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BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
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JUL 16 2015

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San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

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

SUBJECT: FINAL RECORD OF DECISION, OPERABLE UNIT-2B, FORMER NAVAL AIR STATION ALAMEDA, ALAMEDA, CALIFORNIA

I am pleased to submit to you the *Final Record of Decision, Former Naval Air Station Alameda, Alameda, California*, March 2015. Unless otherwise specified, all recipients receive both hard copy and CD.

If you have any questions, please call Ms. Mary Parker, the Project Manager, at 619-532-0945, or me at (619) 532-0972.

Sincerely,

Cecily Sabedra

CECILY D. SABEDRA
BRAC Environmental Coordinator
By direction of the Director

Enclosure: Final Record of Decision, Former Naval Air Station Alameda, Alameda, California, March 2015

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FINAL
RECORD OF DECISION
OPERABLE UNIT-2B
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
MARCH 2015

1 Declaration

1.1 Site Name and Location

This Record of Decision (ROD) presents the selected remedies for all of the sites in Operable Unit (OU)-2B, which consists of Installation Restoration (IR) Sites 3, 4, 11, and 21, at the former Naval Air Station (NAS) Alameda (now known as Alameda Point) in Alameda, California. Alameda Point is located on the western tip of Alameda Island, which is on the eastern side of San Francisco Bay. OU-2B is located on the eastern part of Alameda Point. The locations of Alameda Point and OU-2B sites are shown on Figure 1-1. A site boundary change to facilitate transfer and reuse in accordance with the City of Alameda's reuse plan occurred after issuance of the Final Feasibility Study (FS) Report and resulted in a shift of site boundaries for IR Sites 3, 4, and 21. Figure 1-1 shows the original and current site boundaries. This boundary change is referred to throughout this document as the "post-FS site boundary change."

The U.S. Environmental Protection Agency's (U.S. EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Information System identification number for former NAS Alameda is CA2170023236. Alameda Point was added to the National Priorities List (NPL) of Superfund Sites on July 22, 1999.

1.2 Statement of Basis and Purpose

The remedies in this ROD were selected in accordance with the CERCLA of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, Title 42 *United States Code* (USC) Section 9601, et seq., and in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 *Code of Federal Regulations* (*CFR*) Part 300, et seq.

This ROD is based on information documented in the **Administrative Record**[1] file. Information was developed by extensive field investigations, laboratory analyses, interpretation of data, evaluation of current and future conditions, and assessment of potential human health and

[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 on the CD** serves as a hyperlink to referenced information. The excerpts referenced by the hyperlinks are part of the ROD. The hyperlink will open a text box at the top of the screen. A blue box surrounds applicable information in the hyperlink. To the extent there may be any inconsistencies between the referenced information attached to this ROD via hyperlinks and the information in the ROD itself, the language in the ROD supersedes the attachments.

ecological risks for IR Sites 3, 4, 11, and 21. Based on these findings, remedial alternatives were developed and evaluated.

The U.S. Department of the Navy (Navy) and U.S. EPA co-selected the soil and shallow groundwater remedies for OU-2B. The California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (Water Board) concurred in the remedies selected. The Federal Facilities Agreement (FFA) was signed by the Navy and U.S. EPA on July 5, 2001, and by DTSC and the Water Board in 2005. The FFA documents how the Navy intends to meet its statutory obligations and implement CERCLA in partnership with U.S. EPA, DTSC, and the Water Board. The Navy, U.S. EPA, DTSC, and Water Board constitute the Base Realignment and Closure (BRAC) Cleanup Team (BCT).

1.3 Selected Remedies

Remedial alternatives for soil and shallow groundwater at OU-2B that were evaluated in the FS Report and the FS Addendum Report and presented in the **Proposed Plan** ranged from no action to active remediation. The Navy, in coordination with the regulatory agencies, has selected the remedies for soil and shallow groundwater based on the evaluation of the nine NCP evaluation criteria. The remedies are summarized below.

Soil: No actions are required for IR Sites 11 and 21 soil, consistent with results of the risk assessment. Remedies selected for IR Sites 3 and 4 soil are Alternatives S-3a and S-2. Alternative S-3a consists of excavation and disposal of impacted soil at IR Site 3 (lead) and IR Site 4 (polychlorinated biphenyls [PCBs] and pesticides). Excavation will be complete when statistical evaluations of post-excavation sampling results (as detailed in the remedial action work plan) verify that remedial action objectives (RAOs) are met or groundwater is encountered, whichever occurs first.

Alternative S-2, institutional controls (ICs), will be implemented to prohibit residential use at IR Site 3 in the area of cobalt-impacted soil and at IR Site 4 in the area of hexavalent chromium-impacted soil unless cobalt and hexavalent chromium concentrations are reduced to below residential use levels. In addition, the ICs for hexavalent chromium-impacted soil beneath Building 360 at IR Site 4 will prohibit intrusive activities without prior approval by the agencies approving or concurring on this ROD or their successors. Additional details for the soil remedy are presented in Sections 2.9.1.1 and 2.9.1.2.

Groundwater: The remedy presented in this ROD is for shallow groundwater. This ROD, consistent with the Water Board letter dated September 13, 2013 (see Section 1.3.2), defines shallow groundwater in the OU-2B area as the water-bearing zone that extends from the water table to depths of at least 70 feet below ground surface (bgs) and encompasses geologic units including artificial fill deposits, the Bay Sediment Unit (BSU), and the Posey/Merritt/San Antonio Formation. Consistent with the OU-2B FS Report, the treatment zone for this shallow water-bearing zone for which the goals for vapor intrusion apply is from the water table to 30 feet bgs.

Alternative GM-3b is the remedy for the volatile organic compound (VOC) plume that underlies portions of OU-2B IR Sites 4, 11, and 21. This remedy includes treatment of the five hot spots and the remaining shallow groundwater plume using in-situ bioremediation (ISB), monitoring and ICs. The ICs are described in Section 1.3.1. In accordance with U.S. EPA guidance, a buffer

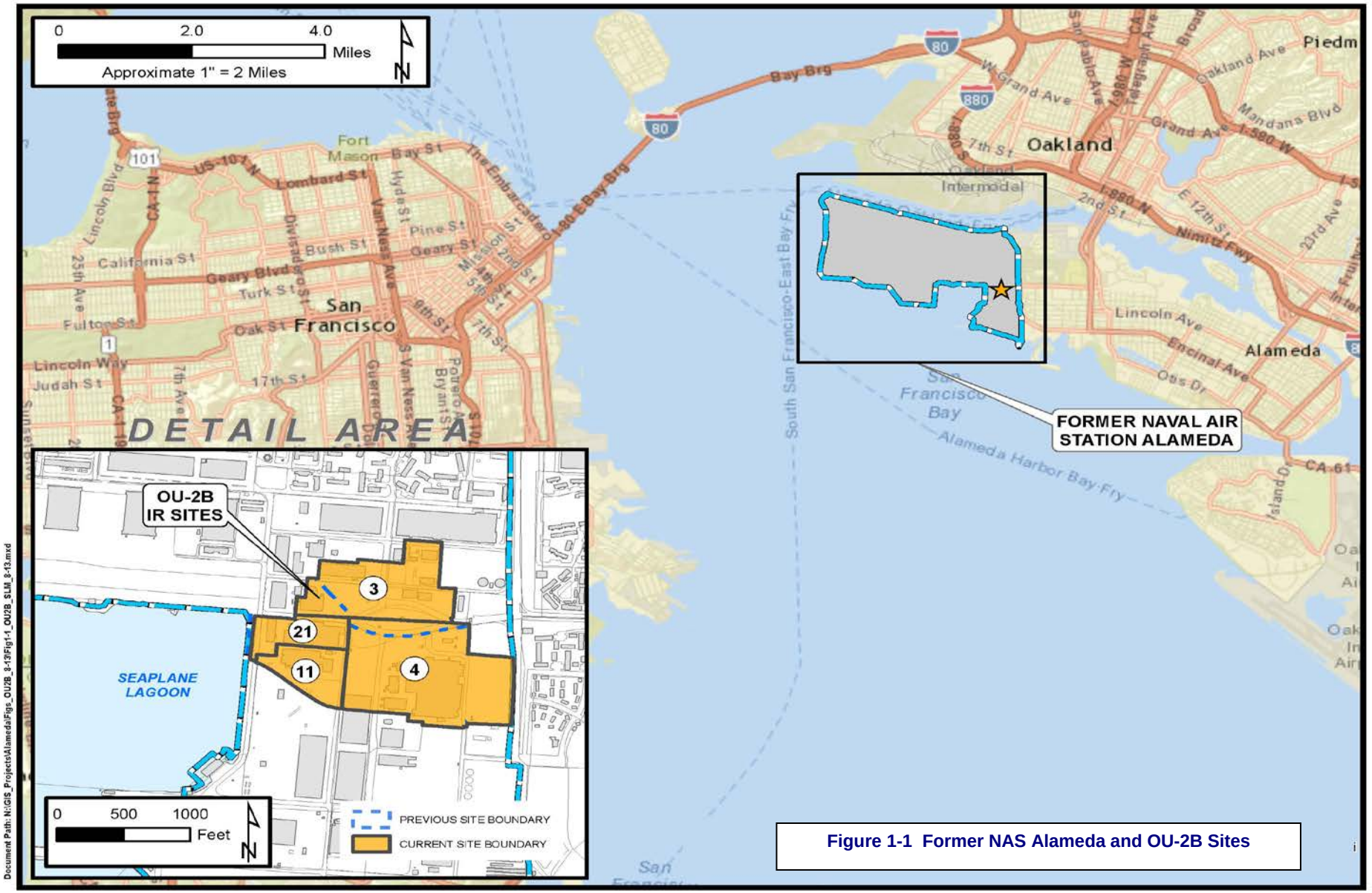

Figure 1-1 Former NAS Alameda and OU-2B Sites

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area is delineated around the perimeter of the plume; a portion of IR Site 3 is included in this buffer area. While in-situ thermal treatment (ISTT) was included in Alternative GM-3b in the FS Report, as a component of the selected remedy for hot spots, at this time the hot spots identified in the FS Report have been treated through multiple pilot tests and treatability studies, including two treatability studies completed in 2013, to levels at which ISB, the next step in the remedy's treatment train, is effective. Further, the December 2013 **Final ISTT Treatability Study** concluded that further ISTT treatment in any areas of OU-2B groundwater with higher concentrations would not likely be effective and is not recommended. Therefore, ISB will be used to treat the remaining OU-2B chemical of concern (COC) concentrations in shallow groundwater to 30 feet bgs. The remedy includes long-term groundwater monitoring following the ISB. Remediation goals (RGs) address vapor intrusion risk associated with contaminated groundwater shallower than 30 feet bgs. For shallow groundwater between 30 and 70 feet bgs, only groundwater monitoring will be conducted. Additional details for the groundwater remedy are presented in Sections 2.9.2.1 and 2.9.2.2.

The RGs are protective of the future land use. The City of Alameda has indicated that the anticipated future land use will include commercial/light industrial use and second floor or above residential use only (i.e. no ground floor residential use). In addition to RGs related to vapor intrusion, the FS Report also identifies goals for potential discharge to Seaplane Lagoon. The RAOs and further details are provided in Section 2.7. Based on modeling conducted during the FS, it is estimated that it will take between 25 and 40 years for the RGs to be achieved. The groundwater RGs for vapor intrusion/discharge into Seaplane Lagoon (in micrograms per liter - µg/L) are as follows (rounded to three significant digits or to 0.1 µg/L):

- 1,1, dichloroethene (DCE): 1,527/32
- 1,2, dichloroethane (DCA): 14.2/990
- benzene: 11.3/710
- chlorobenzene: 3,472/210,000
- cis-1,2-DCE: 402/none
- methylene chloride: 374/16,000
- tetrachloroethene (PCE): 5.9/88.5
- trans-1,2-DCE: 1,592/1,400,000
- trichloroethene (TCE) : 5.1/810
- vinyl chloride (VC): 1.3/5,250

1.3.1 Shallow Groundwater Institutional Controls

ICs will be applied to the OU-2B shallow VOC plume area plus a 100-foot buffer area. Although the OU-2B VOC plume does not underlie IR Site 3, the 100-foot buffer area extends into the southern part of IR Site 3. The areas requiring ICs will be reduced as RAOs (see Section 2.7) are met. ICs will provide restrictions for both commercial and residential construction. These ICs are described in Section 2.9.2.2 and include the following:

- Prohibition on domestic use of shallow groundwater;
- Prohibition on drilling wells of any kind (other than remedy-related monitoring wells);
- A requirement for engineered vapor intrusion mitigation systems acceptable to the other FFA signatories or their successors for all buildings constructed in the area overlying the impacted shallow groundwater plus the 100-foot buffer area until VOC concentrations in groundwater do not pose an unacceptable risk due to the vapor intrusion pathway (see Sections 1.3 and 2.7);
- Prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs; and
- Prohibition against construction of buildings with ground-floor residential units or occupancies with sensitive receptors, including schools, child care facilities, hospitals, and senior care facilities, overlying the impacted shallow groundwater plus the 100-foot buffer area until remedial goals (specified in Sections 1.3 and 2.7) are achieved.

The ICs will be legal and administrative mechanisms that limit the exposure of future landowners and users of the OU-2B property to shallow groundwater in the VOC plume and the 100-foot buffer area and to vapors from that groundwater to maintain the integrity of the selected remedies. The restrictions will be implemented through incorporation into the federal deed(s) and Covenant(s) to Restrict the Use of Property as environmental restrictive covenants that run with the land and are enforceable by the United States, DTSC, and any other signatory state entity.

1.3.2 Groundwater Beneficial Use Evaluation

The Navy, in coordination with the regulatory agencies, evaluated the potential of shallow groundwater in the southeast portion of Alameda Point, including OU-2B, to serve as a future drinking water source. The first encountered groundwater at OU-2B is an unconfined/semi-confined water-bearing zone that extends to depths of at least 70 feet bgs and encompasses geologic units including artificial fill deposits, the BSU, and the Posey/Merritt/San Antonio Formation. The Yerba Buena Mud Aquitard underlies this zone. The City of Alameda informed the Navy and regulatory agencies that the City of Alameda does not foresee using shallow groundwater as a drinking water source at Alameda Point in a letter dated **January 23, 2012**. In a letter report dated **August 6, 2012**, the Navy presented an evaluation that used several lines of evidence, and concluded that the shallow groundwater beneath OU-2B in the water-bearing zone(s) located between the surface and the Yerba Buena Mud Aquitard does not meet the requirements to be a potable water source under federal and state regulations. This Navy letter

contains data supporting the conclusion that shallow groundwater (i.e., groundwater above the Yerba Buena Mud) in the southeastern portion of Alameda Point is not of sufficient quality to be considered a future potential drinking water source, pursuant to State Water Resources Control Board (SWRCB) Resolution No. 88-63 and Regional Water Board Resolution No. 89-39, "Sources of Drinking Water." Lines of evidence included proximity to San Francisco Bay and potential for saltwater intrusion, high salinity, current county restrictions on well installation in shallow groundwater, and the potential for surface runoff to contaminate groundwater. The Water Board concurred that the shallow groundwater in the water-bearing zone(s) located between the surface and the Yerba Buena Mud Aquitard meets the criteria in SWRCB Resolution No. 88-63 and Regional Water Board Resolution No. 89-39 (**Water Board concurrence letter**) in a letter dated September 13, 2012. The U.S. EPA also concurred that OU-2B shallow groundwater does not meet the requirements to be a potable water source (letter dated **September 28, 2012**).

1.4 Assessment of the Sites

The Navy and the regulatory agencies have concluded that remedial actions are required for soil and shallow groundwater at OU-2B. The remedial actions were evaluated to be protective of human health and the environment and are based on the following:

- Site histories;
- Field investigations;
- Laboratory analytical results;
- Previous response actions;
- Evaluation of potential ecological and human health risks;
- Evaluation of potential remedial alternatives; and
- Current land use and reasonably anticipated future land use.

Contamination in OU-2B soil and groundwater was evaluated in the remedial investigation/ feasibility study (RI/FS) phase of the CERCLA process. A human health risk assessment (HHRA) and ecological risk assessment (ERA) were conducted. The HHRA evaluated the risk to human health, including for residential receptors, and concluded that soil and shallow groundwater remediation is required in some areas, as summarized below and described in further detail in Sections 2.5 and 2.9. The ERA evaluated risks to ecological receptors and concluded there are no unacceptable risks to ecological receptors.

As a result of the post-FS site boundary change, cobalt-impacted soil, previously located in IR Site 21, is now located within IR Site 3 (Figure 1-1).

The risk drivers in soil identified as COCs for the OU-2B Sites include the following:

- IR Site 3 – cobalt (identified in the FS Report as an IR Site 21 COC) and lead; and
- IR Site 4 –Aroclor 1254 (a PCB), aldrin, dieldrin, heptachlor epoxide, and hexavalent chromium.

The FS Report's HHRA and Applicable or Relevant and Appropriate Requirements (ARARs) included the assumption that, as a Class II aquifer, shallow groundwater at OU-2B was a potential source of drinking water. An addendum to the FS Report was issued in October 2012 that evaluated the groundwater using updated toxicity values and the scenario in which the shallow groundwater beneath OU-2B is not used as a potential drinking water source.

A Resource Conservation and Recovery Act (RCRA) Facility Assessment was completed in 1992. The assessment identified actual or potential releases that might require further investigation. A RCRA Facility Investigation was conducted as part of the Phase 2 Environmental Baseline Survey (EBS) investigation. In 2007, a solid waste management unit (SWMU) evaluation determined that any RCRA corrective action requirements would be deferred to and complied with under the CERCLA remedial actions or under the corrective actions of the Petroleum Program, a separate program from CERCLA with Water Board oversight. In accordance with CERCLA, the units in Table 1-1 will be closed in this ROD.

Table 1-1: RCRA Units Closed in this Record of Decision

Specific Unit(s)/Type	Unit Former Contents	Rationale for Closure
ASTs 014A-D	Preservative oil	Formerly located inside Building 14, the ASTs were removed prior to 2002. ASTs 014A-D were not listed as a likely source of soil and groundwater contamination at IR Site 11 in the OU-2B RI Report (2005). No further action/closure required based on AST removal, contents and historical use.
ASTs 037A-D	Combustible petroleum waste	Located south of Building 14, the ASTs were removed prior to 2002. ASTs 37 A-D were not listed as a likely source of soil and groundwater contamination at IR Site 11 in the OU-2B RI Report (2005). No further action/closure required based on AST removal, contents and historical use.
AST 360D	Compressed air or steam (erroneously thought to contain PD-680 [Stoddard Solvent])	Located on the western side of Building 360. A 2004 inspection confirmed the AST most likely held steam or compressed air. Subsurface contamination from this tank is not likely. No further action required.

Table 1-1: RCRA Units Closed in this Record of Decision

Specific Unit(s)/Type	Unit Former Contents	Rationale for Closure
AST 360E	Paint and paint seal wastes	Located west of Building 360, results from data gap investigation identified lead above the screening level in soil at AST 360E. Supplemental samples were below screening levels and it was determined lead above the screening level is limited to the immediate vicinity of the initial sample collected at S4-B34 and extends from 1 to 6 feet bgs. VOCs reported in groundwater were similar to OU-2B-wide VOC concentrations. No further action required.
M-06	PD-680, paint thinners, and acetone	M-06 was a portable solvent distillation unit located inside Building 360. The unit was located on a concrete floor. Although located near an expansion joint in the floor no stains were apparent within the joint. M-06 is not listed as a likely source of soil and groundwater contamination at IR Site 4 as reported in the OU-2B RI Report (2005). No further action required.
NADEP GAP 01	Aluminum oxides	NADEP GAP 01 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor in the vicinity. NADEP GAP 01 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NADEP GAP 49A	Aluminum oxide with some ammonium chloride	NADEP GAP 49A was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor in the vicinity. NADEP GAP 49A was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NADEP GAP 50	Blasting grit (glass) and chromic acid	NADEP GAP 50 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor in the vicinity. NADEP GAP 50 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.

Table 1-1: RCRA Units Closed in this Record of Decision

Specific Unit(s)/Type	Unit Former Contents	Rationale for Closure
NADEP GAP 51	Aerosol paint, epoxy paint, and thinner	NADEP GAP 51 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor in the vicinity. NADEP GAP 51 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NADEP GAP 52	Aerosol paint and lubrication, lubrication and engine oils, JP-5, and PD-680	NADEP GAP 52 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor in the vicinity. NADEP GAP 52 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NADEP GAP 55	Blasting grit (glass, plastic) and aluminum oxide	NADEP GAP 55 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor apparent in the vicinity. NADEP GAP 55 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NADEP GAP 57A	Blasting grit (all media)	NADEP GAP 57 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor apparent in the vicinity. One subsurface soil sample was collected and analyzed for TPH, metals, VOCs, SVOCs, PAHs, PCB, herbicides and organotins. Likely sources, metals and organotins, were either not reported or reported at concentrations below residential U.S. EPA PRGs. NADEP GAP 57A was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NADEP GAP 58	Aerosol cans (Turco Dy-check developer and remover) and rags	NADEP GAP 58 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor apparent in the vicinity. NADEP GAP 58 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.

