARIOUS HANDOUTS)	ADMIN RECORD INFO REPOSITORY	025 026 031 OU 5	SOUTHWEST DIVISION - BLDG. 1 SW060629-01 IMAGED APNT_007	181-03-0188 BOX 0013 41031858
N00236 / 000502 CTO-0059/0010 & SWDIV 06CA.GC/0840 REPORT N68711-95-D-7526 00285	06-03-2003 05-19-2003 00059	BECHTEL ENVIRONMENTAL, INC. E. JOHANSEN NAVFAC - SOUTHWEST DIVISION	DRAFT WORK PLAN FOR ASSESSMENT OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) CONTAMINATIONAT SELECTED CERCLA SITES AND EBS PARCELS {INLCUDES SWDIV TRANSMITTAL LETTER BY G. CLARK} {PORTIONS OF FIGURES AND ATTACHMENT C ARE CONFIDENTIAL}	ADMIN RECORD INFO REPOSITORY SENSITIVE	003 004 005 006 007 008 009 010 011 012 013 016 019 021 022 023 030 031 032 PARCEL 205 PARCEL 28 PARCEL 51	SOUTHWEST DIVISION - BLDG. 1 SW060615-03 IMAGED APNT_004	181-03-0188 BOX 0012 41031858

This Administrative Record (AR) Index includes ref[illegible]s to documents which cite bibliography sources. These bibliographic citations are considered to be part of t[illegible] but may not be cited separately in the index.

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 000772 NONE PUB NOTICE NONE 00016	08-04-2003 **07-01-2003** NONE	NAVFAC - SOUTHWEST DIVISION M. MCCLELLAND PUBLIC INTEREST	JULY 2003 ALAMEDA POINT FOCUS ENVIRONMENTAL NEWSLETTER	ADMIN RECORD	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024 025 026 027 028 029 030 031 032	SOUTHWEST DIVISION - BLDG. 1 SW070112-01 IMAGED APNT_008	181-03-0188 BOX 0016 41031858

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 001988 NONE CORRESPONDENCE NONE 00006	03-10-2005 **07-15-2003** NONE	DTSC - BERKELEY M. LIAO NAVFAC - SOUTHWEST DIVISION G. CLARK	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN (WP) FOR THE ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBON (PAH) CONTAMINATION AT SELECTED CERCLA SITES AND ENVIRONMENTAL BASELINE STUDY (EBS) PARCELS (INCLUDES COMMENTS BY HERD DATED 08 JULY 2003)	ADMIN RECORD	003 004 005 006 007 008 009 010 011 012 013 014 015 016 019 021 022 023 030 031 032 PARCEL 205 PARCEL 28 PARCEL 51	SOUTHWEST DIVISION - BLDG. 1 SW060615-04 IMAGED APNT_006	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 001812 CTO-0059/0127 OR SWDIV SER 06CA.DN/0379 REPORT N68711-95-D-7526 00127	04-22-2004 **03-30-2004** 00059	BECHTEL ENVIRONMENTAL, INC. E. JOHANSEN NAVFAC - SOUTHWEST DIVISION	FIELD ACTIVITY REPORT ASSESSMENT OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) CONTAMINATION AT SELECTED CERCLA SITES AND EBS PARCELS (CD COPY OF APPENDICES B THROUGH D AND ATTACHMENT E-1 IS ENCLSOED) [INCLUDES SWDIV TRANSMITTAL LETTER BY T. MACCHIARELLA]. ***COMMENTS: {PORTION OF THE MAILING LIST IS CONFIDENTIAL}***	ADMIN RECORD INFO REPOSITORY SENSITIVE	003 004 005 006 007 008 009 010 011 012 013 016 019 021 022 023 030 031 032 PARCEL 205 PARCEL 28 PARCEL 51	SOUTHWEST DIVISION - BLDG. 1 SW060615-04 IMAGED APNT_006	
N00236 / 001885 SWDIV SER 06CA.DN\0851 CORRESPONDENCE NONE 00005	10-20-2004 **08-25-2004** NONE	NAVFAC - SOUTHWEST DIVISION T. MACCHIARELLA U.S. EPA - SAN FRANCISCO A. COOK	TRANSMITTAL OF POLYNUCLEAR AROMATIC HYDROCARBON (PAH) SUMMARY REPORT FOR PUBLIC BENEFIT CONVEYANCE (PBC) 3 AND ECONOMIC DEVELOPMENT CONVEYANCE (EDC) 21 {PORTION OF THE MAILING LIST IS SENSITIVE} [LETTER RECEIVED IN THE ADM. RECORDS W/OUT ENCLOSURE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	030 031 EDC 21 PBC 3	SOUTHWEST DIVISION - BLDG. 1 SW070413-01 IMAGED APNT_022	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 002031 BRAC SER BPMOW.DN/0598 REPORT N68711-00-D-0004 00258	05-04-2005 **04-11-2005** DO 0086	CDM FEDERAL PROGRAMS BRAC PMO WEST	DRAFT WORK PLAN (WP) FOR THE REMEDIAL INVESTIGATION (RI) [INCLUDES SAMPLING AND ANALYSIS PLAN (SAP) & SITE HEALTH AND SAFETY PLAN (SHSP)] {INCLUDES BRAC PMO WEST TRANSMITTAL LETTER BY T. MACCHIARELLA} (CD COPY OF ATTACHMENT 1 ENCLOSED). ***COMMENTS: [PORTION OF MAILING LIST IS SENSITIVE]***	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	SOUTHWEST DIVISION - BLDG. 1 SW060921-02 IMAGED APNT_005	
N00236 / 002471 NONE CORRESPONDENCE NONE 00013	08-28-2006 **06-20-2005** NONE	DTSC - BERKELEY M. LIAO NAVFAC - SOUTHWEST DIVISION T. MACCHIARELLA	REVIEW AND COMMENTS ON DRAFT WORKPLAN FOR REMEDIAL INVESTIGATION (RI) (INCLUDES GSU COMMENTS DATED 14 JUNE 2005 AND HERD COMMENTS DATED 20 JUNE 2005)	ADMIN RECORD INFO REPOSITORY	031	SOUTHWEST DIVISION - BLDG. 1 SW060921-05 IMAGED APNT_006	
N00236 / 002470 NONE CORRESPONDENCE NONE 00007	08-28-2006 **06-30-2005** NONE	USEPA - SAN FRANCISCO A. COOK BRAC PMO WEST T. MACCHIARELLA	REVIEW AND COMMENTS ON DRAFT WORK PLAN FOR REMEDIAL INVESTIGATION (RI)	ADMIN RECORD INFO REPOSITORY	031	SOUTHWEST DIVISION - BLDG. 1 SW060921-05 IMAGED APNT_006	
N00236 / 002127 NONE REPORT N68711-00-D-0004 00322	10-07-2005 **09-28-2005** DO 0086	CDM FEDERAL PROGRAMS CORP. H. CARTER BRAC PMO WEST	DRAFT FINAL WORK PLAN FOR REMEDIAL INVESTIGATION	ADMIN RECORD INFO REPOSITORY	031	SOUTHWEST DIVISION - BLDG. 1 SW060921-03 IMAGED APNT_006	
N00236 / 002141 NONE CORRESPONDENCE NONE 00014	10-27-2005 **10-17-2005** NONE	DTSC-BERKELY M. LIAO NAVFAC - SOUTHWEST DIVISION T. MACCHIARELLA	DTSC COMMENTS ON DRAFT FINAL SOIL REMEDIAL INVESTIGATION REPORT. (INCLUDES DTSC COMMENTS ON DRAFT FINAL REMEDIAL INVESTIGATION WORKPLAN DATED 10/17/05 W/HERD MEMORANDUM DATED 10/06/05 (PORTION OF THE MAILING LIST IS SENSITIVE)	ADMIN RECORD INFO REPOSITORY SENSITIVE	030 031	SOUTHWEST DIVISION - BLDG. 1 SW060907-04 IMAGED APNT_003	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 002145 BRAC SER BPMOW.MEP/1330 REPORT N68711-00-D-0004 00328	11-02-2005 **10-28-2005** DO 0086	CDM FEDERAL PROGRAMS CORP H. CARTER BRAC PMO WEST	FINAL WORK PLAN FOR REMEDIAL INVESTIGATION (INCLUDES BRAC TRANSMITTAL LETTER BY T. MACCHIARELLA) [CD COPY OF ATTACHMENT 2 ENCLOSED] {PORTION OF THE MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	SOUTHWEST DIVISION - BLDG. 1 SW060921-04 IMAGED APNT_006	