Table 1-1: RCRA Units Closed in this Record of Decision

Specific Unit(s)/Type	Unit Former Contents	Rationale for Closure
NADEP GAP 76	Aerosol paint and rust remover, dope and lacquer thinner, some oil, enamel paint, and 1,1,1-TCA	Located inside Building 113, the data gap investigation reported arsenic and VC concentrations similar to concentrations reported throughout OU-2B groundwater. NADEP GAP 76 is not considered a source of groundwater contamination. No further action required.
NADEP GAP 80	Cyanide	NADEP GAP 80 was located on concrete inside Building 360. Inspectors did not observe apparent staining, corrosion, or an obvious pathway through the floor apparent in the vicinity. NADEP GAP 80 was not listed as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
NAS GAP 10	Solvents, lubrication and hydraulic oils, and asbestos (doubled bags)	Located north of Building 112, the drum storage area was investigated in 2008 as part of the data gap investigation. Reported results of soil samples collected were below screening levels. Previous activities at Building 112 area do not appear to have released contaminants at concentrations above screening levels. No further action required for NAS GAP 10.
NAS GAP 11	Waste oils	Located inside Building 162, NAS GAP 11 was a sump used to collect waste oil. Results from data gap investigation reported soil and groundwater sample results were below screening levels. Previous activities do not appear to have released contaminants at above screening levels. No further action required for NAS GAP 11.
OWS 014A-D	Oil/water mixture	4 OWSs are located on the southern side of Building 14. Results from data gap investigation reported soil and groundwater sample results were below screening levels. Previous activities do not appear to have released contaminants at above screening levels. No further action required for OWSs 14A-D.

Table 1-1: RCRA Units Closed in this Record of Decision

Specific Unit(s)/Type	Unit Former Contents	Rationale for Closure
OWS 014E	Unknown	OWS 14E is located in the center of Building 14. Results from the data gap investigation reported soil sample results below screening levels and arsenic in groundwater was consistent with concentrations throughout OU-2B. Previous activities do not appear to have released contaminants to subsurface. No further action required for OWS 14E.
OWS 372B	Unknown	Located outside the main entrance to Building 372, the OWS was investigated during EBS Phase 2A and CERCLA investigations. Petroleum products in groundwater were reported at one location above the total TPH PRC for aquatic receptors, while other results were either not detected or below residential PRCs and U.S. EPA PRGs. OWS 372B was not identified as a source of IR Site 4 soil or groundwater contamination in the OU-2B RI Report (2005). No further action required.
SWMU 162	Oil and 1,1,1-TCA	SWMU 162 was located inside Building 162 on a second floor laboratory. Because it was on the second floor, SWMU 162 was not listed as a likely source of soil or groundwater contamination at IR Site 21 in the OU-2B RI Report (2005). No further action required. (1999 DTSC Letter recommended no further action for SWMU 162)
TP-06	None	A RCRA Part A-permitted unit consisting of a container located in the rinse shop of Building 360; it was designed to rinse empty acid bottles, but it was never used. The unit was properly closed in accordance with regulations governing the closure of conditionally exempt units in May 1998. No further action required.
TP-09	Cooling and scrubber condensate, process fluid, and overflow	A RCRA Part A-permitted unit consisting of a pH adjustment unit, Unit No. M-1304154, previously associated with Building 360. DTSC and the Alameda County Health Care Services Agency were notified of its proper closure in accordance with regulations in April 1997. No further action required.

Acronyms and Abbreviations:

AST	aboveground storage tank
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DTSC	Department of Toxic Substances Control
EBS	Environmental Baseline Survey
GAP	generator accumulation point
IR	Installation Restoration
M	miscellaneous area identified in RFA
NADEP	Naval Aviation Depot
NAS	Naval Air Station
OU	operable unit
OWS	oil water separator
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRC	preliminary remediation criteria
PRG	preliminary remediation goal
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	remedial investigation
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TCA	trichloroethane
TP	Tiered Permit
TPH	total petroleum hydrocarbon
U.S. EPA	U.S. Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compounds

1.5 Statutory Determinations

The Navy and U.S. EPA co-selected the soil and shallow groundwater remedies for OU-2B IR Sites 3, 4, 11, and 21 at the former NAS Alameda. The Navy, U.S. EPA, and the State of California (referring collectively to the DTSC and Water Board) have concluded that remedial action is necessary for soil at IR Sites 3 and 4 and for shallow groundwater beneath portions of IR Sites 4, 11, and 21 because elevated concentrations of COCs pose a potential risk to human health. The risk assessment methodologies, exposure scenarios, and risks for each site are summarized in Section 2.5.1 (and subsections).

Remedial action for soil at IR Sites 3 and 4 will consist of excavation and disposal of soil in selected areas, and ICs for two small areas at IR Sites 3 and 4. No further action is necessary for soil at IR Sites 11 and 21 because results of the risk assessment show that there is no unacceptable risk. The basis for no action for soil at IR Sites 11 and 21 is presented in Section 2.5.4.

The remedy for the shallow groundwater plume beneath portions of OU-2B IR Sites 4, 11 and 21 consists of ISB, monitoring, and ICs to restrict contact with, or use of, groundwater. The OU-2B shallow groundwater plume does not extend beneath IR Site 3, but because the buffer area for the plume extends across the southern boundary of IR Site 3, ICs for OU-2B shallow groundwater apply to that portion of IR Site 3.

The selected remedies are protective of human health and the environment and comply with federal and state requirements. The ICs described in Sections 2.9.1.2 and 2.9.2.2 will be legal and administrative mechanisms that limit the exposure of future landowners and users of the property to soil and shallow groundwater and vapors from the groundwater and maintain the integrity of the selected remedies.

CERCLA Five-Year Reviews are required for soil and shallow groundwater at OU-2B IR Sites 3, 4, 11 and 21 because the selected remedies will result in contaminants being left on-site above levels allowing for unrestricted use and unlimited exposure. A statutory review will be conducted every five years after initiation of the remedy to ensure that the remedy is protective, with ICs in

place that are protective of human health and the environment. The RCRA units identified in Table 1-1 are closed, with no further action required by this ROD.

1.6 Data Certification Checklist

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

Table 1-2: Data Certification Checklist

Checklist Item	Description
Identification of chemicals of potential concern and their concentrations.	Chemicals of potential concern were characterized for OU-2B based on data from several investigations. Descriptions of these investigations are provided in Section 2.3 of this ROD.
Current and reasonably anticipated future land use assumptions.	Current and potential future Site uses are discussed in Section 2.4.
Risk assessments for the chemicals of potential concern.	A baseline HHRA and an ecological risk evaluation were conducted as part of the remedial investigation and FS using data representative of current conditions at OU-2B. Results of the risk assessments are presented in Section 2.5 of this ROD.
Cleanup levels established for chemicals of concern and the basis for these levels.	RGs are the basis for measuring the success of the cleanup. RGs are presented in Section 2.7 and Tables 2-3 and 2-4.
How source materials constituting principal threats are addressed.	There are no principal threat wastes at OU-2B, as described in Section 2.6.
Estimated costs and the number of years over which the remedy cost estimate is projected.	Costs and the projected timeframe are provided in Tables 2-5 and 2-7.
Key factors that led to selecting the remedy.	A description of how the Selected Remedy meets threshold criteria and provides the best balance with respect to the balancing and modifying criteria is discussed in Section 2.8.

Acronyms and Abbreviations:

FS	feasibility study
HHRA	human health risk assessment
OU	Operable Unit
RG	remediation goals
ROD	Record of Decision

1.7 Authorizing Signatures

This signature sheet documents the Navy's and U.S. EPA's co-selection of: (1) remedial actions for soil at IR Sites 3 and 4 consisting of excavation and disposal with ICs for soil in selected areas at IR Sites 3 and 4; (2) remedial actions for shallow groundwater at OU-2B consisting of ISB, monitoring, and ICs; and (3) no action for soil at IR Sites 11 and 21. It also documents the U.S. EPA and the State of California's FFA signatories', the DTSC and the Water Board, concurrence with this ROD. The respective parties may sign this sheet in counterparts.

Signature — Date: March 11, 2015

Mr. Derek Robinson
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Signature — Date: April 13, 2015

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2 Decision Summary

The following sections provide a brief description and history of OU-2B and each IR Site, characteristics of OU-2B, a summary of previous investigations at each IR Site, current and potential future land uses at OU-2B, a summary of Site risks and COCs, and a discussion of the principal threat wastes. RAOs and RGs, a description and evaluation of remedial alternatives, the selected remedies, and information about community participation opportunities are also presented.

2.1 Site Description and History

OU-2B is located at the former NAS Alameda, now referred to as **Alameda Point**. Historical operations at the installation supported a wide variety of air operations across the facility by the Navy and former tenants. Alameda Point is located on the western tip of Alameda Island, which is on the eastern side of San Francisco Bay (Figure 2-1). The eastern portion of the base was used for industrial purposes in the late 1800s by the Pacific Coast Oil Company. The Navy acquired the land in 1936, and the base was constructed following several iterations of filling the tidelands and marshlands. Areas of OU-2B were filled from 1942–1946. NAS Alameda ceased operations in 1997.

As a management tool to accelerate site investigation, cleanup, and reuse at Alameda Point, a comprehensive OU strategy was developed, separating 34 CERCLA IR Sites into a total of 10 OUs: OU-1, OU-2A, OU-2B, OU-2C, OU-3, OU-4A, OU-4B, OU-4C, OU-5, and OU-6.

OU-2B is located in the southeastern corner of Alameda Point (Figure 2-1). The four CERCLA IR Sites that comprise OU-2B are:

- IR Site 3 – Abandoned Fuel Storage Area
- IR Site 4 – Aircraft Engine Test Facility (Building 360)
- IR Site 11 – Engine Test Cell (Building 14)
- IR Site 21 – Ship Fitting and Engine Repair (Building 162)

2.1.1 IR Site 3 – Abandoned Fuel Storage Area

IR Site 3 is an approximately **13-acre** site located near the eastern entrance to Alameda Point (Figure 2-2). **IR Site 3** is known as the Abandoned Fuel Storage Area. Nearly 80 percent of the site is covered with asphalt and concrete in the form of buildings, roads, and parking lots.

Portions of Petroleum Program Corrective Action Areas (CAAs) 3A, 3B and 3C are located within IR Site 3, to the south of Buildings 112 and 527. Figure 2-2 includes the ROD remedial action areas for IR Site 3 soil. While cobalt was originally a COC in IR Site 21 soil, as a result of the post-FS site boundary change, the cobalt-impacted soil is now within IR Site 3.

2.1.2 IR Site 4 – Aircraft Engine Facility

IR Site 4 is approximately **22 acres** in the eastern portion of Alameda Point (Figure 2-3). The site is also known as Building 360, the **Aircraft Engine Facility**, which contained multiple

process shops including a blast shop, cleaning shop, paint shop, welding shop, plating shop, various aircraft component repair rooms, and non-destructive testing facilities. About 65 percent of IR Site 4 is covered with asphalt and concrete in the form of buildings, roads, and parking lots.

Portions of CAAs 3C, 4A, 4B, 4C and 13 are within the site boundaries. Underground fuel lines and an old railroad track ran through IR Site 4. Aboveground storage tanks (ASTs), underground storage tanks (USTs), RCRA waste units, an industrial waste treatment plant, hazardous waste generator accumulation points (GAPs), and oil/water separators (OWSs) were associated with Building 360 operations. Figure 2-3 includes the ROD remedial action area for soil and the shallow groundwater hot spots in IR Site 4. The post-FS site boundary change included IR Site 4.

2.1.3 IR Site 11 – Engine Test Cell

IR Site 11 covers approximately **5.4 acres** in the eastern portion of Alameda Point (Figure 2-4). IR Site 11 contains Building 14, an engine test cell. Building 14 was constructed in 1940 and operated as an aircraft testing and repair facility. **IR Site 11** is a developed area. Approximately 95 percent of IR Site 11 consists of buildings, roads, and parking lots covered with asphalt and concrete.

IR Site 11 contains two CAAs, 11A and 11B. Multiple OWSs, hazardous waste GAPs, ASTs, USTs, and underground fuel lines were located at IR Site 11. Figure 2-4 includes the groundwater hot spot in IR Site 11. The post-FS site boundary change did not affect IR Site 11.

2.1.4 IR Site 21 – Ship Fitting and Engine Repair

IR Site 21 covers approximately **5.1 acres** and is located in the eastern portion of Alameda Point (Figure 2-5). **IR Site 21** is a developed area consisting primarily of buildings, roads, and parking lots, and is bordered by other developed areas. Approximately 50 percent of IR Site 21 is covered with asphalt and concrete, and the rest of IR Site 21 consists of buildings, roads, and parking lots.

The northern portion of IR Site 21 is designated as part of CAA-3A and the southwestern corner as part of CAA-11A because of petroleum hydrocarbon contamination in groundwater at these locations. The main feature of IR Site 21 is Building 162, which was constructed in 1945 and operated as a ship and aircraft maintenance shop. Multiple OWSs, hazardous waste GAPs, an AST, non-permitted RCRA units, SWMUs, USTs, and underground fuel lines were associated with IR Site 21 operations. Figure 2-5 includes the shallow groundwater hot spot in IR Site 21. While cobalt was originally a COC in IR Site 21 soil, as a result of the post-FS site boundary change, the cobalt-impacted soil is now within IR Site 3.

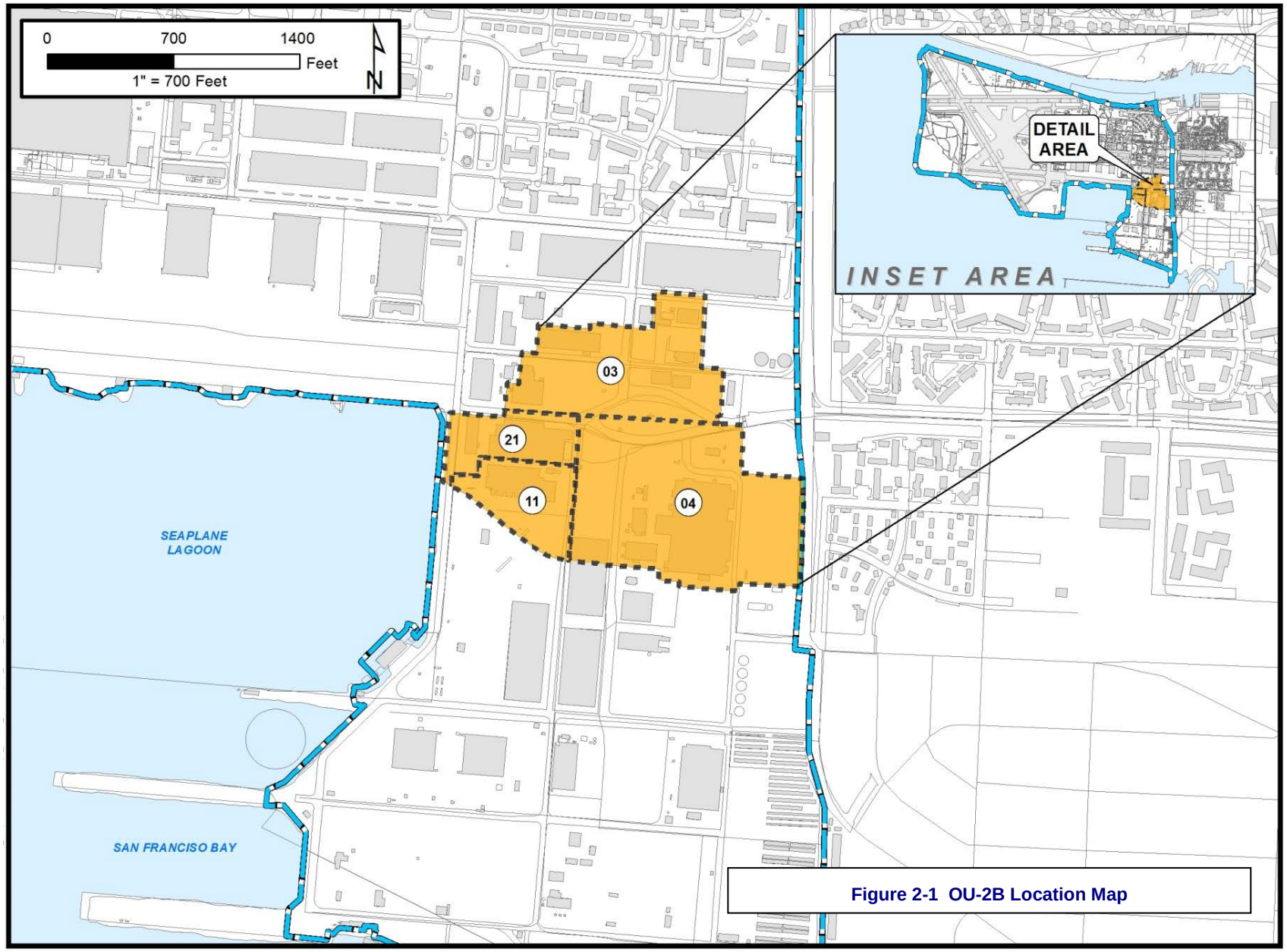

Figure 2-1 OU-2B Location Map

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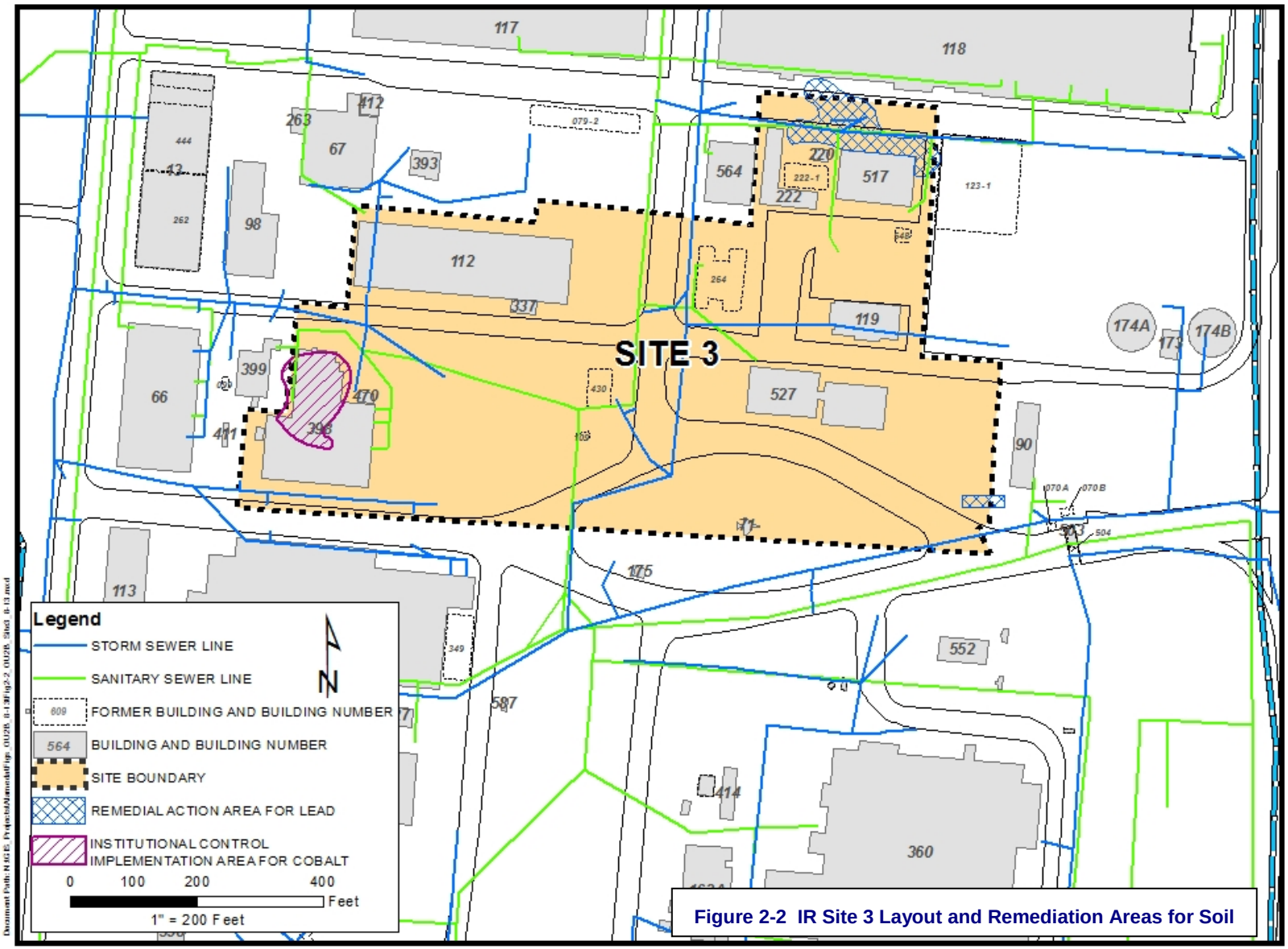