N00236 / 002275 NONE REPORT N68711-00-D-0004 02094	04-25-2006 **04-21-2006** DO 0086	CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT, MARINA VILLAGE HOUSING [SEE AR #2276 - BRAC TRANSMITTAL LETTER BY T. MACCHIARELLA AND AR# 2622 - DRAFT SOIL RI REPORT - REVISION I]	ADMIN RECORD INFO REPOSITORY	031	SOUTHWEST DIVISION - BLDG. 1 SW070316-04 IMAGED APNT_023	
N00236 / 002276 BRAC SER BPMOW.MEP/0369 CORRESPONDENC E NONE 00004	04-25-2006 **04-21-2006** NONE	BRAC PMO WEST T. MACCHIARELLA VARIOUS AGENCIES	TRANSMITTAL OF DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT, MARINA VILLAGE HOUSING (PORTION OF THE MAILING LIST IS CONFIDENTIAL) [SEE AR #2275 - DRAFT SOIL REMEDIAL INVESTIGATION REPORT, MARINA VILLAGE HOUSING]	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	SOUTHWEST DIVISION - BLDG. 1 SW070316-04 IMAGED APNT_023	
N00236 / 002613 NONE CORRESPONDENC E NONE 00001	11-22-2006 **06-22-2006** NONE	US EPA - SAN FRANCISCO A. COOK BRAC PMO WEST T. MACCHIARELLA	REQUEST FOR THIRTY (30) DAY EXTENSION FOR REVIEW OF DRAFT SOIL FEASIBILITY STUDY (FS) REPORT AND DRAFT REMEDIAL INVESTIGATION (RI) REPORT	ADMIN RECORD INFO REPOSITORY	030 031	SOUTHWEST DIVISION - BLDG. 1 SW071207-02 IMAGED APNT_028	
N00236 / 002614 11011.10 CORRESPONDENC E NONE 00003	11-22-2006 **06-23-2006** NONE	US COAST GUARD R.L. SMITH BRAC PMO WEST T. MACCHIARELLA	REVIEW AND COMMENTS ON DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT, MARINA VILLAGE HOUSING	ADMIN RECORD INFO REPOSITORY	031	SOUTHWEST DIVISION - BLDG. 1 SW071207-02 IMAGED APNT_028	
N00236 / 002665 NONE CORRESPONDENC E NONE 00026	01-23-2007 **07-31-2006** NONE	DTSC - SACRAMENTO D. LOFSTROM BRAC PMO WEST T. MACCHIARELLA	REVIEW AND COMMENTS ON DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT, MARINA VILLAGE HOUSING (INCLUDES HERD COMMENTS DATED 06/26/2006 AND GSU COMMENTS DATED 06/26/2006) [PORTION OF THE MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	SOUTHWEST DIVISION - BLDG. 1 SW071207-03 IMAGED APNT_028	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 002622 NONE REPORT N68711-00-D-0004 01035	12-06-2006 **11-01-2006** 00086	CDM FEDERAL PROGRAMS CORP. C. ZAKOWSKI BRAC PMO WEST	DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT - REVISION I FOR MARINA VILLAGE HOUSING (CD COPY ENCLOSED) [SEE AR# 2621 - BRAC TRANSMITTAL LETTER BY T. MACCHIARELLA AND AR# 2275 - DRAFT SOIL RI REPORT]. ***COMMENTS: (NOTE: APPENDIX F2 IS ISSUED IN ELECTRONIC FORMAT ONLY)***	ADMIN RECORD INFO REPOSITORY	031	SOUTHWEST DIVISION - BLDG. 1 SW070316-04 IMAGED APNT_023	
N00236 / 002621 BRAC SER BPMOW.MEP/0155 CORRESPONDENCE NONE 00004	12-06-2006 **11-30-2006** NONE	BRAC PMO WEST T. MACCHIARELLA VARIOUS AGENCIES	TRANSMITTAL OF DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT - REVISION I FOR MARINA VILLAGE HOUSING (W/OUT ENCLOSURE) [SEE AR# 2622 - DRAFT SOIL RI REPORT - REVISION I] {PORTION OF MAILING LIST IS SENSITIVE}	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	SOUTHWEST DIVISION - BLDG. 1 SW070316-04 IMAGED APNT_023	
N00236 / 002768 NONE CORRESPONDENCE NONE 00065	05-22-2007 **12-04-2006** NONE	BRAC PMO WEST PARKER, M. VARIOUS AGENCIES	TRANSMITTAL OF RESPONSE TO COMMENTS ON DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT FOR MARINA VILLAGE HOUSING (W/ ENCLOSURE) [SEE AR # 2275 - DRAFT SOIL REMEDIAL INVESTIGATION REPORT]	ADMIN RECORD INFO REPOSITORY	031	CHOICE IMAGING SOLUTIONS SW080104-03	
N00236 / 002697 NONE CORRESPONDENCE NONE 00003	02-27-2007 **02-08-2007** NONE	DTSC - SACRAMENTO D. LOFSTROM BRAC PMO WEST T. MACCHIARELLA	REQUEST FOR THIRTY (30) DAY EXTENSION FOR REVIEW OF DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT, REVISION 1 [PORTION OF THE MAILING LIST IS SENSITIVE]	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	SOUTHWEST DIVISION - BLDG. 1 SW071207-04 IMAGED APNT_028	
N00236 / 002871 NONE CORRESPONDENCE NONE 00005	09-25-2007 **03-17-2007** NONE	US EPA - SAN FRANCISCO COOK, A. BRAC PMO WEST MACCHIARELLA, T.	REVIEW AND COMMENTS ON THE DRAFT REVISION I SOIL REMEDIAL INVESTIGATION REPORT, MARINA VILLAGE HOUSING [SEE AR # 2622 - DRAFT REVISION I SOIL RI]	ADMIN RECORD INFO REPOSITORY	031	CHOICE IMAGING SOLUTIONS SW080104-03	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 002877 NONE CORRESPONDENCE NONE 00012	10-04-2007 **04-17-2007** NONE	DTSC - SACRAMENTO LOFSTROM, D. BRAC PMO WEST MACCHIARELLA, T.	REVIEW AND COMMENTS ON THE DRAFT SOIL REMEDIAL INVESTIGATION (RI) REPORT - REVISION 1, MARINA VILLAGE HOUSING (INCLUDES GSU COMMENTS DATED 13 AUGUST 2007, AND HERD COMMENTS DATED 09 APRIL 2007) [PORTION OF THE MAILING LIST IS SENSITIVE]. ***COMMENTS: {SEE AR # 2622 - DRAFT SOIL REMEDIAL INVESTIGATION REPORT, REVISION 1}***	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	CHOICE IMAGING SOLUTIONS SW080104-03	
N00236 / 002788 BRAC SER BPMOW.MEP/0650 CORRESPONDENCE NONE 00004	07-09-2007 **06-06-2007** NONE	BRAC PMO WEST MACCHIARELLA, T. VARIOUS AGENCIES	TRANSMITTAL OF DRAFT FINAL SOIL REMEDIAL INVESTIGATION REPORT FOR MARINA VILLAGE HOUSING (W/OUT ENCLOSURE) [CD COPY ENCLOSED] {SEE AR # 2789 - FINAL SOIL RI REPORT FOR MARINA VILLAGE HOUSING} (PORTION OF THE MAILING LIST IS SENSITIVE). ***COMMENTS: DRAFT FINAL SOIL RI REPORT WAS CONVERTED TO FINAL.***	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	CHOICE IMAGING SOLUTIONS SW080104-03	
N00236 / 002789 BAI.5106.0032.0001 REPORT N68711-03-D-5106 01200	07-09-2007 **08-01-2007** DO 0032	BAI BARAJAS & ASSOCIATES, INC. - SAN DIEGO ALLEN, M NAVFAC - SOUTHWEST DIVISION	FINAL SOIL REMEDIAL INVESTIGATION REPORT FOR MARINA VILLAGE HOUSING (CD COPY IS ENCLOSED) [SEE AR # 2818 - BRAC TRANSMITTAL LETTER]. ***COMMENTS: {INCLUDES REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 07/05/2007 TO FINAL} (REPLACEMENT PAGES ISSUED ON 08/14/2007 INCLUDE COPY OF CD, COVER PAGE, TITLE PAGE, SIGNATURE PAGE, AND APPENDIX L PAGES 1-18, 1-22, AND 1-46)***	ADMIN RECORD INFO REPOSITORY	031	CHOICE IMAGING SOLUTIONS SW080118-02 AND SW080118-03	
N00236 / 002832 NONE CORRESPONDENCE NONE 00002	09-12-2007 **08-08-2007** NONE	DTSC - SACRAMENTO LOFSTROM, D. BRAC PMO WEST MACCHIARELLA, T.	REVIEW AND COMMENTS ON THE DRAFT FINAL SOIL REMEDIAL INVESTIGATION REPORT FOR MARINA VILLAGE HOUSING [SEE AR # 2789 - FINAL SOIL RI REPORT] {***SEE COMMENTS}. ***COMMENTS: ***DRAFT FINAL DATED 07/05/2007 WAS CONVERTED TO FINAL***	ADMIN RECORD INFO REPOSITORY	031	CHOICE IMAGING SOLUTIONS SW080104-03	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 002831 NONE CORRESPONDENCE NONE 00002	09-12-2007 **08-09-2007** NONE	US EPA - SAN FRANCISCO COOK, A. BRAC PMO WEST MACCHIARELLA, T.	REVIEW AND CONCURRENCE ON THE DRAFT FINAL SOIL REMEDIAL INVESTIGATION REPORT FOR MARINA VILLAGE HOUSING [SEE AR # 2789 - FINAL RI REPORT] {***SEE COMMENTS}. ***COMMENTS: ***DRAFT FINAL DATED 07/05/2007 WAS CONVERTED TO FINAL***	ADMIN RECORD INFO REPOSITORY	031	CHOICE IMAGING SOLUTIONS SW080104-03	
N00236 / 002818 BRAC PMOW SER BPMOW.MEP/0757 CORRESPONDENCE NONE 00003	08-29-2007 **08-14-2007** NONE	BRAC PMO WEST MACCHIARELLA, T. VARIOUS AGENCIES	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING DRAFT FINAL DATED 05 JULY 2007 TO FINAL SOIL REMEDIAL INVESTIGATION REPORT FOR MARINA VILLAGE HOUSING (W/OUT ENCLOSURE) [SEE AR # 2789 - FINAL SOIL REMEDIAL IR FOR MARINA VILLAGE HOUSING]. ***COMMENTS: {PORTION OF THE MAILING LIST IS SENSITIVE} REPLACEMENT PAGES WERE INSERTED IN THE DOCUMENT***	ADMIN RECORD INFO REPOSITORY SENSITIVE	031	CHOICE IMAGING SOLUTIONS SW080104-03	
N00236 / 002957 SULT.5104.0130.005 0 MINUTES N68711-03-D-5104 00050	12-26-2007 **09-06-2007** 00130	BRAC PMO WEST RAB MEMBERS	06 SEPTEMBER 2007 FINAL RESTORATION ADVISORY BOARD MEETING SUMMARY (INCLUDES CD COPY, LIST OF ATTENDEES, AGENDA, AND VARIOUS HANDOUT MATERIALS)	ADMIN RECORD INFO REPOSITORY	SITE 00005 SITE 00009 SITE 00010 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00022 SITE 00023 SITE 00025 SITE 00030 SITE 00031 SITE 00032	CHOICE IMAGING SOLUTIONS SW080204-03	