Figure 2-2 IR Site 3 Layout and Remediation Areas for Soil

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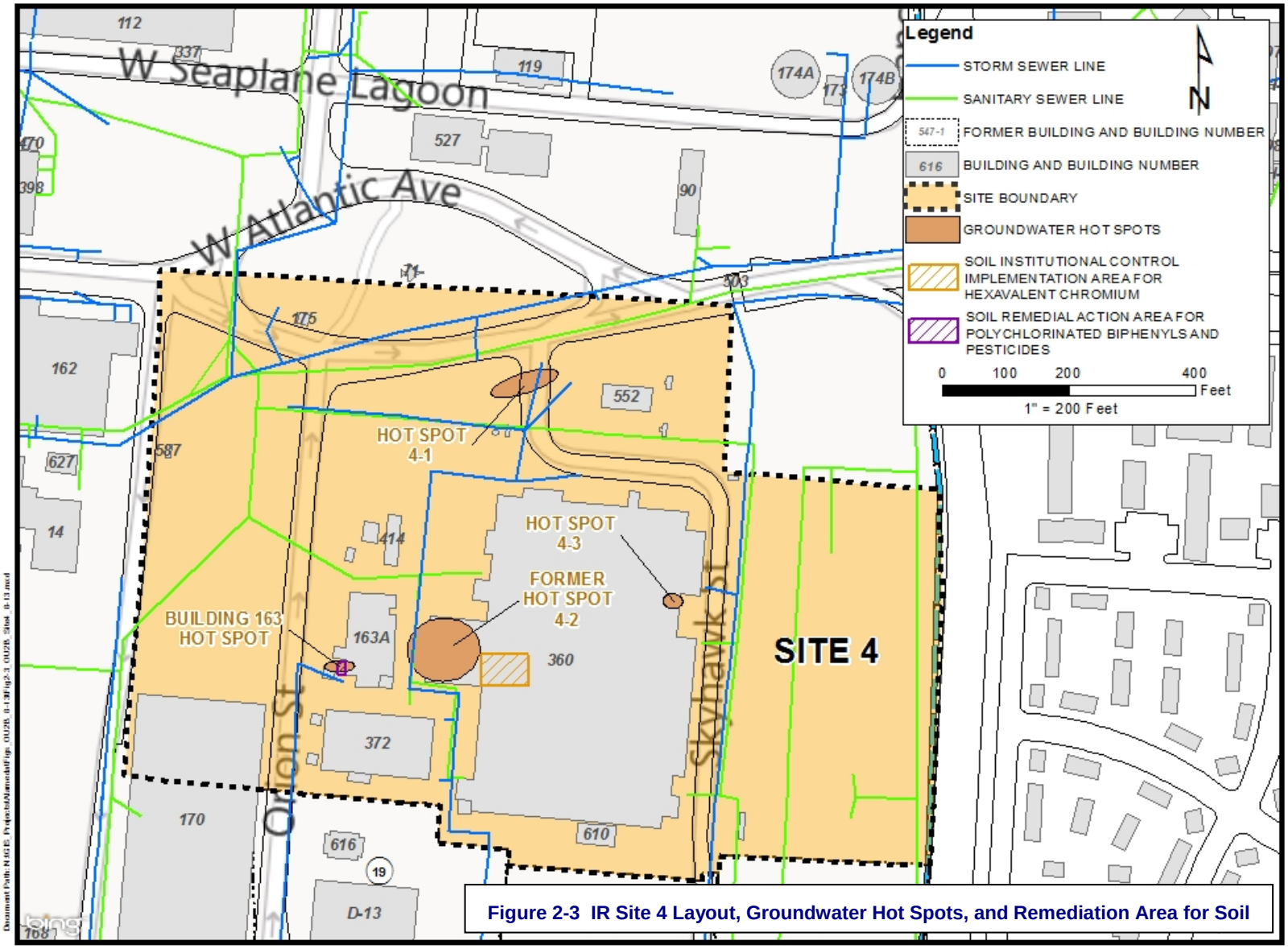

Figure 2-3 IR Site 4 Layout, Groundwater Hot Spots, and Remediation Area for Soil

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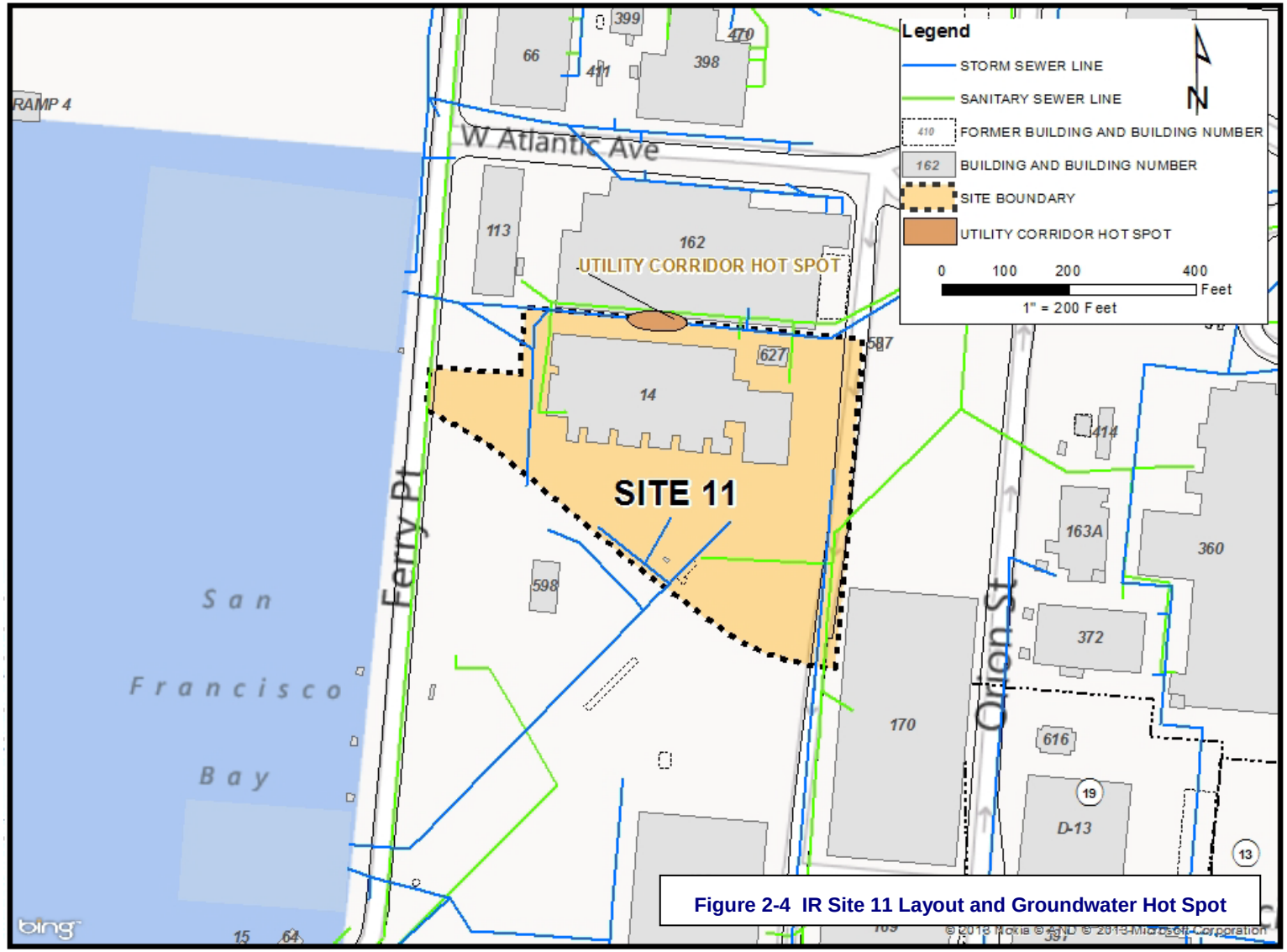

Figure 2-4 IR Site 11 Layout and Groundwater Hot Spot

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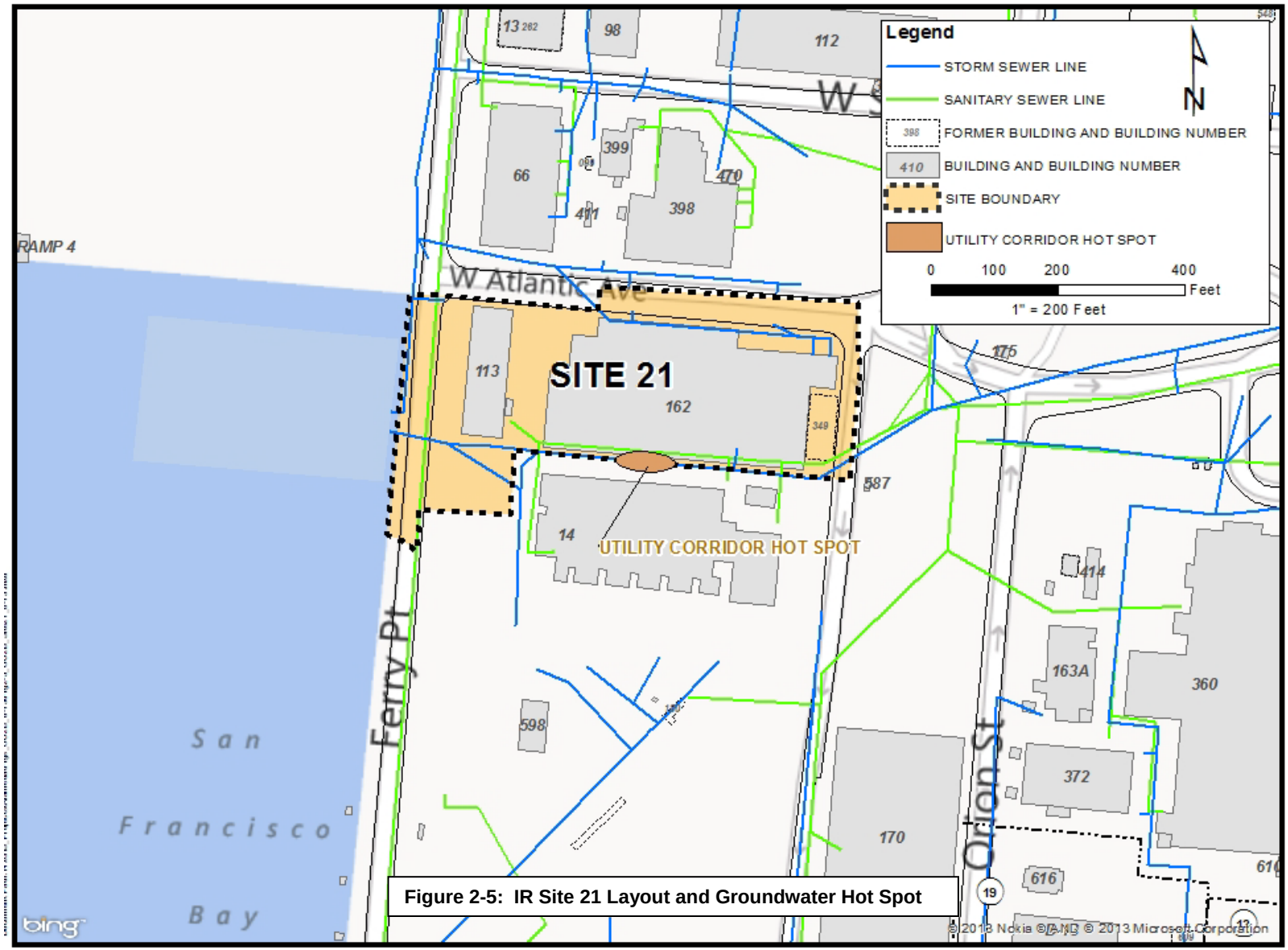

Figure 2-5: IR Site 21 Layout and Groundwater Hot Spot

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2.2 Site Characteristics

OU-2B is characterized by flat topography. There are no streams or surface water bodies at OU-2B. Alameda Point **geology** is characterized by unconsolidated sedimentary deposits. The geologic units that have been encountered during previous investigations at OU-2B include: (1) artificial fill, (2) BSU, (3) the Posey/Merritt/San Antonio Formation, (4) Yerba Buena Mud, and (5) Alameda Formation.

The artificial fill is the uppermost unit that underlies most of OU-2B, ranging in thickness from 0 feet to 18 feet bgs. The artificial fill is thickest in the southern portion of IR Site 4 and thinnest in the northern portion of IR Site 3. The BSU underlies the artificial fill material at OU-2B, although it is not present in the southeastern portion of IR Site 4 where it pinches out along the former shoreline. The BSU reaches a maximum thickness of 11 feet at IR Site 3. The Posey/Merritt/San Antonio Formation underlies the artificial fill in the southeastern portion of IR Site 4 and the BSU across the rest of OU-2B.

The **hydrogeology** at OU-2B includes a shallow unconfined/semi-confined water-bearing zone in the BSU, Yerba Buena Mud Aquitard, and the Alameda Aquifer. Groundwater generally flows west toward Seaplane Lagoon. The FS Report specifies that the average depth to groundwater at IR Sites 3, 11, and 21 is 5.5 feet bgs, and at IR Site 4 the average depth to groundwater is 4.5 feet bgs.

The hydrostratigraphic units at OU-2B include an unconfined/semi-confined water-bearing zone, the BSU, the Yerba Buena Mud Aquitard, and the Alameda Aquifer. The unconfined/semi-confined water-bearing zone extends to depths of at least 70 feet bgs and encompasses geologic units including artificial fill deposits, the BSU, and the Posey/Merritt/San Antonio Formation. The fine-grained deposits constituting BSU (silts and clays) within the water-bearing zone are laterally discontinuous and relatively thin. Therefore, the BSU in this area of Alameda Point is an ineffective aquitard at OU-2B and does not fully prevent vertical migration of VOCs.

The Yerba Buena Mud Aquitard occurs at depths of 70 feet to 95 feet bgs at OU-2B. The Yerba Buena Mud acts as an effective confining layer between the shallow, relatively saline groundwater above this aquitard and the underlying freshwater Alameda Formation Water-Bearing Zone. The Alameda Formation Water-Bearing Zone represents deep groundwater underlying the Yerba Buena Mud Aquitard in Alameda Formation sediments.

Following evaluation of water quality and beneficial use at OU-2B by the Navy, the Water Board stated that the shallow groundwater in the water-bearing zone(s) located between the surface and the Yerba Buena Mud Aquitard (70 feet or greater bgs) meets the criteria in SWRCB Resolution No. 88-63 and Regional Water Board Resolution No. 89-39 in a letter dated September 13, 2012 (**Water Board concurrence letter**). Further detail related to this evaluation is presented in Section 1.3.2.

Although the unconfined/semi-confined water-bearing zone extends from the water table to the top of the Yerba Buena Mud Aquitard at depths of at least 70 feet bgs, some previous documents subdivided this water bearing zone into shallow and deeper zones. This terminology is not used in this ROD so that there is consistency with the definition of shallow groundwater (water table

to the top of the Yerba Buena Mud Aquitard at 70 feet bgs or greater) that does not meet potable water criteria per the **Water Board concurrence letter**. As stated above, the Yerba Buena Mud acts as an effective confining layer between the shallow, relatively saline groundwater above this aquitard and the underlying freshwater Alameda Formation Water-Bearing Zone, which is not impacted.

2.3 Previous Investigations, Removal Actions, and Treatability Studies

Various environmental investigations have been performed for soil and groundwater at OU-2B in conformance with CERCLA, the former NAS Alameda EBS, the Petroleum Program, and RCRA. These investigations characterized the physical attributes of OU-2B IR Sites 3, 4, 11, and 21, including geology and hydrogeology, nature and extent of chemicals and their impact, risks to human health and the environment, and feasibility of potential soil and groundwater remediation technologies. The OU-2B groundwater between the water table and the Yerba Buena Mud Aquitard at approximately 70 feet bgs was characterized through multiple investigations.

The Petroleum Program is a separate program from CERCLA; oversight for the Petroleum Program is provided by the Water Board. Because some Petroleum Program remediation areas are located within OU-2B, relevant Petroleum Program corrective actions in these areas are summarized in this ROD.

The following sections provide a summary of the investigations and treatability studies conducted at each of the IR sites within OU-2B. The OU-2B remedial investigation (RI) Report provided a table summarizing historical investigations by site through 2005. Additional data gap investigations were conducted between 2007 and 2013. Table 2-1 provides a summary of environmental investigations conducted at OU-2B.

Table 2-1: Summary of Historical Environmental Investigations at OU-2B Sites

Environmental Investigation		IR Site 3	IR Site 4	IR Site 11	IR Site 21
Prior to IR Program	Initial Assessment Study, 1983	✓	✓		
CERCLA	Phases 1A and 2A Investigation, 1991	✓	✓		
	Phases 2B and 3 Investigation, 1991		✓	✓	✓
	Additional Work at IR Sites 4 and 5, 1992		✓		
	Follow-on Investigation, 1994	✓	✓	✓	✓
	Storm Sewer Removal, 1997	✓	✓	✓	✓
	Geotechnical Profiling to Define Chlorinated Solvent Plumes, 1997		✓		
	Follow-on Investigation, 1998	✓	✓	✓	✓
	Supplemental RI Data Gap Sampling, 2001	✓	✓	✓	✓
	Basewide Investigation of Transformer Pads, 1999-2000	✓	✓	✓	✓
	Basewide Groundwater Monitoring, 2002	✓	✓	✓	✓
	Pilot Studies, 2002		✓		

Table 2-1: Summary of Historical Environmental Investigations at OU-2B Sites

Environmental Investigation		IR Site 3	IR Site 4	IR Site 11	IR Site 21
CERCLA (cont.)	DNAPL Removal Action, 2002	✓			
	Basewide PAH Investigation, 2003	✓	✓	✓	✓
	DNAPL Removal Action, 2007		✓		
	Tidal Study, 2008	✓	✓	✓	✓
	Data Gaps Investigation, 2008-2009	✓	✓	✓	✓
	Supplemental Data Gaps Investigation 2009-2010	✓	✓	✓	✓
	Feasibility Study 2011	✓	✓	✓	✓
	Zero-Valent Iron, ISTT, and Bioremediation Treatability Studies, 2009–2013		✓	✓	
	Feasibility Study Addendum 2012	✓	✓	✓	✓
	Pre-Design Investigation, 2013	✓	✓	✓	✓
EBS	Phase 1, 1993-1994	✓	✓	✓	✓
	Phase 2A, 1994	✓	✓	✓	✓
	Phase 2B, 1995	✓	✓	✓	✓
	Phase 2C, 1998-2001	✓			
	Storm Sewer Investigation, 2000	✓	✓	✓	✓
Petroleum	Treatability Study, 1996-1998	✓			
	Fuel Lines and UST Investigations, 1992-2013	✓	✓	✓	✓
	Data Gap Sampling for CAAs, 2000	✓	✓	✓	✓
RCRA	RCRA Facility Assessment, 1992	✓	✓	✓	✓

Acronyms and Abbreviations:

CAA	(Petroleum Program) Corrective Action Areas
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DNAPL	dense non-aqueous phase liquid
EBS	environmental baseline survey
IR	Installation Restoration
ISTT	in-situ thermal treatment
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
UST	underground storage tank

2.3.1 IR Site 3 – Abandoned Fuel Storage Area

Environmental investigations are summarized in the OU-2B **RI Report for IR Site 3** and include investigations conducted before the IR Program, for the IR Program, and for the EBS. As part of the Petroleum Program for CAAs 3A, 3B, and 3C at IR Site 3, petroleum hydrocarbon investigations were conducted between 1995 and 2010, a treatability study was performed, and remediation was conducted. Fuel lines were removed at IR Site 3 between 1998 and 2001. Several concrete USTs were demolished and partially removed, with further excavation in 2010 at one location (UST 97D) in the grass to the south of Building 527. A dual-vapor extraction system operated in these CAAs through December 2010.

The evaluation of the **nature and extent of contamination in soil at IR Site 3** supports a conclusion that most of the chemicals reported across IR Site 3 are consistent with background concentrations with the exception of lead and petroleum hydrocarbons. Concentrations of lead in

soil that exceed 208 milligrams per kilogram (mg/kg) (the RG for lead based on a residential use scenario; see Section 2.7) are localized in the northern portion of IR Site 3, north of Building 517 and along the southeastern edge of the site. Petroleum constituents are being remediated under the Petroleum Program. Since the cobalt-impacted soil area in IR Site 3 was part of IR Site 21 at the time of the RI and FS, previous investigation results for cobalt are discussed in Section 2.3.4. No groundwater contamination was identified at IR Site 3.

Investigations conducted between 2003 and 2013 included analysis of over 200 soil samples at IR Site 3 for polycyclic aromatic hydrocarbons (PAHs), which are components of petroleum hydrocarbons but also may be due to other sources. At Alameda Point, a benzo(a)pyrene (B[a]P) equivalent of 0.62 mg/kg for PAHs in soil is an Alameda Point screening level determined based on risk that has been used since 2001 to identify areas of unrestricted reuse and no further action. Further investigation/assessment is to be conducted if this PAH screening level is exceeded. The FS Report compared individual PAH results expressed as B(a)P equivalent to the Alameda Point screening level of 0.62 mg/kg and identified exceedances in two localized areas that were identified as potential remedial action areas for further assessment. One localized area was located in the northeastern portion of the site and was based on one B(a)P equivalent exceedance at a depth of 4 to 8 feet bgs. The FS Report stated that this concentration is at a depth "where Marsh Crust is known to be present." The second area was in the southern part of the site in CAA 3C, near the location of former UST 97D. The FS Report risk assessment included these higher PAH concentrations, and the total residential risk for benzo(a)pyrene is 4.2×10^{-5}. These areas were further investigated in 2013.

In August 2013, soil sampling was conducted in CAA 3C at the one location in the remedial action area south of Building 527 where PAHs previously exceeded screening levels. The 2013 confirmation sample results showed a laboratory-estimated (designated as a "J" value) current B(a)P equivalent concentration of 0.094J mg/kg in surface soil and 0.11 mg/kg in the deeper subsurface sample at this location. Thus, the historical sampling exceedance was not confirmed. At one location on the perimeter of the remedial action area identified in the FS Report, 2013 sampling indicated an estimated B(a)P equivalent concentration of 1.2J mg/kg beneath the pavement at a depth of 1 to 1.5 feet bgs. The sample beneath it had a B(a)P equivalent concentration of 0.054 mg/kg. No other 2013 sample results at IR Site 3 from the confirmation sample boring location or the four additional perimeter boring locations exceeded a B(a)P equivalent of 0.62 mg/kg. These results show that no remedial action is necessary for PAHs in IR Site 3 soil.

2.3.2 IR Site 4 – Aircraft Engine Test Facility (Building 360)

Environmental investigations are summarized in the OU-2B **RI Report for IR Site 4** and include investigations conducted before the IR Program, for the IR Program, for the EBS, and for removal actions and pilot studies. Petroleum hydrocarbon investigations were conducted as part of the Petroleum Program for CAA 3C, 4A, 4B, 4C and 13 at IR Site 4. Fuel lines were removed or closed in place between 1998 and 1999.

The evaluation of the **nature and extent of contamination in soil at IR Site 4** and shallow groundwater concluded that most of the chemicals reported across IR Site 4 are consistent with historical activities at Building 360, including painting, blasting, degreasing, solvent cleaning, and plating of aircraft parts, and activities at Building 372 including petroleum-related

compounds, and landscaping activities in the field area east of Building 360. Results of investigations and subsequent risk assessment show that the COCs for IR Site 4 soil are hexavalent chromium, Aroclor 1254, aldrin, dieldrin, and heptachlor epoxide. Risk assessment results are presented in Section 2.5.1. A brief summary of key investigation results for soil follow, with groundwater investigations summarized at the end of this section.

The investigation of IR Site 4 soil included characterization of soil beneath Building 360, and investigation results show that only hexavalent chromium is a COC beneath Building 360. The maximum results reported for chromium (1,180 mg/kg) and hexavalent chromium (905 mg/kg) were in an isolated sample location beneath the western side of the building (see Figure 2-3). As part of the 2009 data gaps investigation, additional soil samples were collected within and north of Building 360 and analyzed for metals. Concentrations for chromium did not exceed 210 micrograms per kilogram (µg/kg). Hexavalent chromium concentrations did not exceed 30 µg/kg.

At IR Site 4, pesticides and PCBs are only present in one small area located on the southwest corner of Building 163A (see Figure 2-3). In January 2009, former OWS 163 was removed and the area excavated. Confirmation samples collected in soil after the removal action reported concentrations of Aroclor 1254 at 14,000 µg/kg, aldrin at 130 µg/kg, dieldrin at 1,400 µg/kg, and heptachlor epoxide at 930 µg/kg. These chemicals were further evaluated in the FS report, and HHRA results are presented in Section 2.5.1.2.

Lead was further investigated based on a 2007 maximum concentration of lead in IR Site 4 soil of 1,000 mg/kg in one boring (S4-B34) at a depth of 1.0 to 1.5 feet bgs. Additional lead soil sampling was conducted as part of the 2008/2009 supplemental data gaps investigation for soil east of Building 360. Six soil samples were collected adjacent to location S4-B34 and analyzed for lead, with a maximum result of 26.1 mg/kg of lead at boring S4-B34D at a depth of 1 to 1.5 feet bgs. At the September 8, 2011 BCT meeting, it was agreed that samples would be collected at the boring S4-B34 location prior to the remediation to verify the lead concentration at this location.

In September 2013, one confirmation boring was advanced at the S4-B34 exceedance location, and the soil was sampled for lead at the same depths as the historical sample. Also, three additional borings were advanced in the vicinity of boring S4-B34, and soil was sampled for lead at two depths. This 2013 sampling event results in a total of 11 borings advanced between 2007 and 2013 within an approximately 20-foot square area. There were no exceedances of 208 mg/kg for lead in the samples collected in 2013. Thus, the historical sampling exceedance was not confirmed. In the 2013 pre-design investigation, the maximum lead concentration in soil from 1.0 to 1.5 feet bgs was 5 mg/kg; the maximum lead concentration in soil from 5.5 to 6 feet bgs was 87 mg/kg. These results show that no remedial action is necessary for lead at IR Site 4.

Near the southeastern portion of Building 360, one subsurface sample exceeded the background level for antimony of 7.71 mg/kg. Arsenic in soil exceeded the background level of 16.55 mg/kg in four samples. A statistical evaluation concluded that the arsenic concentrations were not related to site activities. A bentonite-like layer was observed in a localized area north of Building 170 where elevated arsenic concentrations were reported. The FS Report identified this as a potential remedial action area for further evaluation of the soil.

The bentonite-like layer was further investigated in September 2013. Coring and soil sampling for antimony and arsenic was conducted at three locations within the potential borax waste area defined in the FS Report and eight locations outside and around the perimeter of this area. Results show that there are no exceedances of background levels for antimony or arsenic in the potential borax layer or soil fill above the water table. The maximum antimony concentration above 5 feet bgs (approximately the water table per the FS Report) in the 2013 investigation was 3.8J mg/kg. The maximum arsenic concentration above 5 feet bgs in the 2013 investigation was 15 mg/kg. These results show that no remedial action is necessary for antimony and arsenic at IR Site 4.

A variety of chlorinated compounds were reported in shallow groundwater in the following four general areas around Building 360: (1) along the western edge between Buildings 360, 372, 163 and 414; (2) near the northwest corner of Building 360; (3) along the eastern edge of Building 360, near OWS-360; and (4) in the southern portion of Building 163 near former OWS-163. Groundwater actions for IR Site 4 include pilot testing, treatability studies, and a removal action. In 2002, a pilot test using six-phase heating was conducted at IR Site 4 to treat dense non-aqueous phase liquid (DNAPL) in Hot Spot 4-1 near Building 360 (see Figure 2-6). In 2003 and 2004, in-situ chemical oxidation (ISCO) was used to treat VOCs in the area of Hot Spot 4-1. A bioremediation treatability study was conducted at Hot Spot 4-1 in 2012. From 2009 to 2010 a treatability study using zero-valent iron was conducted in IR Site 4, near the corner of Building 163. In 2006-2007 a removal action using electrical resistance heating was conducted in Hot Spot 4-2 near Building 360. Results of these tests, treatability studies, and removal actions are presented in the RI Report and/or FS Report. The shallow groundwater at IR Site 4 is further discussed in Section 2.3.5.

2.3.3 IR Site 11 – Engine Test Cell (Building 14)

Environmental investigations are summarized in the OU-2B **RI Report for IR Site 11** and include investigations conducted before the IR Program, for the IR Program, and for the EBS. CAAs 11A and 11B include petroleum hydrocarbon contamination in shallow groundwater. Fuel lines were removed or closed in place between 1998 and 1999. All IR Site 11 Petroleum Program USTs have been removed, and site assessment is in progress.

The evaluation of the **nature and extent of contamination in soil at IR Site 11** and shallow groundwater concluded that most of the chemicals reported across IR Site 11 are consistent with historical activities that occurred at Building 14, including jet engine testing, equipment cleaning and repair, and use of petroleum products. Investigations conducted between 2003 and 2013 at IR Site 11 included analysis of over 80 soil samples for PAHs since they are components of petroleum hydrocarbons, but also may be due to other sources.

The FS Report compared individual PAH results expressed as B(a)P equivalent to the Alameda Point screening level of 0.62 mg/kg. Exceedances of this screening level were identified in 4 of the 80 samples, and the FS Report identified two localized areas as potential remedial action areas for further assessment. The FS Report risk assessment included these higher PAH concentrations, and the total residential risk for benzo(a)pyrene was 4.0×10^{-5}.

IR Site 11 is located in CAAs 11A and 11B. The maximum 2003 B(a)P equivalent concentration of 14.4 mg/kg was at a depth of 4 to 8 feet bgs in a localized area along the southern border of

the site that is in an area of active petroleum hydrocarbon investigation near former USTs. This southern remedial action area was not included in the Proposed Plan due to the former USTs that were located there. The FS Report defined this southern remedial action area for PAHs based on this one B(a)P equivalent exceedance of 0.62 mg/kg at depth; shallower sample results were less than 0.62 mg/kg. The FS Report stated that this exceedance at depth "may be associated with the use of fill material to construct the island."

The second IR Site 11 localized area identified in the FS Report was located east of Building 14. This potential remedial action area was identified based on the results of two soil samples. The B(a)P equivalents in the FS Report for this area are 1.8 mg/kg and 12 mg/kg at a depth of 0 feet to 0.5 feet bgs. Three samples collected beneath this surface sample at each location were below a B(a)P equivalent of 0.62 mg/kg, with a maximum B(a)P equivalent of 0.015 mg/kg in deeper samples at both locations. The FS Report stated that since the samples were collected "immediately below the parking lot," they "may be associated with asphalt." This area was further investigated in 2013.

In August to early September 2013, soil sampling was conducted in the localized area east of Building 14. Confirmation samples were collected at the same locations as the previous exceedances and at two additional locations along the perimeter of the remedial action area. The 2013 maximum surface soil B(a)P equivalent result at the two historical surface soil exceedance locations was 0.17J mg/kg. Thus, the historical sampling exceedances were not confirmed. One 2013 sample collected below the pavement at 0.5 to 2 feet bgs had an estimated B(a)P equivalent concentration of 32J mg/kg that is likely due to a fragment of pavement or fill material since the other sample collected at this depth at this location had a B(a)P equivalent of 0.014 mg/kg. Only one other 2013 sample, located on the perimeter of the remedial action area, had an exceedance of 0.62 mg/kg, at a B(a)P equivalent concentration of 3.3 mg/kg. This sample is bounded by other samples with B(a)P equivalent concentrations less than 0.62 mg/kg. These results show that no remedial action is necessary for PAHs in IR Site 11 soil.

One pilot study for six-phase heating was conducted at the IR Site 11 Utility Corridor between Buildings 162 and 14. Results are presented in the December 2013 **Final ISTT Treatability Study**. The shallow groundwater at IR Site 11 is further discussed in Section 2.3.5.

2.3.4 IR Site 21 – Ship Fitting and Engine Repair (Building 162)

Environmental investigations are summarized in the OU-2B **RI Report for IR Site 21** and include investigations conducted before the IR Program, for the IR Program, for the EBS, and for removal actions.

The evaluation of the **nature and extent of contamination in soil at IR Site 21** and groundwater concluded that most of the chemicals reported across IR Site 21 are consistent with historical activities that occurred at Buildings 162, 398, and 113, including painting, paint stripping, sandblasting, jet engine maintenance and testing, equipment cleaning, and the use of petroleum products. Underground fuel lines were removed in 1998.

The metal cobalt was reported at concentrations greater than a residential screening level in 10 of 72 samples. A statistical evaluation concluded that the cobalt concentrations were related to site

activities. The post-FS site boundary change resulted in the relocation of the area containing elevated concentrations of cobalt from IR Site 21 into IR Site 3.

A pilot study was conducted using ISCO in 2002. Oxidants were injected into shallow groundwater to promote the degradation of VOCs. The concentrations of TCE initially decreased, but rebounded to near starting concentrations about four weeks post-injection. Further results are presented in the RI Report and/or FS Report. The shallow groundwater at IR Site 21 is further discussed in Section 2.3.5.

2.3.5 OU-2B Groundwater

The **FS Report for Groundwater** evaluated sources and the nature and extent of contamination in groundwater, and concluded that the primary constituents in shallow groundwater at OU-2B are VOCs. The first encountered groundwater at OU-2B is an unconfined/semi-confined water-bearing zone that extends to depths of at least 70 feet bgs and encompasses geologic units including artificial fill deposits, the BSU, and the Posey/Merritt/San Antonio Formation. The Yerba Buena Mud Aquitard underlies this zone. After the Water Board concurred that the shallow groundwater in water-bearing zones located between the surface and the Yerba Buena Mud Aquitard meets the criteria in State Board Resolution 88-63 (**Water Board concurrence letter**), OU-2B shallow groundwater was no longer considered a source of drinking water and screening levels changed from drinking water criteria to vapor intrusion criteria. The FS Addendum evaluated the constituents in shallow groundwater against the vapor intrusion criteria for a commercial use scenario and identified the VOCs TCE and VC as the potential COCs. The FS Report identified potential COCs and RGs for the vapor intrusion pathway for residential use.

As identified in the FS Report, the OU-2B VOC shallow groundwater plume consists of two lobes with sources in IR Site 4. The following text in this section is summarized from the FS Report.

The northern lobe originates north of Building 360 (Hot Spot 4-1) and the southern lobe originates in the western center of Building 360 (Hot Spot 4-2) (Figure 2-6). Additional source areas for the OU-2B VOC shallow groundwater plume include:

- A utility corridor between Buildings 162 and 113 in IR Site 21 and Building 14 in IR Site 11;
- A catch basin northwest of Building 360;
- The area in the southern portion of Building 163; and
- The area located on the east side of Building 360 at OWS 360 (Hot Spot 4-3, Figure 2-6).

The general primary and secondary release mechanisms of VOCs to OU-2B shallow groundwater are:

- Direct release of solvents, oil, or other hazardous wastes to soil from spills or equipment washing and secondary release to groundwater through infiltration;
- Direct release of solvents, oil, or other hazardous wastes to groundwater from disposal in sinks or floor drains and leaks in sanitary sewer lines; and
- Secondary release from soil to groundwater through infiltration.

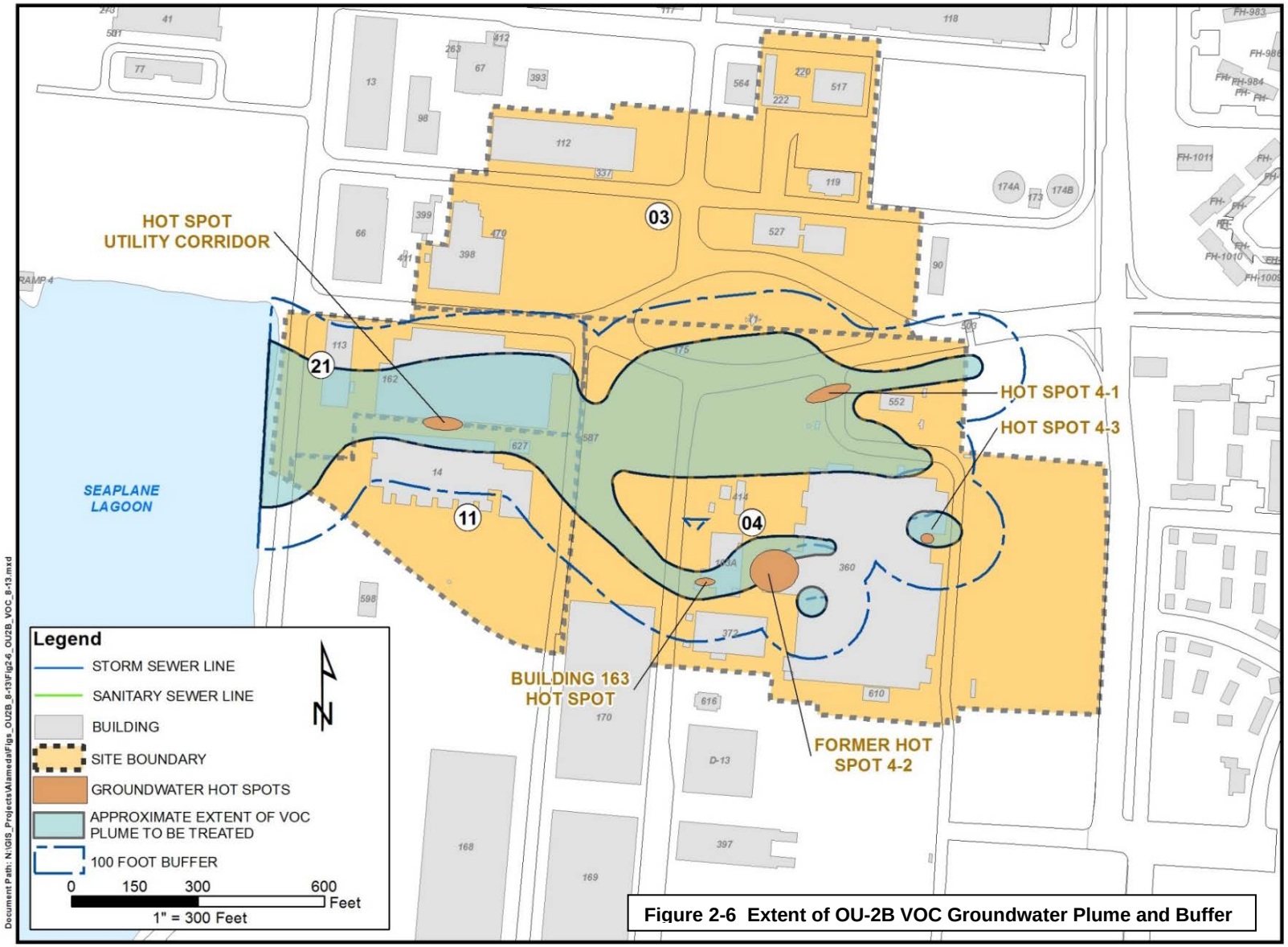

Figure 2-6 Extent of OU-2B VOC Groundwater Plume and Buffer

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The likely sources of releases include direct subsurface discharges of solvents or other hazardous substances associated with painting/plating/degreasing operations within Building 360; historical surface spills or discharges of solvents or other hazardous wastes to catch basins; discharges of solvents or other hazardous wastes used in various buildings into the leaking sewers; and discharges associated with former OWS-163.

The primary constituents reported in shallow groundwater at OU-2B are VOCs. The present distribution of VOCs in shallow groundwater suggests the following sources: (1) Hot Spot 4-1 Source Area; (2) utility corridor between Buildings 162 and 113 in IR Site 21 and Building 14 in IR Site 11; (3) Hot Spot 4-2; (4) Building 163 and former OWS 163 and (5) OWS 360 (Hot Spot 4-3). The releases of chlorinated hydrocarbons in source areas have led to concentrations of chlorinated hydrocarbons greater than 10,000 µg/L. The shallow VOC plume at OU-2B consists primarily of chlorinated hydrocarbons including TCE, cis-1,2-DCE, trans-1,2-DCE, VC, PCE, 1,2-DCA, and 1,1-DCE. In addition to those chlorinated hydrocarbons, the FS Report also identified benzene, methylene chloride, and chlorobenzene as potential COCs for the residential indoor air pathway and cited proposed RGs for each chemical. VOCs in shallow groundwater at OU-2B extend from 5 feet to approximately 70 feet bgs.