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N00236 / 002968 SULT.5104.0130.005 2 MINUTES N68711-03-D-5104 00030	01-09-2008 **09-18-2007** 00130	SULTECH BRAC PMO WEST	18 SEPTEMBER 2007 FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT), MONTHLY TRACKING MEETING, AFTER ACTION REPORT (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00034 SITE 00035	CHOICE IMAGING SOLUTIONS SW080215-04	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
N00236 / 002956 BEI-7526-0089-0054 PUBLIC NOTICE N68711-95-D-7526 00010	12-04-2007 **11-01-2007** 00089	BECHTEL ENVIRONMENTAL, INC. ARGYRES, J. PUBLIC INTEREST	DRAFT PROPOSED PLAN FOR SOIL AT MARINA VILLAGE HOUSING [SEE AR #2955 - BRAC PMO WEST TRANSMITTAL LETTER]. ***COMMENTS: PER D. SILVA, DRAFT PROPOSED PLAN NOT SENT TO INFO REPOSITORY***	ADMIN RECORD	SITE 00031	CHOICE IMAGING SOLUTIONS SW080215-03	
N00236 / 002955 BRAC SER BPMOW.MP\0078 CORRESPONDENCE NONE 00002	12-04-2007 **11-08-2007** NONE	BRAC PMO WEST MACCHIARELLA, T. VARIOUS AGENCIES	TRANSMITTAL OF DRAFT PROPOSED PLAN FOR SOIL AT MARINA VILLAGE HOUSING (SEE AR #2956 - DRAFT PROPOSED PLAN) [PORTION OF THE MAILING LIST IS SENSITIVE.]. ***COMMENTS: PER D. SILVA, DRAFT PROPOSED PLAN NOT SENT TO INFO REPOSITORY***	ADMIN RECORD SENSITIVE	SITE 00031	CHOICE IMAGING SOLUTIONS SW080215-03	
N00236 / 002992 NONE CORRESPONDENCE NONE 00004	01-28-2008 **12-11-2007** NONE	US EPA - SAN FRANCISCO COOK, A. BRAC PMO WEST MACCHIARELLA, T.	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN FOR SOIL AT MARINA VILLAGE HOUSING [SEE AR # 2956 – DRAFT PROPOSED PLAN]	ADMIN RECORD INFO REPOSITORY	SITE 00031	CHOICE IMAGING SOLUTIONS SW080215-04	