2.4 Current and Potential Future Site Uses

NAS Alameda closed in 1997. Current land use in the OU-2B area is commercial and includes vehicle parking, storage, and tenant leases. The City of Alameda has indicated that the anticipated future land use will include commercial/light industrial use and second floor or above residential use only (i.e. no ground floor residential use).

2.5 Summary of Site Risks

As part of the OU-2B RI Report, a baseline HHRA and an ERA were conducted in 2005 using data collected during RI sampling activities. A **revised HHRA** and **ERA** was performed as part of the OU-2B FS to include evaluation of the additional data collected subsequent to the RI. The objective of the risk assessments was to estimate the risk to human and ecological receptors from exposure to chemicals in OU-2B soil and groundwater. A Conceptual Site Model (CSM) was developed that highlighted potential exposure pathways between contaminants in OU-2B media and human receptors (Figure 2-7), including domestic use of the groundwater.

The FS Report included a review of the June 2011 U.S. EPA regional screening levels (RSLs) in comparison with the May 2009 U.S. EPA RSLs to evaluate potential impacts to the RI Report's HHRA. This evaluation indicates that risk would not change significantly as a result of the June 2011 toxicity criteria, except for hexavalent chromium. In September 2011, the U.S. EPA issued updated toxicity factors for TCE. Given the updated toxicity factors and the change from drinking water criteria to vapor intrusion criteria, an addendum to the FS Report was prepared to evaluate the effect of these changes on the groundwater response action alternatives presented in the FS Report.

In addition to evaluating risk for commercial use, the FS Addendum updated the residential risk assessment for groundwater. The FS Addendum documented that there is no change to the list of COCs for groundwater in the FS Report for the residential use indoor air pathway. In addition, this addendum evaluated the footprint requiring groundwater remediation and determined that

there is "no discernable difference in the VOC footprint requiring remediation" compared to the footprint in the FS Report. It also updated the RGs for the residential indoor air pathway for TCE, VC, and cis-1,2-DCE.

The methodologies and results of the revised HHRA and ERA are presented in detail in the OU-2B FS Report. A summary of findings for the revised HHRA and ERA is provided below.

2.5.1 Human Health Risk Assessment

In accordance with U.S. EPA guidance, the risk management range for cancer risk is considered to be 10^{-4} to 10^{-6}. U.S. EPA guidance (Office of Solid Waste and Emergency Response [OSWER] Directive 9355.0-30) states that "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 non-carcinogenic hazard quotient (HQ) is less than one (1.0), action generally is not warranted unless there are adverse environmental impacts." If an individual is exposed to more than one chemical, a screening-level estimate of the total non-cancer risk is derived simply by summing the HQ values for that individual. This total is referred to as the Hazard Index (HI). Site-specific factors are typically considered at sites where the cancer risks are 10^{-4} to 10^{-6}. Cancer risks below 10^{-6} are generally considered insignificant, and no action is required. For cancer risks that are above the risk management range of 10^{-4} to 10^{-6}, action is generally required.

Several facts regarding the OU-2B FS Report HHRA results are important to note. For groundwater, the risk assessment in the FS Report included the risk associated with the OU-2B shallow groundwater plume in the total risk for all OU-2B sites, including IR Site 3. Following finalization of the OU-2B FS Report, the IR Site 3 boundary was revised such that the OU-2B shallow groundwater plume is no longer located within the boundary of IR Site 3. Therefore, the ROD appropriately does not include the risk associated with the OU-2B shallow groundwater plume in the IR Site 3 total risk because the plume is no longer located within the site. For soil, in contrast to Navy guidance for conducting human health risk assessment, the risk due to inorganic compounds **below background** was retained in the OU-2B total risk assessment in the FS Report. Separate risk calculations in Appendix B of the FS Report for soil identified as "excluding background" excluded the metals indicated as background in the FS Report but included risk due to background levels for remaining metals (and PAHs).

Given that the anticipated reuse for the OU-2B area includes non-ground floor residential, the HHRA evaluated soil and shallow groundwater risks for both residential and commercial exposure scenarios, with residential use representing the greatest potential exposure to contamination. The construction worker scenario was also evaluated in the HHRA. Table 2-2 presents the total risks for soil and groundwater for residential, commercial, and construction worker receptors.

The exposure point concentration (EPC) is the concentration in soil or groundwater that represents the concentration of site chemicals to which the receptor may be exposed. The OU-2B risk assessment used the 95 percent upper confidence limit (UCL) of the mean to estimate the EPC, in accordance with U.S. EPA guidance.

Figure 2-7 Human Health Risk Assessment Conceptual Site Model (Source: Figure 3-1, Final Feasibility Study Report, OU-2B)

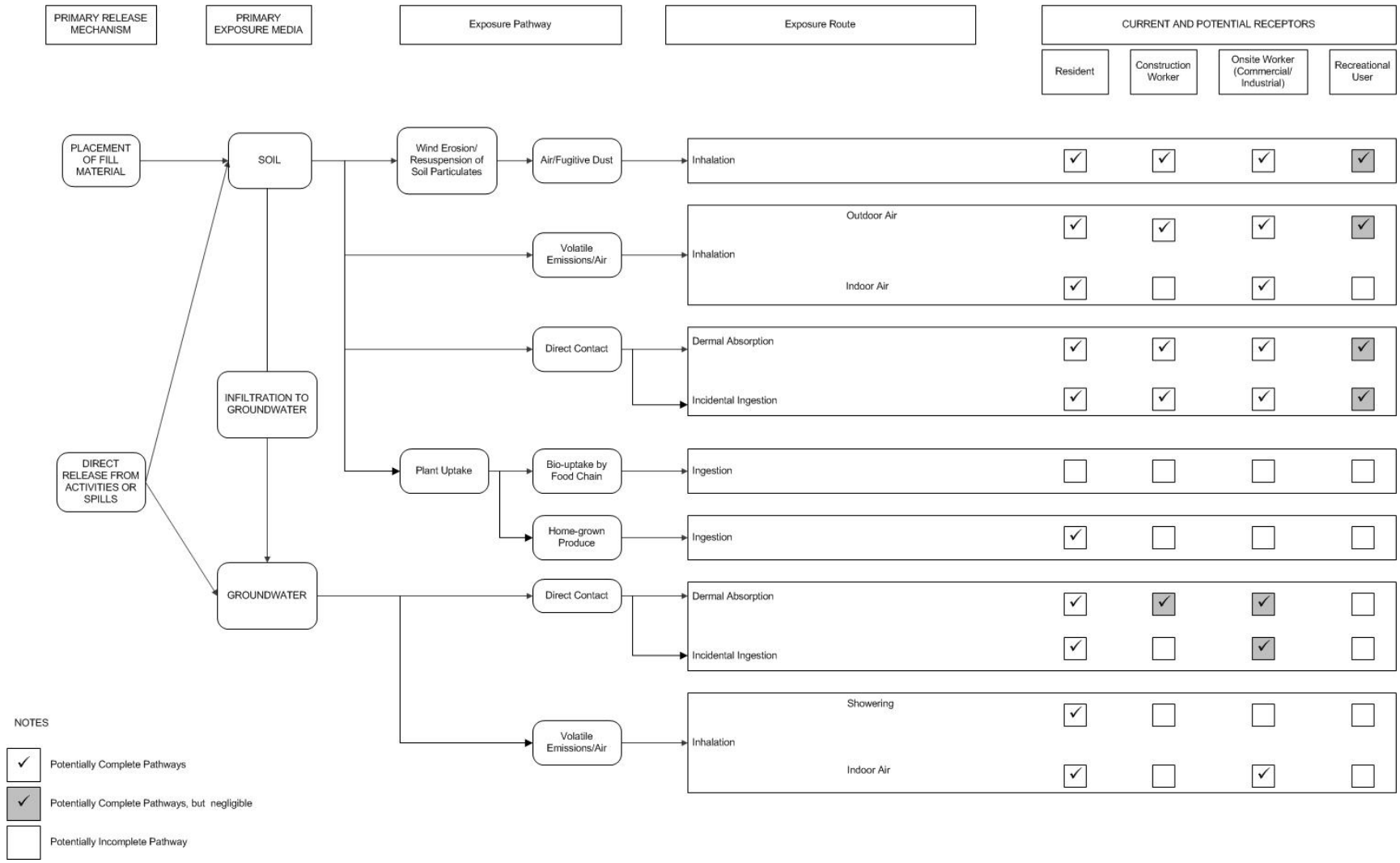

Table 2-2 Human Health Risk Assessment Results: Total Soil and Groundwater Risk*

Reuse Scenario and Media	IR Site 3	IR Site 3	IR Site 4	IR Site 4	IR Site 11**	IR Site 11**	IR Site 21	IR Site 21
	Total U.S. EPA Cancer Risk	Total Non-cancer Hazard Index	Total U.S. EPA Cancer Risk	Total Non-cancer Hazard Index	Total U.S. EPA Cancer Risk	Total Non-cancer Hazard Index	Total U.S. EPA Cancer Risk	Total Non-cancer Hazard Index
Residential: Soil surface to 5.5 feet bgs except to 4.5 feet bgs at Site 4 (water table)	2×10^{-4}[a]	7[a]	8×10^{-3}	307	8×10^{-5}	3/1 [f]	NA	NA
Residential: Groundwater with separate municipal water supply[b]	--	--	7×10^{-4}	71	7×10^{-4}	71	7×10^{-4}	71
Commercial: Soil 0 feet to water table and groundwater[c]	8×10^{-5}[d]	3[d]	2×10^{-4}	4	5×10^{-5}	0.6	5×10^{-5}[e]	0.3[e]
Construction Worker	1×10^{-6}	1	1×10^{-5}	1	9×10^{-7}	0.5	7×10^{-7}	1

Notes:

*Sources - Total groundwater risk for residential scenario per Final FS Addendum; Remainder of risk results per FS Report

**The IR Site 11 risk assessment included two high surface soil PAH concentrations in a paved area that were not confirmed by further investigation in 2013.

(a) A post-FS boundary change resulted in a cobalt-impacted soil area that previously was located in IR Site 21 being part of IR Site 3. The IR Site 21 soil risk (0 to 5.5 feet bgs) for cobalt for residential use is 1.3×10^{-7} with a hazard index of 2.42.

(b) Total residential risk associated with groundwater was calculated for the plume that covers portions of IR Sites 4, 11, and 21; separate groundwater risk per site was not calculated; this risk calculated in 2012 includes updated toxicity data for trichloroethene and other chemicals.

(c) Water table at 5.5 feet bgs except at IR Site 4, where it is at 4.5 feet bgs; since groundwater risk for the commercial scenario is from the FS Report, updated toxicity data could result in a slightly higher risk.

(d) Since the groundwater plume does not extend into IR Site 3, this total risk is for all soil pathways only.

(e) Since the risk driver for soil is now part of IR Site 3, this risk is for the groundwater.

(f) Each hazard quotient is less than 1.

-- Groundwater plume does not extend into IR Site 3

Acronyms and Abbreviations:

bgs below ground surface
FS feasibility study
IR Installation Restoration
NA not applicable at IR Site 21 because cobalt in soil is now part of IR Site 3, due to the post-FS boundary change
PAH polycyclic aromatic hydrocarbon
U.S. EPA U.S. Environmental Protection Agency

The risks were calculated for the following three residential scenario exposure groups:

- **Exposure Group 1**. All soil and groundwater pathways (residential development and residential use of shallow groundwater) – for ingestion of soil, homegrown produce, and groundwater, inhalation of vapors in indoor and outdoor air, inhalation of vapors in indoor air while showering, inhalation of particulates from soil in outdoor air, and dermal contact with soil and with groundwater while showering;

  Exposure Group 2. Pathways for soil and vapors from VOCs in shallow groundwater (reasonable current and future use exposure with residential development and municipal water supply) – for ingestion of soil and homegrown produce, inhalation of particulates from soil in outdoor air, inhalation of vapors in indoor and outdoor air, and dermal contact with soil; and

- **Exposure Group 3.** Exposure pathways for residential use of shallow groundwater – for ingestion of groundwater, dermal contact with groundwater while showering, and inhalation of vapors in indoor air while showering.

For the commercial exposure scenario, the pathways included in the HHRA for soil were:

- ingestion of soil;
- dermal contact with soil;
- inhalation of soil particulates in outdoor air;
- inhalation of volatiles in outdoor air; and
- inhalation of vapors in indoor air originating from soil.

For the construction worker exposure scenario, the pathways included in the HHRA for soil were:

- ingestion of soil;
- dermal contact with soil;
- inhalation of soil particulates in outdoor air; and
- inhalation of volatiles in outdoor air.

The FS Addendum re-calculated the OU-2B total risk for shallow groundwater for the residential scenario using the latest toxicity data with municipal water supply from an outside source, which is the current residential scenario given the recent determination that the shallow groundwater does not meet State or federal requirements for potable water. The OU-2B updated total shallow groundwater risk for the residential scenario with municipal water supply is included on Table 2-2. The findings of the revised baseline HHRA, including the total cancer risks and non-cancer hazards, are summarized below with a focus on the residential scenario since those risks are the highest.

In September 2011, U.S. EPA promulgated changes to the toxicity criteria for TCE. The Navy and U.S. EPA both independently evaluated changes to toxicity criteria for TCE since the FS

Report risk assessment was completed, and determined that the remedy at OU-2B remains protective of human health and the environment based on the updated toxicity criteria.

2.5.1.1 IR SITE 3

Since the OU-2B shallow groundwater plume does not extend into IR **Site 3, only the HHRA results for soil** at IR Site 3 (pre-clean-up) are summarized in this section. The OU-2B soil risk assessment conservatively included all analytical results in the CAAs. The IR Site 3 risk assessment included a B(a)P equivalent concentration of 15 mg/kg in the surface to 2 feet bgs depth interval that was not confirmed by further investigation in 2013. For surface soil (0 to 2 feet bgs), the U.S. EPA total cancer risk for residential use at IR Site 3 (including background) is 1×10^{-4} and the HI is 2. The U.S. EPA surface soil cancer risk for residential use excluding metals determined to be background is 8×10^{-5} and the HI is 0.6. The U.S. EPA total surface soil cancer risk for residential use for IR Site 21 cobalt (including background) that is now located in IR Site 3 is 1.4×10^{-7} and the HI is 2.49. For surface soil at IR Site 3, a majority of the cancer risk is associated with soil ingestion of PAHs and background arsenic. The EPC for benzo(a)pyrene in surface soil (defined as 0 to 2 feet bgs in the risk assessment) is 0.805 mg/kg. The EPC for arsenic in surface soil is 4.11 mg/kg, which is less than the background level for arsenic. The majority of the IR Site 3 surface soil non-cancer risk is due to soil ingestion, with background total chromium, iron, cobalt, and arsenic as the primary risk contributors; the hazard quotient for each metal was less than 1.

For soil from 0 to 5.5 feet bgs, the U.S. EPA total cancer risk for residential use at IR Site 3 (including background) is 2×10^{-4} and the HI is 7. For this depth interval, the majority of the cancer risk is associated with inhalation of benzene vapors in indoor air, with benzene contributing 50 percent of the U.S. EPA total cancer risk. The RI Report documents that the high benzene concentrations are located in CAAs which have recently undergone dual-vapor extraction remediation. Ingestion of soil also contributes to the cancer risk, including ingestion of PAHs, benzene, and arsenic. The majority of the non-cancer risk is associated with inhalation of benzene and toluene vapors in indoor air (36 percent of the risk). Ingestion of soil also contributes to the non-cancer risk, with total chromium and arsenic as the primary contributors.

Based on the HHRA in the FS Report and coordination with the BCT, action is required for IR Site 3 soil. The identification of **soil COCs at IR Site 3** was based on human health risk considerations, ARARs, and 2013 sampling data. The COCs for soil at IR Site 3 are lead and cobalt (formerly located in IR Site 21). Further information on the COCs is presented in Section 2.7.

Residential risk (from the FS Report) for each IR Site 3 soil COC is summarized as follows:

- Lead: The total cancer risk for lead in soil from 0 to 5.5 feet bgs is 2.3×10^{-9}. The EPC for lead in surface soil of 139 mg/kg is less than the RG of 208 mg/kg (see Section 2.7) but the soil EPC of 622 mg/kg for the 0 to 5.5 feet depth interval exceeds the lead RG of 208 mg/kg.
- Cobalt: The U.S. EPA **total cancer risk for cobalt** (including background) in surface soil is 1.4×10^{-7}, with an HI of 2.49 and in soil from 0 to 5.5 feet bgs is 1.3×10^{-7} with an HI of 2.42. The EPC for cobalt in surface soil is 51 mg/kg, and 49.5 mg/kg in soil

from 0 to 5.5 feet bgs. Therefore, the EPC is less than the commercial-based RG of 300 mg/kg (see Section 2.7).

2.5.1.2 IR SITE 4

The OU-2B shallow groundwater plume underlies IR Site 4 and is described in Section 2.5.1.5. The FS Report **HHRA results for soil at IR Site 4** are summarized in this section.

For surface soil (0 to 2 feet bgs), the U.S. EPA total cancer risk for residential use at IR Site 4 (including background) is 5 X 10^{-3} and the HI is 9. For soil from 0 to 4.5 feet bgs, the U.S. EPA total cancer risk for residential use at IR Site 4 (including background) is 8 X 10^{-3} and the HI is 307. The risk drivers are the COCs, as described below, with the exception of n-nitroso-di-n-propylamine detected above screening levels in one sample. As part of the 2011 supplemental data gap sampling, samples were collected in an attempt to delineate location B04-45 where the elevated detection was previously reported. All the supplemental data gap analyses results were less than the detection limit and, therefore, n-nitroso-di-n-propylamine was not carried forward as a COC.

Based on the revised HHRA in the FS Report, action is required for IR Site 4 soil. The identification of **soil COCs at IR Site 4** was based on human health risk considerations, ARARs, and 2013 sampling data. Based on the revised HHRA, the identified COCs for IR Site 4 soil are Aroclor 1254, aldrin, dieldrin, heptachlor epoxide, and hexavalent chromium in soil. Further information on the COCs is presented in Section 2.7.

Residential risk (from the FS Report) for each IR Site 4 soil COC is summarized as follows:

- Aroclor 1254: This PCB was not detected in soil from 0 to 2 feet bgs, but is confined to subsurface soil (deeper than 2.5 feet bgs) in a small area on the southwest side of Building 163A. The U.S. EPA total cancer risk in soil from 0 to 4.5 feet bgs is 1.1 X 10^{-3} with an HI of 194.92. The HI is primarily due to ingestion of homegrown produce, based on extensive gardening for 350 days per year for 30 years.
- Aldrin: This pesticide was not detected in soil from 0 to 2 feet bgs, but is confined to subsurface soil (at approximately 4 feet bgs) in a small area on the southwest side of Building 163A. The U.S. EPA total cancer risk in soil from 0 to 4.5 feet bgs is 1.5 X 10^{-4} with an HI of 2.05. The cancer risk and HI are primarily due to ingestion of homegrown produce, based on extensive gardening for 350 days per year for 30 years.
- Dieldrin: This pesticide was not detected in soil from 0 to 2 feet bgs, but is confined to subsurface soil (deeper than 2.5 feet bgs) in a small area on the southwest side of Building 163A. The U.S. EPA total cancer risk in soil from 0 to 4.5 feet bgs is 2.9 X 10^{-3} with an HI of 24.61. The HI is primarily due to ingestion of homegrown produce, based on extensive gardening for 350 days per year for 30 years.
- Heptachlor epoxide: This pesticide was not detected in soil from 0 to 2 feet bgs, but is confined to subsurface soil (at and deeper than 4 feet bgs) in a small area on the southwest side of Building 163A. The U.S. EPA total cancer risk in soil from 0 to 4.5 feet bgs is 1.2 X 10^{-3} with an HI of 69.99. The cancer risk and HI are primarily due to ingestion of homegrown produce, based on extensive gardening for 350 days per year for 30 years.

- Hexavalent chromium: The U.S. EPA total cancer risk for hexavalent chromium in surface soil is 1.1 X 10^{-3} with an HI of 1.47 and in soil from 0 to 4.5 feet bgs is 6.4 X 10^{-4} with an HI of 0.88. The cancer risk and HI are primarily due to ingestion of soil.

2.5.1.3 IR SITE 11

The OU-2B shallow groundwater plume underlies IR Site 11 and is described in Section 2.5.1.5. The FS Report **HHRA results for soil at IR Site 11** are summarized in this section.

The OU-2B soil risk assessment conservatively included all analytical results in the CAAs. The IR Site 11 risk assessment summarized below included a B(a)P equivalent concentration of 14 mg/kg at depth in a CAA UST area and a shallow soil B(a)P equivalent concentration of 11 mg/kg that was not confirmed by further investigation in 2013.

The U.S. EPA total cancer risk (soil from 0 to 5.5 feet bgs) for residential use at IR Site 11 (including background) is 8 X 10^{-5} and the HI is 3. The majority of the cancer risk is associated with ingestion of soil, and background arsenic and PAHs are the primary risk contributors. The U.S. EPA residential total cancer risk for benzo(a)pyrene in soil from 0 to 5.5 feet bgs is 4.0 X 10^{-5}, and the EPC for benzo(a)pyrene in soil from 0 to 5.5 feet bgs is 0.556 mg/kg. The majority of the non-cancer risk is associated with soil ingestion. The primary risk contributors are background cobalt and chromium; each contributor has an HQ less than 1. Section 2.5.4 further describes why no action is required for IR Site 11 soil.

2.5.1.4 IR SITE 21

The OU-2B shallow groundwater plume underlies IR Site 21 and is described in Section 2.5.1.5. Based on the post-FS site boundary change that moved the cobalt area into IR Site 3, no action is required for IR Site 21 soil. Section 2.5.4 further describes why no action is required for IR Site 21 soil.

2.5.1.5 OU-2B Shallow Groundwater

Groundwater data from selected locations, collected after 2002, and including the results of the data gap sampling effort, were used to characterize the **risk for OU-2B sites**. This included the results of the data gap sampling investigations in 2008 and supplemental data gap sampling investigations in 2009 and 2010. Because the FS Addendum provides an **updated residential risk for the groundwater plume** due to toxicity changes for COCs and the change from drinking water criteria to vapor intrusion criteria, the FS Report shallow groundwater risks are not summarized in this section. The FS Addendum updated U.S. EPA total cancer risk for shallow groundwater for residential scenario Exposure Group 2 (using potable water from an outside source) is 7 X 10^{-4}. The updated non-cancer HI for residential use is 71. The FS Addendum documented that there is no change to the groundwater COCs in the FS Report for the residential vapor intrusion pathway.

The FS Addendum also considered commercial reuse in determination of the COCs and RGs. The exposure pathway was inhalation by commercial workers of COC vapors from groundwater that may migrate to indoor air. In addition, migration of impacted groundwater and potential discharge into the Seaplane Lagoon at concentrations exceeding the **values derived based on**

the ARARs pertaining to surface water discharge was evaluated. In accordance with the **FS Addendum**, TCE and VC are the groundwater COCs for the indoor air pathway for commercial use.

2.5.2 Ecological Risk Assessment

OU-2B has limited habitat for ecological receptors, so a modified ERA was performed in the RI to provide a conservative estimate of ecological risk, and a revised **ERA** was performed as part of the FS. An evaluation of potential adverse effects to ecological receptors was performed for the Seaplane Lagoon. The CSM suggests that groundwater from OU-2B flows beneath the bottom of the lagoon and may enter the lagoon where the elevation of groundwater and the depth of the lagoon bottom (i.e., sediment-water interface) intersect. Further, groundwater beneath the lagoon may percolate vertically through the sediments and into the overlying water at the sediment-water interface.

The risk evaluation focused on exposure to dissolved concentrations of metals in OU-2B groundwater, and analytical results from groundwater monitoring wells at locations immediately adjacent to the seawall and in closest proximity to receiving waters in the lagoon.

Aquatic ecological receptors of concern at Seaplane Lagoon include benthic invertebrates living in sediment (i.e., infauna) and on sediment (i.e., epifauna), fish (i.e., especially bottom fish), and water birds. Potential adverse effects to these ecological receptors may result from direct toxicity or bioaccumulation of the metals, or from ingestion of affected organisms that bioaccumulate metals by the higher trophic-level ecological receptors.

EPCs for the dissolved metals were calculated for the risk evaluation based on upper confidence limits of the mean concentrations for all groundwater samples collected between May 2006 and October 2008. EPCs were then compared to background metal concentrations, and only metals with EPCs exceeding respective background levels were retained for further evaluation. Only lead and manganese were found to have EPCs exceeding background concentrations. Results of the ERA concluded that metals in OU-2B groundwater do not pose an unacceptable risk to ecological receptors, and no remedial action for metals in groundwater is warranted.

2.5.3 Basis for Response Action for Soil at IR Sites 3 and 4 and Shallow Groundwater at OU-2B

Potentially unacceptable human health risks included a variety of soil exposure pathways: ingestion of soil, ingestion of homegrown produce, dermal contact with soil, and inhalation of vapors in indoor air from soil. A number of COCs including lead, Aroclor 1254, aldrin, dieldrin, heptachlor epoxide, hexavalent chromium, and cobalt were identified at IR Sites 3 and 4. Therefore, a response action is necessary to protect human health and the environment from actual or threatened releases. Table 2-3 lists soil COCs by site with RGs.

Groundwater beneath Alameda Point is not currently used for drinking water, irrigation, or industrial supply. Shallow groundwater will not be used in the foreseeable future as a drinking water source. In 2012, the City of Alameda wrote a letter informing the Navy and regulatory agencies that the City does not foresee ever using the groundwater as a drinking water source. The Water Board concurred that the shallow groundwater meets the criteria in State Board Resolution 88-63 (**Water Board concurrence letter**). Exposure to COCs in groundwater could

occur via inhalation of COC vapors from shallow groundwater that may migrate to indoor air. In addition, migration of impacted shallow groundwater and potential discharge into the Seaplane Lagoon may present an ecological risk. Therefore, a response action is necessary to protect human health and the environment from actual or threatened releases. Table 2-4 lists the shallow groundwater COCs and RGs that are protective of the future land use. The City of Alameda has indicated that the anticipated future land use will include commercial/light industrial use and second floor or above residential use only (i.e. no ground floor residential use).

2.5.4 Basis for No Action for Soil at IR Sites 11 and 21

No action is required for soil at IR Site 11. The potential PAH remedial action area identified in previous documents is not included in the ROD. Soil sampling conducted in September 2013 did not duplicate the previous higher results at the two historical sample locations with a B(a)P equivalent exceeding 0.62 mg/kg (a value that has been used to identify areas of unrestricted reuse at Alameda Point; see Section 2.7). Sample results do not have a distribution that would indicate a spill or other source of contamination. Both historical exceedances were in the surface soil from 0 to 0.5 feet bgs, with no deeper higher levels. The 2013 maximum surface soil B(a)P equivalent result at these two historical locations was 0.17J mg/kg. One deeper 2013 sample collected immediately below the pavement had a higher B(a)P equivalent concentration that may be due to a fragment of pavement since the other sample at this depth at this location had a B(a)P equivalent of 0.014 mg/kg.

As described in Section 2.5.1.3, results of the risk assessment at IR Site 11 that includes the higher PAH concentrations not confirmed during the 2013 confirmation sampling do not exceed the risk management range for residential receptors. The EPC for benzo(a)pyrene in soil from the surface to 5.5 feet bgs is 0.556 mg/kg, and the U.S. EPA residential total cancer risk for benzo(a)pyrene in soil from 0 to 5.5 feet bgs is 4.0×10^{-5}. The U.S. EPA residential total cancer risk for soil from the surface to 5.5 feet bgs at IR Site 11, which includes the two isolated higher PAH concentrations not confirmed during subsequent sampling, is 8 X 10-5; HQs are less than 1. The majority of the residential total cancer risk is associated with soil ingestion of PAHs and background arsenic. Both the total soil risk (with background) for residential receptors and the total commercial risk are within the risk management range, with HQs less than 1. Therefore, there is no unacceptable risk for soil, and no soil remediation is required at IR Site 11.

No action is required for soil at IR Site 21 based on the risk assessment results and location of cobalt-impacted soil within IR Site 3 that was evaluated in the RI and FS reports as part of IR Site 21. For soil, the FS Report only identified cobalt as a COC at IR Site 21. For residential receptors, the HQ for cobalt in soil is 2.42, primarily due to ingestion of soil. The cobalt-impacted soil area is addressed in this ROD as part of IR Site 3.

2.6 Principal Threat Wastes

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. While PCBs and pesticides in soil at IR Site 4 exceed the risk management range and HI of 1, they are not considered source materials as they are not highly mobile in soil; therefore, they are not a principal threat waste. In addition, these COCs are located in a small area adjacent to a building that does not extend into the other

areas of OU-2B (as evidenced in historical sampling). Therefore, the area of highest COC concentrations is not an ongoing source of contamination to other areas of OU-2B. Risk assessment results for the other OU-2B COCs for soil are lower and the COCs are not highly mobile in soil, so they are not considered source materials. These soil remediation areas also are located adjacent to and/or beneath buildings. Therefore, access to the soil remediation areas is limited, minimizing possible exposure. In addition, there is no ecological risk. In summary, there are no principal threat wastes at OU-2B.

2.7 Remedial Action Objectives

RAOs provide the foundation used to develop the remedial alternatives for a site. RAOs are established by: taking into account regulatory requirements, standards, and guidance (e.g., ARARs); identifying contaminated media and COCs; identifying potential receptors and exposure scenarios; and calculating human health and ecological risks. RAOs establish the basis for identifying areas requiring remedial action, screening technologies or processes to accomplish remediation, and assessing a remedial alternative's ability to achieve the required objectives. RAOs were developed to provide protection against the identified risks. Each RAO specifies a receptor and the relevant exposure route. Based on the potential exposure pathways, and potential risks to human-health and the environment, the FS Report included the following RAO for PAHs in soil at IR Sites 3 and 11:

- Reduce the risks associated with PAHs in soil to levels that are consistent with the Alameda Point background values.

To define background, the FS Report cited the Alameda Point unrestricted use screening level B(a)P equivalent of 0.62 mg/kg. Further investigation of individual concentrations exceeding 0.62 mg/kg and addressing PAHs in accordance with CERCLA risk criteria also is cited.

The August to September 2013 sampling results for PAHs confirm that this RAO is met, with no action required.

Based on the potential exposure pathways, and risks to human-health and the environment, the following RAO was developed for remediation of cobalt-impacted soil at IR Site 3; lead-impacted soil at IR Site 3; and hexavalent chromium, PCBs, and pesticides-impacted soil at IR Site 4:

- Reduce potential for exposure to COC-impacted soil that would result in unacceptable risks to future receptors.

RGs are the basis for measuring the success of the cleanup. For OU-2B soil, the RGs were determined in coordination with the regulatory agencies and are the RSLs for residential use for the PCBs and pesticides. The lead RG of 208 mg/kg is protective of residential use. This is a site-specific RG agreed upon with the BCT at the time of the FS report that is lower than the current U.S. EPA residential soil-screening level of 400 mg/kg, due to uncertainty in a protective lead level for residential use. The state of the science regarding recent lead studies by federal agencies confirms the protectiveness of this RG for lead. The RG for lead at IR Site 3 corresponds to a residential use value for lead of 208 mg/kg. Based on the toxicity data for Aroclor 1254, aldrin, dieldrin, and heptachlor epoxide in combination with the small area to be excavated, the Navy, in coordination with the regulatory agencies, made a site-specific decision

to use residential RSLs as RGs instead of calculating site-specific RGs for this OU-2B remediation. The RGs for Aroclor 1254 (0.22 mg/kg), aldrin (0.029 mg/kg), dieldrin (0.03 mg/kg), and heptachlor epoxide (0.053 mg/kg) are the U.S. EPA 2009 residential RSLs. The RGs for cobalt (300 mg/kg) and hexavalent chromium (5.6 mg/kg) are the U.S. EPA 2011 commercial RSLs; these COCs are largely located beneath buildings.

These commercial RGs allow for future commercial use, and for future residential use with appropriate ICs. The City of Alameda has indicated that the anticipated future land use will include commercial/light industrial use and second floor or above residential use only (i.e. no ground floor residential use). The vast majority of IR Site 3 is currently suitable for unrestricted use and unlimited exposure and only a small portion requires ICs. Approximately 98 percent of OU-2B will have cobalt concentrations in soil consistent with unrestricted use and unlimited exposure, and 2 percent of OU-2B will require ICs based on cobalt. The hexavalent chromium area is much smaller than the cobalt area and is located entirely beneath Building 360.

Table 2-3: Remediation Goals for Soil Chemicals by Site

Chemical of Concern	IR Site 3 RGs(mg/kg)	IR Site 4 RGs(mg/kg)
Lead[a]	208	
Cobalt[b]	300	
Aroclor 1254[c]		0.22
Hexavalent Chromium[b]		5.6
Aldrin[c]		0.029
Dieldrin[c]		0.03
Heptachlor Epoxide[c]		0.053

Notes:
a. For residential reuse based on DTSC lead spreadsheet (January 2009)
b. U.S. EPA 2011 commercial RSL
c. U.S. EPA 2009 residential RSL

Acronyms and Abbreviations:
DTSC Department of Toxic Substances Control
IR Installation Restoration
mg/kg milligram per kilogram
RG remediation goal
RSL regional screening level
U.S. EPA U.S. Environmental Protection Agency

The following RAOs were developed for remediation of OU-2B shallow groundwater:

- Minimize the potential for exposure of on-site receptors to COC vapors from groundwater at concentrations exceeding their respective RGs for protection against indoor air risks; and
- Minimize the potential for migration of impacted groundwater into Seaplane Lagoon at concentrations exceeding the values derived based on potential surface water discharge ARARs.

The shallow groundwater RGs for OU-2B are the calculated risk-based concentrations (RBCs) for the COCs in groundwater that are protective of the future land use; see Table 2-4). The RGs for the treatment zone from the water table to 30 feet bgs are those presented in the FS Report and/or FS Addendum for protection against unacceptable indoor air risks. RGs are rounded to three significant digits or to 0.1 µg/L. The RBCs are the concentrations that are protective of human health corresponding to a cancer risk of 10^{-6} or non-cancer HI of 1.

Table 2-4: Remediation Goals for OU-2B Shallow Groundwater COCs Consistent with the Water Board Concurrence Letter and Future Land Use

Chemical of Concern	RG for Protection Against Unacceptable Indoor Air Risks (µg/L)	RG for Discharge into Seaplane Lagoon (µg/L)
1,1-DCE	1,527	32
1,2-DCA	14.2	990
Benzene	11.3	710
Chlorobenzene	3,472	210,000
cis-1,2-DCE	402	None
methylene chloride	374	16,000
PCE	5.9	88.5
trans-1.2-DCE	1,592	1,400,000
TCE	5.1	810
VC	1.3	5,250

Acronyms and Abbreviations:

µg/L	micrograms per liter
COC	chemical of concern
DCA	dichloroethane
DCE	dichloroethene
FS	feasibility study
None	no RG in the Final FS Report
OU	Operable Unit
PCE	tetrachloroethene
RG	remediation goal
TCE	trichloroethene
VC	vinyl chloride
Water Board	San Francisco Bay Regional Water Quality Control Board

2.8 Description and Evaluation of Remedial Alternatives

In accordance with CERCLA guidance, several general remedial alternatives were evaluated and screened to refine the remedy selection process, as detailed in the OU-2B FS. The alternatives were evaluated based on **the nine NCP evaluation criteria**. Alternatives evaluated for soil at **IR Sites 3 and 4** and **OU-2B-wide groundwater** are described below.

2.8.1 Description of Soil Remedial Alternatives

The remedial alternatives for soil are presented in Table 2-5, along with general descriptions and estimated costs.

The depths for excavations presented in the FS Report are revised to the water table in this ROD because of the **Water Board concurrence letter** finding that the shallow groundwater meets the criteria in Resolution 88-63 (issued after the FS Report). Excavation below the water table is not required to protect human health. The FS Report specified an approximate water table depth of 4.5 feet bgs at IR Site 4 and approximately 5.5 feet bgs at IR Sites 3, 11, and 21. Excavation will be complete when statistical evaluations of post-excavation sampling results (as detailed in the remedial action work plan) verify that RAOs are met or groundwater is encountered, whichever occurs first.

Remedial alternatives for soil address cobalt and lead in soil at IR Site 3 and Aroclor 1254, aldrin, dieldrin, heptachlor epoxide, and hexavalent chromium in soil at IR Site 4.

There is no need for remedial action in the potential northern PAH remedial action area of IR Site 3 identified in the FS Report because this area does not present an unacceptable risk. Only one sample, which is located at or below the water table, exceeds a B(a)P equivalent of 0.62 mg/kg (a value that generally has been used to identify areas of unrestricted reuse at Alameda Point). However, soil at this sample location (above and to the water table) will be excavated because the sample is located in the middle of an area that needs to be excavated based on levels of lead.

There is no need for remedial action in the potential southern PAH remedial action area of IR Site 3 identified in the FS Report because there is no unacceptable risk. This area is located in a non-CERCLA CAA where excavation has been conducted and dual vapor extraction has been operating. Soil sampling conducted in August 2013 at the one historical sample location with B(a)P equivalent concentrations exceeding 0.62 mg/kg did not duplicate the previous higher results.

There is no need for remedial action in the potential arsenic, antimony, and lead remedial action areas in IR Site 4 identified in the FS Report because there is no unacceptable risk for arsenic, antimony and lead. Soil sampling of these areas was conducted in late August to early September 2013. No historical or 2013 sampling results above the water table exceed the remedial goals presented in the FS Report. In addition, the 2013 coring shows that there are no higher concentrations in the borax layer, which previously was a factor in the identification of the remedial action area. The IR Site 4 EPCs in the FS Report for arsenic, antimony, and lead in surface soil and subsurface soil are less than the RGs for each, except for antimony in subsurface soil, which equals the RG.

In summary, the soil excavation remedies in this ROD were modified after issuance of the FS Report as a result of the **Water Board concurrence letter** and also were modified following issuance of the Proposed Plan based on soil data collected in August and September 2013.

Table 2-5: Summary of Soil Remedial Alternatives – IR Sites 3 and 4

Remedial Alternative	Estimated Remediation Duration (years)	Total Cost	Description
Alternative S-1: No Action	0	0	CERCLA requires the evaluation of a No Action alternative to establish a baseline for comparison with other alternatives. Under this scenario, no action would be performed to remediate soil.
Alternative S-2: ICs	30	$398,000 (IR Sites 3 and 4)	Alternative S-2 would rely on ICs to minimize the potential for exposure to cobalt-impacted soil at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4 that would result in risks to human health and the environment. ICs would prohibit residential use at IR Site 3 in the area of cobalt-impacted soil and at IR Site 4 in the area of hexavalent chromium-impacted soil unless cobalt and hexavalent chromium concentrations are reduced to below residential use levels. ICs implemented as part of Alternative S-2 for hexavalent chromium-impacted soil at IR Site 4 would prohibit intrusive activities without prior approval by the agencies approving or concurring on this ROD or their successors. ICs would remain in place indefinitely; however, the cost comparison assumes that ICs would last 30 years.
Alternative S-3a: Excavation and Disposal of Impacted Soil (for Residential Reuse)	2	$1,117,369 (IR Site 3); $613,797 (IR Site 4) Total: $1,731,166	Alternative S-3a involves excavating soil containing COCs with concentrations above the RGs, chemical profiling of the excavated soil, and transporting the impacted soil to an approved disposal facility. The Navy may consider on-site re-use of impacted soil at other Alameda Point areas (IR Sites 1 and 2) if the soil meets reuse criteria. Soil volumes are calculated based on data from the FS Report. The volume of lead-impacted soil at IR Site 3 is estimated to be 1,700 bcy. The volume of PCB- and pesticide-impacted soil at IR Site 4 is estimated as 82 bcy.
Alternative S-3b: Excavation and Disposal of Hexavalent Chromium-Impacted Soil and ICs at IR Site 4	33	$1,073,000 (IR Site 4)	Soil containing hexavalent chromium with concentrations above the RGs would be excavated. Dewatering and chemical profiling of the excavated soil, loading and transporting the impacted soil to an approved disposal facility, and backfilling the excavation areas with clean fill would be conducted. The volume of hexavalent chromium-impacted soil at IR Site 4 is estimated at approximately 770 bcy. Excavation would be performed to approximately 5.5 feet bgs. Upon completion of excavation, soil samples would be collected from the sidewalls and bottom of the excavated area. ICs would be implemented to restrict future use to commercial. The cost comparison assumes that ICs would last 30 years.

Acronyms and Abbreviations:

bcy	bank cubic yards	IC	institutional control
bgs	below ground surface	IR	Installation Restoration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	Navy	Department of the Navy
		PCB	polychlorinated biphenyl
COC	chemical of concern	RG	remediation goal
FS	feasibility study	ROD	Record of Decision

2.8.2 Comparative Analysis of Soil Alternatives for IR Sites 3 and 4

The results of the comparative analysis of the remedial alternatives for soil that were evaluated in detail in the **OU-2B FS Report** with respect to **the nine NCP evaluation criteria** are summarized in Table 2-6. A combination of Alternatives S-2 and S-3a are the preferred remedial alternatives for soil at IR Sites 3 and 4.