Total Estimated Record Page Count: 5,961

Total - Administrative Records: 33

[UIC NUMBER]='N00236'
No Keywords
Sites=031;SITE 00031
No Classification

Item	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
14	**meeting transcript**	**Section 3**	Public Meeting Transcript, March 12, 2008, Public Comment Period for Proposed Plan for IR Site 31, former NAS Alameda, Alameda, California.

PROPOSED PLAN FOR
INSTALLATION RESTORATION
SITES 20 AND 31 AT ALAMEDA POINT

ALAMEDA POINT, CALIFORNIA

PUBLIC MEETING

Wednesday, March 12, 2008

Main Office Building
950 W. Mall Square
Community Conference Room 201
Alameda Point, California

Reported by: Valerie E. Jensen, CSR No. 4401

JAN BROWN & ASSOCIATES
CERTIFIED SHORTHAND REPORTERS
701 Battery Street, 3rd Floor
San Francisco, California 94111

P A R T I C I P A N T S

PRESENTERS:

THOMAS MACCHIARELLA, U.S. Navy
MARY PARKER, U.S. Navy

OTHER AGENCY, NAVY STAFF AND CONSULTANT REPRESENTATIVES:

BOB COLEMAN, Brown and Caldwell
LINDA HENRY, Brown and Caldwell
DOT LOFSTROM, Department of Toxic Substances Control
MARCUS SIMPSON, Department of Toxic Substances Control
ANNA-MARIE COOK, U.S. Environmental Protection Agency
XUAN-MAI TRAN, U.S. Environmental Protection Agency
JOHN WEST, RWQCB
DAN CARROLL, Kleinfelder

COMMUNITY MEMBERS AND INTERESTED PARTIES:

(None)

MARCH 12, 2008 6:48 P.M.

MR. MACCHIARELLA: We just concluded the posterboard viewing and informal discussion period. And since there are no community members present, we'll postpone the subsequent presentations until community members arrive. If none arrive by 7:30, we will conclude at that time.

Community members may provide written comments to the Navy through the end of the comment period.

In the event that no community members arrive, the view slides, rather than any verbatim transcript of the presentations, will be in the stenographer's report of this meeting and together will be placed in the administrative record and other places, as appropriate.

The stenographer will now stop recording while the Navy and regulatory agency representatives await the arrival of community members. Recording will resume when we return to the presentations or adjourn the meeting, whichever comes first.

(Off the record at 6:49 p.m.)

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(On the record at 7:30 p.m.)

MR. MACCHIARELLA: It's now 7:30. No community members arrived, and we are adjourning the meeting.

(Adjourned at 7:30 p.m.)

STATE OF CALIFORNIA) SS.

I do hereby certify that the public meeting was held at the time and place therein stated; that the statements made were reported by me, a certified shorthand reporter and disinterested person, and were, under my supervision, thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the participants in said public meeting nor in any way personally interested or involved in the matters therein discussed.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office this 26th day of March, 2008.

VALERIE E. JENSEN

Certified Shorthand Reporter