Table 2-6: Comparative Analysis of Soil Remedial Alternatives, IR Sites 3 and 4

NCP Evaluation Criterion	Alternative S-1 No Action	Alternative S-2 ICs	Alternative S-3a Excavation and Disposal of Impacted Soil (Residential Use)	Alternative S-3b Excavation and Disposal of Hexavalent Chromium-Impacted Soil with ICs at IR Site 4
Overall Protection of Human Health and the Environment	Not Satisfied	Satisfied	Satisfied	Satisfied
Compliance with ARARs	Since Alternative S-1 is not protective of human health and the environment, no ratings have been assigned to other criteria	Satisfied	Satisfied	Satisfied
Long-Term Effectiveness and Permanence		◑	●	◑ to ●
Reduction in Toxicity, Mobility, and Volume through Treatment		○	○	○
Short-Term Effectiveness		●	◑	◑ to ●
Implementability		◑ to ●	◑	○ to ◑
Costs[a]		●	◑	◑ to ●
State Acceptance	The State of California (DTSC and Water Board) agrees with the selected soil alternatives. See Section 2.9.1 of this ROD.			
Community Acceptance	The Proposed Plan was presented for the community and discussed in a public meeting. See responsiveness summary in Section 3 of this ROD.			

Notes:

○ = Poor ◑ = Fair ● = Good

[a] Cost evaluation is based on the NPV. The lower cost receives a high rating because it is more cost effective.

Acronyms and Abbreviations:

ARAR applicable or relevant and appropriate requirement
DTSC Department of Toxic Substances Control
IC institutional control
IR Installation Restoration
NCP National Oil and Hazardous Substances Pollution Contingency Plan
NPV net present value
ROD Record of Decision
Water Board San Francisco Bay Regional Water Quality Control Board

2.8.2.1 Threshold Criteria

The threshold criteria must be satisfied by each alternative and relate directly to statutory findings.

Overall Protection of Human Health and the Environment. *Under this criterion, the alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by COCs present at the site by eliminating, reducing, or controlling exposures to COC levels established during development of RGs. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.*

Soil at IR Sites 3 and 4

All alternatives, except Alternative S-1 (No Action), were evaluated as being protective of human health and the environment. Under Alternative S-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective RGs. Alternative S-2 provides protection by implementation of land-use and/or groundwater-use restrictions to minimize the potential for exposure to COCs above their respective RGs.

Alternatives S-3a and S-3b include excavation and disposal of impacted soil to treat COCs in soil. Alternative S-3a includes RAOs for residential reuse, while S-3b includes planned future commercial reuse.

Compliance with ARARs. *CERCLA Section (§)121(d)(1) and NCP §300.430 (f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain Federal and State legally applicable or relevant and appropriate requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under §121(d)(4).*

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental, State environmental, or facility siting laws that specifically address hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances found at a CERCLA site. Only those State standards that are identified by a state in a timely manner that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental, State environmental, or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

Chemical-specific ARARs are health- or risk-based numerical values or methods that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions on the concentrations of hazardous substances or on conducting activities solely because they are in specific locations. Specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site.

Soil at IR Sites 3 and 4

Since Alternative S-1 entails no remedial action, ARARs would not be triggered. Alternatives S-2 through S-3b were evaluated as complying with all soil ARARs.

2.8.2.2 Balancing Criteria

Primary balancing criteria are used to weigh major trade-offs among alternatives.

Long-Term Effectiveness and Permanence. *Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the considerations of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.*

Soil at IR Sites 3 and 4

Alternative S-2 (rated Fair in Table 2-6), would provide long- term effectiveness by reducing the potential for contact with impacted soil provided ICs are effectively implemented. Alternative S-3b (rated Fair to Good in Table 2-6) would provide long- term effectiveness because COC-impacted soil would be removed, thereby reducing concentrations of COCs. Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of this soil alternative because hazardous substances may remain on-site in concentrations above RGs. Alternative S-3a (rated Good in Table 2-6) would provide long term effectiveness because COC-impacted soil would be removed and ICs (Alternative S-2) would be implemented to reduce potential for contact with a limited volume of impacted soil remaining in place.

Reduction in Toxicity, Mobility, and Volume through Treatment. *Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.*

Soil at IR Sites 3 and 4

Alternative S-2 (rated Poor on Table 2-6) does not result in appreciable reduction in toxicity, mobility, and/or volume of impacted soil since no soil treatment is included in this alternative. Alternative S-3a (rated Poor on Table 2-6) would reduce toxicity, mobility and volume in COC-impacted soil through removal and not through on-site treatment, and it allows for residential reuse. Alternative S-3b (rated Poor on Table 2-6) would reduce toxicity, mobility and volume of impacted soil through removal and not through on-site treatment, and it allows for commercial reuse. The extent of reduction in toxicity, mobility and/or volume in soil is greater in case of Alternative S-3a compared to Alternative S-3b.

Short-Term Effectiveness. *Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may exist to workers, the community, and the environment during construction and operation of the remedy until cleanup goals are achieved.*

Soil at IR Sites 3 and 4

Alternative S-2 (rated Good on Table 2-6) would be effective in the short term since no significant construction activities would be implemented; therefore, no additional short-term risks would be posed to workers or the environment. Also, there would be limited environmental impact (emissions of pollutants, dust, and greenhouse gases) under Alternative S-2 due to transportation of personnel for site visits/inspections.

Alternatives S-3a and S-3b (rated Fair and Fair to Good respectively on Table 2-6) would present short-term risks/hazards to site workers through the performance of soil excavation, backfilling and field activities.

Implementability. *Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with governmental entities are also considered.*

Soil at IR Sites 3 and 4

This is not applicable for Alternative S-1 since the threshold criteria are not met. ICs required for Alternative S-2 (rated Fair to Good on Table 2-6) are easily implementable. The removal and off-site disposal of COC-impacted soil for Alternative S-3a (rated Fair on Table 2-6) is easily implementable. Alternative S-3b (rated Poor to Fair on Table 2-6) is not easily implementable due to the presence of the dual slab and the potential requirement for bracing to ensure the structural integrity along with the complexities of expanding the excavation footprint.

Costs. *The types of costs assessed include capital costs (both direct and indirect) and annual operation and maintenance (O&M) costs. Both types were assessed based on net present value.*

Soil at IR Sites 3 and 4

There are no costs associated with Alternative 1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative S-2 (rated Good in Table 2-6) is the least expensive. Costs of Alternative S-3a (rated Fair in Table 2-6) are the most expensive. Alternative S-3b (rated Fair to Good in Table 2-6) is between those of Alternatives S-2 and S-3a.

2.8.2.3 Modifying Criteria

The modifying criteria are taken into account following comment on the OU-2B FS Report and Proposed Plan, and are addressed in the final decision.

State Acceptance. *Regulatory involvement has been solicited throughout the CERCLA process. The State concurs with the selected remedy documented in this ROD.*

Community Acceptance. *The Proposed Plan was issued for public review between April 30 through May 31, 2013, and was discussed at a public meeting held May 15, 2013. The Responsiveness Summary (see Section 3) addresses public comments and concerns, voiced at the Public Meeting and received in writing, related to the preferred remedies identified in the Proposed Plan.*

Soil at IR Sites 3 and 4

The Responsiveness Summary (see Section 3) addresses public comments and concerns related to the preferred remedies identified in the Proposed Plan.

2.8.3 Description of Shallow Groundwater Remedial Alternatives

The remedial alternatives for shallow groundwater that were evaluated in detail in the **OU-2B FS** Report and **amended in the addendum** are presented in Table 2-7, along with general descriptions and estimated costs. The remedial alternative addresses the COCs in the shallow groundwater at OU-2B.

2.8.4 Comparative Analysis of Shallow Groundwater Alternatives for OU-2B

The results of the comparative analysis of the remedial alternatives that were evaluated in detail in the OU-2B FS Report and FS Addendum with respect to **the nine NCP evaluation criteria** are summarized in Table 2-8. Sections 2.8.4.1 and 2.8.4.2 summarize the FS evaluation of Threshold and Balancing Criteria.

The Water Board concurred that the shallow groundwater meets the criteria in State Board Resolution 88-63 (**Water Board concurrence letter**). The concurrence means that shallow groundwater is not expected to be used as a potable water source in the foreseeable future. The remedies for OU-2B shallow groundwater discussed in the FS Report evaluated the risk to the on-site receptor from groundwater as a drinking-water source. The remedies discussed in the FS Addendum evaluated the risk to the on-site receptor from groundwater as a vapor intrusion risk.

Based upon the **Water Board concurrence letter**, there is a change to the ARARs; i.e., drinking water criteria are no longer the applicable criteria for shallow groundwater, but the vapor intrusion criteria remain applicable. The human health risk from vapor intrusion risk drives the requirements for remedial action at OU-2B. The FS Addendum assumed shallow groundwater at OU-2B would not be used for drinking water.

Table 2-7: Summary of OU-2B Shallow Groundwater Remedial Alternatives

Remedial Alternative	Estimated Remediation Duration (years)	Total Cost	Description
Alternative GM-1: No Action	NA	NA	CERCLA requires the evaluation of a No Action alternative to establish a baseline for comparison with other alternatives. Under this scenario, no action would be performed to remediate groundwater at OU-2B.
Alternative GM-2: ISTT of Hot Spots, Control/Treatment at the Seaplane Lagoon using PRB, MNA, and ICs	35 to 53	$14,419,000	Alternative GM-2 includes remediation of hot spots to treat relatively high concentrations of VOCs in groundwater. Treated areas would include Hot Spot 4-1 north of Building 360 (IR Site 4); Hot Spot 4-2 at the western portion of Building 360 (IR Site 4); Hot Spot 4-3 at the northeast portion of Building 360, adjacent to OWS 360 (IR Site 4); Building 163 (IR Site 4); and Building 162/Building 14 Utility Corridor (IR Sites 21 and 11). The different hot spots may be remediated using a different ISTT technology such as ERH, conductive heating, or steam flushing. If groundwater monitoring results indicated that control/treatment is necessary at the Seaplane Lagoon, a PRB would be installed immediately upgradient of Seaplane Lagoon to control potential discharge of contaminants of concern into the Lagoon. This may be a trench PRB where treatment media are placed in engineered trenches, or a trenchless PRB where treatment media are injected into the subsurface using direct push, injection wells, or other technologies. Natural attenuation processes would be monitored, as would remediation of VOC-impacted groundwater downgradient of the source areas. ICs will be applied to the VOC plume area plus a 100-foot buffer area. ICs would be required until such time that groundwater concentrations are at levels that allow for unrestricted use and unlimited exposure.

Table 2-7: Summary of OU-2B Shallow Groundwater Remedial Alternatives

Remedial Alternative	Estimated Remediation Duration (years)	Total Cost	Description
Alternative GM-3a: ISTT of Hot Spots; Shallow Groundwater Treatment using ISCO, Monitoring, and ICs	25 to 40	$14,786,000	Alternative GM-3a includes implementation of ISTT to treat relatively high VOC concentrations at five hot spot/source areas. The different hot spots may be remediated using a different ISTT technology such as ERH, conductive heating, or steam flushing. ISCO would be implemented to treat shallow groundwater (less than or equal to 30 feet bgs) in hot spot areas upon completion of ISTT to further reduce VOC concentrations. ISCO would be implemented for the remaining portion of OU-2B to treat shallow groundwater to further reduce VOC concentrations. ISTT would be implemented as discussed under GM-2, above. ISCO would include injection of chemical reagent/oxidant into the subsurface using direct-push technology, groundwater wells, or other specialized technology. The injected oxidant would oxidize VOCs into innocuous end products such as carbon dioxide and water. The remedial design will finalize the areas and depths of shallow groundwater treatment to address vapor intrusion. VOCs in shallow groundwater are responsible for the potential vapor intrusion concerns, rather than VOCs at deeper intervals. ICs will be applied to the VOC plume area plus a 100-foot buffer area. ICs would be required until such time that groundwater concentrations are at levels that allow for unrestricted use and unlimited exposure.
Alternative GM-3b: Hot Spots and Shallow Groundwater Treatment using ISB, Monitoring, and ICs	25 to 40	$12,421,000	Alternative GM-3b in the FS Report included implementation of ISTT and/or ISB to treat relatively high VOC concentrations at five hot spot/source areas. Based on results of the 2013 treatability studies, only ISB will be implemented in the hot spot/source areas. ISB would be implemented for the remaining portion of OU-2B to treat shallow groundwater to further reduce VOC concentrations. The remedial design will finalize the areas and depths of shallow groundwater treatment to address vapor intrusion. ICs will be applied to the VOC plume area plus a 100-foot buffer area. ICs would be required until such time that groundwater concentrations are at levels that allow for unrestricted use and unlimited exposure. See Section 2.9.2.2 for details.

Table 2-7: Summary of OU-2B Shallow Groundwater Remedial Alternatives

Remedial Alternative	Estimated Remediation Duration (years)	Total Cost	Description
Alternative GM-4: Treatment of the Entire Plume using Groundwater Recirculation, PRBs, and ICs	35 to 53	$16,752,000	Alternative GM-4 would include treatment of VOCs in OU-2B groundwater using multiple groundwater recirculation loops and PRBs until the RGs (vapor intrusion RGs) are met. Under Alternative GM-4, groundwater would be simultaneously extracted and injected to induce hydraulic gradients that mobilize VOCs and/or DNAPL towards extraction wells. The exact locations and designs of recirculation systems and PRBs would be determined as part of remedial design/remedial action. The FS assumed that two groundwater recirculation loops and two PRBs would be installed for OU-2B groundwater remediation. ICs will be applied to the VOC plume area plus a 100-foot buffer area. ICs would be required until such time that groundwater concentrations are at levels that allow for unrestricted use and unlimited exposure.

Acronyms and Abbreviations:

bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DNAPL	dense non-aqueous phase liquid
ERH	electrical resistance heating
FS	feasibility study
IC	institutional control
IR	Installation Restoration
ISB	in-situ bioremediation
ISCO	in-situ chemical oxidation
ISTT	in-situ thermal treatment
MNA	monitored natural attenuation
NA	not applicable
OWS	oil/water separator
OU	Operable Unit
PRB	permeable reactive barrier
RG	remediation goal
VOC	volatile organic compound

Table 2-8: Comparative Analysis of OU-2B Shallow Groundwater Remedial Alternatives

NCP Criterion	Alternative GM-1 No Action	Alternative GM-2 ISTT of Hot Spots, Control/ Treatment at the Seaplane Lagoon Using PRB, MNA and ICs	Alternative GM-3a ISTT of Hot Spots, Shallow Groundwater Treatment using ISCO, Monitoring, and ICs	Alternative GM-3b Hot Spots and Shallow Groundwater Treatment using ISB, Monitoring, and ICs	Alternative GM-4 Treatment of the Entire Plume using Groundwater Recirculation and PRBs Plus ICs
Overall Protection of Human Health and the Environment	Not Satisfied	Satisfied	Satisfied	Satisfied	Satisfied
Compliance with ARARs	Since Alternative GM-1 is not protective of human health and the environment, no ratings have been assigned to other criteria	Satisfied	Satisfied	Satisfied	Satisfied
Long-Term Effectiveness and Permanence		◑	●	●	●
Reduction in Toxicity, Mobility, and Volume through Treatment		◑ to ●	◑	◑	●
Short-Term Effectiveness		○	○ to ◑	○ to ◑	◑
Implementability		◑	◑ to ●	◑ to ●	○
Costs[a]		◑	○ to ◑	●	○
State Acceptance	The State of California (DTSC and Water Board) agrees with the groundwater alternative selected for OU-2B (IR Sites 3, 4, 11, and 21).				
Community Acceptance	The Proposed Plan was presented for the community and discussed in a public meeting. See responsiveness summary in Section 3 of this ROD.				

Notes:

○ = Poor ◑ = Fair ● = Good

[a] Cost evaluation is based on the NPV. The lower cost receives a high rating because it is more cost effective.

Acronyms and Abbreviations:

ARAR	applicable or relevant and appropriate requirement
DTSC	Department of Toxic Substances Control
IC	institutional control
IR	Installation Restoration
ISB	in-situ bioremediation
ISCO	in-situ chemical oxidation
ISTT	in-situ thermal treatment
MNA	monitored natural attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPV	net present value
OU	Operable Unit
PRB	permeable reactive barrier
ROD	Record of Decision
Water Board	San Francisco Bay Regional Water Quality Control Board

2.8.4.1 Threshold Criteria

The threshold criteria must be satisfied by each alternative and relate directly to statutory findings.

Overall Protection of Human Health and the Environment. *Under this criterion, the alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by COCs present at the site by eliminating, reducing, or controlling exposures to COC levels established during development of RGs. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.*

OU-2B Shallow Groundwater

All alternatives, except Alternative GM-1 (No Action), were evaluated as being protective of human health and the environment. Under Alternative GM-1, no remedial action would be implemented to treat or reduce potential for exposure to COCs above their respective RGs.

Alternative GM-2 includes ISTT of hot-spots, Control/Treatment at the Seaplane Lagoon using permeable reactive barriers (PRBs), monitored natural attenuation (MNA), and ICs to treat COCs in groundwater. Alternative GM-2 provides protection by implementation of land-use and/or groundwater-use restrictions to minimize the potential for exposure to COCs.

Alternative GM-3a includes implementation of ISTT, ISCO, monitoring and ICs to treat COCs in groundwater. Alternative GM-3b includes implementation of ISB, monitoring and ICs. Alternative GM-4 includes groundwater recirculation to treat the entire plume, PRBs and ICs to treat COCs in groundwater. ICs implemented as part of Alternatives GM-3 and GM-4 would minimize the potential for exposure to COCs.

Compliance with ARARs. *CERCLA §121(d)(1) and NCP §300.430 (f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain Federal and State legally applicable or relevant and appropriate requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under §121(d)(4).*

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental, State environmental, or facility siting laws that specifically address hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances found at a CERCLA site. Only those State standards that are identified by a state in a timely manner that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental, State environmental, or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

Chemical-specific ARARs are health- or risk-based numerical values or methods that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions on the concentrations of hazardous substances or on conducting activities solely because they are in specific locations. Specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site.

OU-2B Shallow Groundwater

Since Alternative GM-1 entails no remedial action, ARARs would not be triggered. Alternatives GM-2 through GM-4 were evaluated as complying with all identified ARARs. The shallow groundwater meets the criteria in Resolution 88-63, which is an ARAR.

2.8.4.2 Balancing Criteria

Primary balancing criteria are used to weigh major trade-offs among alternatives.

Long-Term Effectiveness and Permanence. *Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the considerations of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.*

OU-2B Shallow Groundwater

This criterion evaluates the residual risk at the completion of remedial actions along with the adequacy and reliability of remedial alternatives for ensuring the continued protection of human health and the environment. The more active remedial alternatives such as Alternatives GM-3a, GM-3b and GM-4 (rated Good in Table 2-8) would provide a high degree of long-term effectiveness and reliability since they include comprehensive remediation of impacted shallow groundwater at OU-2B. Alternative GM-2 (rated Fair Table 2-8) includes a relatively lesser degree of active remediation and therefore is rated lower in long-term effectiveness compared to Alternatives GM-3a, GM-3b and GM-4. Alternative GM-1 affords little long-term effectiveness and permanence since it includes no controls for preventing or reducing exposure to COCs in groundwater.

Alternatives GM-2 through GM-4 all require ICs which include groundwater use restrictions to ensure protection of potential receptors. Monitoring and maintaining these ICs would ensure their long-term effectiveness.

Reduction in Toxicity, Mobility, and Volume through Treatment. *Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.*

OU-2B Shallow Groundwater

All alternatives, except Alternative GM-1 (No Action), would include treatment to reduce toxicity, mobility or volume of COCs in shallow groundwater at OU-2B. Alternative GM-4 (rated Good in Table 2-8) includes extraction of impacted shallow groundwater, treatment above-ground, and reinjection. In addition, this alternative would include installation of multiple PRBs within the aquifer to reduce toxicity, mobility, or volume of COCs in groundwater. Since Alternative GM-4 aggressively treats the entire volume of impacted groundwater within the aquifer at OU-2B, it is expected to provide a high degree of reduction on toxicity, mobility, or volume of COCs through treatment compared to Alternatives GM-2, GM-3a, and GM-3b.

Alternative GM-2 (rated Fair to Good in Table 2-8) and Alternatives GM-3a, and GM-3b (rated Fair in Table 2-8) would provide a relatively high degree of reduction in toxicity, mobility, or volume of COCs in shallow groundwater through treatment of high concentrations of VOCs in source areas. The remaining VOCs in shallow groundwater would be treated using a PRB at the Seaplane Lagoon and MNA under Alternative GM-2. For Alternative GM-3a, the remaining VOCs are treated using active shallow groundwater remediation with ISCO and monitoring. For Alternative GM-3b, the remaining VOCs would be treated using active shallow groundwater remediation with ISB and monitoring. Since the PRB at the Seaplane Lagoon under Alternative GM-2 would be designed to treat the entire estimated vertical extent of COCs passing through it as compared to just shallow groundwater treatment, Alternative GM-2 is expected to achieve a higher degree of reduction in toxicity, mobility, or volume/mass of COCs through treatment compared to Alternatives GM-3a and GM-3b.

Short-Term Effectiveness. *Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may exist to workers, the community, and the environment during construction and operation of the remedy until cleanup goals are achieved.*

OU-2B Shallow Groundwater

No short-term effectiveness is associated with Alternative GM-1 since no remedial action would be implemented.

Alternative GM-2, (rated Poor in Table 2-8) and Alternatives GM-3a and GM-3b (rated Poor to Fair in Table 2-8) would have the greatest short-term site risks as they involve heating of soil and groundwater at the source areas. Short term risks include: drilling and well/electrode installation, exposure of work crews to COC-impacted groundwater, use of mechanized equipment, exposure to contaminated vapors extracted from the subsurface for above-ground treatment and hot surfaces and energized electrical sources. In addition, pollutant and greenhouse gas (GHG) emissions and energy use for alternatives involving ISTT (Alternatives GM-2, and GM-3a), are estimated to be comparable to each other and significantly higher than alternatives that do not include ISTT.

The impacts on the environment for Alternative GM-4 (rated Fair on Table 2-8) as quantified by pollutant and GHG emissions are estimated to be lower than alternatives that include ISTT. The risks for injuries and fatalities for Alternative GM-4 are estimated to be significantly higher than

other alternatives. This is due to greater requirement for transportation of personnel during construction and O&M phases of Alternative GM-4 compared to other alternatives.

Implementability. *Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with governmental entities are also considered.*

OU-2B Shallow Groundwater

There is no implementability concern associated with Alternative GM-1 since no action will be taken. Alternative GM-4 (rated Poor in Table 2-8) would include extraction/injection of impacted shallow groundwater, above-ground treatment, and PRBs for remediation of impacted groundwater. Therefore, Alternative GM-4 would be more difficult to implement compared to Alternatives GM-2 and GM-3. The implementation of a groundwater recirculation loop under Alternative GM-4 is considered to be more complex than the in-situ technologies proposed under Alternatives GM-2 and GM-3 since it involves elaborate groundwater modeling, aboveground handling/treatment of impacted groundwater, and pilot testing. In addition, operation of a groundwater recirculation system requires controlled injection of treated groundwater and periodic process monitoring.

Among the in-situ treatment alternatives (Alternatives GM-2, GM-3a, and GM-3b), the alternatives with technologies that have already been pilot tested at OU-2B (e.g. ISTT and ISCO) are considered easier to implement compared to the alternatives proposing technologies that have not been pilot tested (e.g., ISB and PRB). Based on this criterion and taking into consideration the scale of drilling/reagent injection activities, in-situ treatment alternatives may be arranged in decreasing order of complexity to implement as follows: Alternative GM-3b (rated Fair to Good on Table 2-8), Alternative GM-2 (rated Fair on Table 2-8), and Alternative GM-3a (rated Fair to Good on Table 2-8).

Costs. *The types of costs assessed include capital costs (both direct and indirect) and annual O&M costs. Both types were assessed based on net present value.*

OU-2B Shallow Groundwater

There are no costs associated with Alternative GM-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative GM-3b (rated Good in Table 2-8) is the least expensive. Costs of Alternative GM-2 (rated Fair in Table 2-8) and GM-3a (rated Poor to Fair in Table 2-8) are between those of Alternatives GM-3b and GM-4. Alternative GM-4 (rated Poor in Table 2-8) is the most expensive.

2.8.4.3 Modifying Criteria

The modifying criteria are taken into account following comment on the OU-2B FS Report, FS Addendum, and Proposed Plan, and are addressed in the final decision.

State Acceptance. *Regulatory involvement has been solicited throughout the CERCLA process. The State has concurred with the preferred alternative presented in the Proposed Plan which is the same selected remedy documented in this ROD.*

Community Acceptance. *The Proposed Plan was issued for public review between April 30 through May 31, 2013, and was discussed at a public meeting held May 15, 2013. The Responsiveness Summary (see Section 3) addresses public comments and concerns related to the preferred remedies identified in the Proposed Plan.*

OU-2B Shallow Groundwater

The Responsiveness Summary (see Section 3) addresses public comments and concerns related to the preferred remedies identified in the Proposed Plan.

2.9 Selected Remedies

The sections below summarize the rationale for the selected remedies for soil at IR Sites 3 and 4 and groundwater at OU-2B. A description of the selected remedies, the expected outcomes of the selected remedies, and statutory determinations are presented.

2.9.1 Selected Remedy for Soil at IR Sites 3 and 4

The selected remedy for soil at IR Sites 3 and 4 is excavation and disposal of soil impacted by lead at IR Site 3 and by Aroclor 1254, aldrin, dieldrin, and heptachlor epoxide at IR Site 4 to residential reuse RGs (Alternative S-3a); and ICs (Alternative S-2) for limited areas of soil containing cobalt (in IR Site 3) and hexavalent chromium (in IR Site 4). For the soil excavation remedies, investigation may be conducted prior to the remedial actions at soil exceedance locations to verify areas of soil contamination. The soil excavation remedies were modified following issuance of the Proposed Plan based on sampling data collected in August and September 2013 and the **Water Board concurrence letter** finding that the shallow groundwater meets the criteria in Resolution 88-63 (determined after FS Report issuance). These modifications to the FS Report excavation depths and remedial action areas are detailed in Section 2.8.1. The excavation and ICs areas are shown on Figures 2-2 and 2-3. No actions are required for IR Sites 11 and 21 soils.

2.9.1.1 Rationale for Selected Remedy for Soil for IR Sites 3 and 4

The selected remedies for soil maximize unrestricted reuse and minimize the areas requiring ICs. Addressing the cobalt-impacted soil and hexavalent chromium-impacted soil via ICs is based on consensus by the Navy, U.S. EPA, DTSC, and Water Board prior to issuance of the Proposed Plan. In accordance with CERCLA, this decision was made due to multiple site-specific factors including the following:

- location of the areas with these COCs: At IR Site 3, the cobalt-impacted soil is underneath and immediately adjacent to Building 398. At IR Site 4, the hexavalent chromium-impacted soil is entirely beneath Building 360. These locations are easy to identify and are not in areas planned for future utilities, such as along streets.

- concentrations and depths: At IR Site 3, the EPC for cobalt in surface soil is 51 mg/kg, and 49 mg/kg in soil from 0 to 5.5 feet bgs. Therefore, the EPC is less than the RG (commercial) of 300 mg/kg. In addition, only one sample, which is located beneath Building 398, exceeds this RG, with a concentration of 326 mg/kg at a depth of 4.5 feet

bgs. At IR Site 4, the EPC for hexavalent chromium in soil from 0 to 4.5 feet bgs is 186 mg/kg, which exceeds the RG (commercial). The FS Report documents that 67 of the 82 samples analyzed for hexavalent chromium at IR Site 4 were below the RG. The maximum concentration is at a depth of 0 to 0.5 feet bgs. In summary, although there are a range of concentrations and depths for detections of both COCs, the majority of sample results are less than the RG, with generally small areas beneath buildings requiring ICs.

- properties of the COCs: Cobalt and hexavalent chromium are not very mobile in the soil, and their location largely beneath buildings further minimizes any potential for migration or exposure.

- planned re-use/input from the planned future landowner (City of Alameda): The City of alameda was involved in the discussion of placing ICs on these areas and indicated that ICs in these areas would not negatively impact their development.

Because of site specific factors associated with cobalt and hexavalent chromium-impacted soils and after evaluation of **the nine NCP evaluation criteria** under CERCLA, ICs were selected as the preferred remedial alternatives for soil at IR Sites 3 and 4.

2.9.1.2 Description of Selected Remedy for Soil for IR Sites 3 and 4

Under Alternative S-3a, COC-impacted soil (lead in soil at IR Site 3 and Aroclor 1254, aldrin, dieldrin, and heptachlor epoxide in soil at IR Site 4) will be removed from IR Sites 3 and 4 and disposed of at an appropriate off-site licensed disposal facility unless the soil is appropriate for re-use on-base, as detailed in the soil remedial action work plan. The volume of lead-impacted soil at IR Site 3 estimated in the FS Report is 1,700 bank cubic yards (bcy). The FS Report estimated the volume of PCB- and pesticide-impacted soil at IR Site 4 to be 82 bcy. Excavation will be complete when statistical evaluations of post-excavation sampling results (as detailed in the remedial action work plan) verify that RAOs are met or groundwater is encountered, whichever occurs first. The excavated areas then will be backfilled. The expected duration of Alternative S-3a is two years.

Under Alternative S-2, ICs will be implemented for the cobalt-impacted soil area at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4. Figures 2-2 and 2-3 show the estimated IC boundaries. The selected remedies for soil maximize unrestricted reuse and minimize the areas requiring ICs. The rationale for selection of ICs as the remedies for these COCs is presented in Section 2.9.1.1.

The land use control (LUC) performance objective is to minimize the potential for exposure to cobalt-impacted soil at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4 that may result in risks to human health if no controls are implemented. As stated in the FS Report, the ICs would protect human health by imposing restrictions on activities that may result in exposure to cobalt-impacted soil at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4. ICs will be implemented to prohibit residential use at IR Site 3 in the area of cobalt-impacted soil and at IR Site 4 in the area of hexavalent chromium-impacted soil unless cobalt and hexavalent chromium concentrations are reduced to below residential use levels. In addition, because the RGs for commercial use are exceeded in the hexavalent chromium-impacted soil beneath Building 360, the ICs for hexavalent chromium-impacted soil at IR Site 4 will prohibit intrusive

activities without prior approval by the agencies approving or concurring on this ROD or their successors. Additional detail regarding implementation of the ICs will be presented in the Land Use Control Remedial Design (LUC RD), which may refine the boundaries shown on Figures 2-2 and 2-3. The FS Report evaluated an estimated duration for Alternative S-2 of 30 years, consistent with federal guidance. ICs would be maintained until COC concentrations in the soil are at levels that allow unrestricted use and unlimited exposure.

2.9.1.3 Expected Outcomes of the Selected Remedy for Soil for IR Sites 3 and 4

Once the selected remedy has been implemented, risks to human health and the environment associated with soil will be acceptable for residential reuse (with the exception of 0.28 acre in IR Site 3 associated with cobalt-impacted soil and 0.08 acre in IR Site 4 associated with hexavalent chromium-impacted soil), and the RAO will be achieved. This remedy will take little time to put in place, will pose very few operational challenges, and will be effective.

2.9.1.4 Statutory Determinations for IR Sites 3 and 4 Soil

In accordance with the NCP, the excavation and disposal of contaminated soil and implementation of ICs for soil at IR Sites 3 and 4 meets the following statutory determinations.

Protection of Human Health and the Environment: The selected soil remedy is needed to protect human health by preventing exposure to COCs.

Compliance with ARARs: The selected soil remedy will meet potential chemical-specific, location-specific, and action-specific ARARs.

Cost-Effectiveness: The selected remedy is the most cost-effective remedy and will provide overall effectiveness in proportion to its costs. The remedy is readily implementable and has been widely used, thus demonstrating its effectiveness.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable: The selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner.

Preference for Treatment as a Principal Element: Active treatment is not an element of the soil remedy for IR Sites 3 and 4.

Five-Year Review Requirements: A CERCLA Five-Year Review will be conducted no less often than once every five years after implementation of the selected remedy to ensure that the remedy remains protective of human health and the environment.

2.9.2 Selected Remedy for Shallow Groundwater at OU-2B

The selected remedy for the shallow VOC plume that underlies portions of OU-2B IR Sites 4, 11, and 21 is Alternative GM-3b, treatment using ISB of hot spots and shallow groundwater to 30 feet bgs, monitoring, and ICs. The RGs are protective of the future land use. ICs will be applied to the VOC plume area plus a 100-foot buffer area. The buffer area includes part of IR

Site 3. No action is required for IR Site 3 groundwater, which is not impacted and not part of the shallow VOC plume. The plume and buffer area are shown on Figure 2-6.

2.9.2.1 Rationale for Selected Remedy for Shallow Groundwater at OU-2B

Alternative GM-3b was selected because it provides the best balance of trade-offs between the balancing criteria. Based on the sustainability evaluation, Alternative GM-3b was rated as being overall easier to implement and more cost effective than Alternatives GM-3a and GM-4. The remedy will be protective of human health and the environment, and will comply with ARARs.

In accordance with federal and State guidance, vapor intrusion risk is typically associated with COC concentrations within the upper foot or so of the water table. The zone for shallow groundwater treatment at OU-2B (water table to 30 feet bgs) was determined based on discussions between the Navy, the U.S. EPA, DTSC, and Water Board and verified to be protective using site specific modeling. Modeling completed as part of the FS Report evaluation indicated that treatment to 30 feet bgs would be protective of future contaminant migration and vapor intrusion.

Alternative GM-3b will also include implementation of ICs to ensure protection of human health, attainment of RAOs, and to ensure the integrity of the remedy in place. The ICs for the shallow VOC plume and 100-foot buffer area will include land-use and/or groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater.

2.9.2.2 Description of Selected Remedy for Shallow Groundwater at OU-2B

The components of Alternative GM-3b for shallow impacted groundwater underlying portions of OU-2B IR Sites 4, 11, and 21 include hot-spot treatment, shallow groundwater treatment, monitoring, and ICs. The selected remedy includes implementation of ISB to treat concentrations of VOCs above the RGs for vapor intrusion in shallow groundwater to a depth of 30 feet bgs at the five OU-2B hot spots and in the surrounding shallow groundwater. The rationale for selection of the shallow groundwater to 30 feet bgs for treatment is presented in Section 2.9.2.1. A buffer zone is delineated around the perimeter of the plume; this buffer zone includes a portion of IR Site 3. The detailed design and implementation strategy for remediation will be presented in the remedial design.

While ISTT was included in the FS Report as a component of the Alternative GM-3b for hot spots, at this time the hot spots identified in the FS Report have been treated. Further, the December 2013 **Final ISTT Treatability Study** concluded that further ISTT treatment of OU-2B groundwater with higher concentrations would not likely be effective and is not recommended. Therefore, ISB will be used to treat the remaining OU-2B hot-spot COC concentrations.

ISB will be implemented to treat shallow groundwater that is less than or equal to 30 feet bgs in the hot-spot areas and the remaining portion of OU-2B VOC plume. Details regarding implementation of the ISB in the hot spots and other plume areas at OU-2B will be finalized during the remedial design/remedial action (RD/RA) phase, including the horizontal extent of the target remediation area to address potential vapor intrusion risks. In addition to VOC groundwater monitoring, monitoring may also be conducted for process parameters such as total

organic carbon, dissolved oxygen, oxygen reduction potential, and pH. The performance monitoring for ISB will include assessment of mobilization and subsequent re-precipitation of metals such as iron and manganese, as appropriate. For shallow groundwater between 30 and 70 feet bgs, only groundwater monitoring will be conducted. The primary purpose of this monitoring is to verify that the shallow groundwater greater than 30 feet bgs does not negatively impact the bioremediation of the shallow groundwater to 30 feet bgs. The monitoring parameters and frequency will be identified during the remedial design phase. Based on modeling conducted during the FS, it is estimated that it will take between 25 and 40 years for the RGs to be achieved.

ICs will be implemented to ensure protection of human health and attainment of RAOs. ICs will be applied to the shallow VOC plume area plus a 100-foot buffer area, which is based on U.S. EPA guidance. The areas requiring ICs will be reduced as RAOs are met. The ICs are described in detail below. ICs will include land/groundwater-use restrictions to limit exposure of future landowner(s) and/or user(s) to COC-impacted groundwater until the RAOs are met through treatment and natural attenuation mechanisms. ICs will be required until such time that groundwater concentrations are at levels that allow for unrestricted use and unlimited exposure.

As a result of the **Water Board concurrence letter** dated September 13, 2012, drinking water criteria are not considered ARARs for shallow groundwater (defined in the Water Board letter as groundwater in water-bearing zones located between the surface and the Yerba Buena Mud Aquitard, which is estimated to be present in the OU-2B area at depths of 70 to 95 feet bgs). Further detail related to the beneficial use evaluation is presented in Section 1.3.2.

ICs are legal and administrative mechanisms used to limit the potential for human exposure to impacted groundwater by restricting its extraction and use. The areas subject to the restriction are shown on Figure 2-6. The restrictions will remain in place until the concentrations of hazardous substances in the groundwater are at levels that allow for unrestricted use and unlimited exposure. The restrictions will be incorporated into both the federal deed(s) for the transfer of property within OU-2B as well as the Covenants to Restrict the Use of Property which will be executed prior to the transfer of title to such property.

The environmental protection provisions included in the ICs may include provisions that will allow the Navy, regulatory agencies, and their authorized agents, employees, contractors, and subcontractors access to the property overlying impacted groundwater. The ICs will also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA. Further details for the implementation, monitoring and enforcement of the ICs will be described in the LUC RD. The LUC RD will include:

- Identification of responsibilities for Navy, U.S EPA, DTSC, Water Board, other government agencies, and new property owner;
- A list of ICs with their expected duration;
- Maps identifying where ICs are to be implemented;
- Requirements for CERCLA five-year remedy review;
- Frequency and requirements for periodic monitoring or visual inspections;

- Reporting results from monitoring and inspections;
- Notification procedures to the regulators for planned property conveyance, corrective action required, and/or response to actions inconsistent with ICs for the remedy; and
- Consultation with U.S. EPA, DTSC, Water Board, and other government agencies regarding wording for land use restrictions and parties to be provided copies of the deed language once executed.

Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or other means, the Navy shall retain ultimate responsibility for remedy integrity and enforcement of the ICs described in this ROD in accordance with the approved RD reports. Should any of the ICs fail, the Navy 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 Navy's costs for mitigating any discovered IC violation(s). The ICs shall be maintained until such time as VOC concentrations have been reduced or remediated to levels that allow for unrestricted use and unlimited exposure.

The Navy and other FFA signatories and their authorized agents, employees, contractors, and subcontractors shall have the right to enter upon OU-2B to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary.

ICs for the shallow groundwater remedy will be implemented as described in this section. A LUC RD will be prepared as the land use component of the Remedial Design. In accordance with the FFA schedule, the Navy shall prepare and submit to the other FFA signatories for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections. Additional detail regarding implementation of the ICs will be presented in the LUC RD, which may refine the boundaries shown on Figure 2-6. As the groundwater remedy progresses, the associated IC restrictions will no longer be required in areas where RAOs have been achieved. Attainment of RAOs will be determined by statistical evaluation of groundwater sampling results, which will be detailed in the RD. The IC restriction boundaries may be adjusted as RAOs are achieved for portions of the ROD IC areas.

The ICs will also ensure that the integrity of the remedial action components such as monitoring wells is maintained. The land-use restrictions will achieve the following objectives:

- Prevent land use that presents unacceptable hazard to human health due to the existence of residual COCs;
- Protect site security features such as fences and signs;
- Preserve access to the areas requiring ICs for the relevant regulatory agencies and the Navy;
- Prevent exposure to groundwater until groundwater remedial goals are met; and
- Prevent exposure to vapor concentrations above acceptable levels due to COCs in groundwater until groundwater remedial goals are met.

The land-use restrictions in general will include the following:

- Prohibition on domestic use of shallow groundwater;
- Prohibition on drilling wells of any kind (other than remedy-related monitoring wells);
- A requirement for engineered vapor intrusion mitigation systems acceptable to the other FFA signatories or their successors for all buildings constructed on the area overlying the impacted shallow groundwater plus the 100-foot buffer area until VOC concentrations in groundwater do not pose an unacceptable risk due to the vapor intrusion pathway;
- Prohibition on disturbing/removing/altering components of the remedy including monitoring wells and warning signs; and
- Prohibition against construction of buildings with ground-floor residential units or occupancies with sensitive receptors, including schools, child care facilities, hospitals, and senior care facilities, overlying the impacted shallow groundwater plus the 100-foot buffer area until remedial goals (specified in Sections 1.3 and 2.7) are achieved.

Since modeling for Alternative GM-3b indicates that it will take between 25 and 40 years for the RGs to be achieved, the protectiveness of the remedy will be evaluated as part of the Five-Year Reviews. Each Five-Year Review will include review of the collected data, interviews, and site-inspections to determine if the remedy remains protective of human health and the environment.

2.9.2.3 Expected Outcomes of the Selected Remedy for Shallow Groundwater at OU-2B

Once the selected remedy (Alternative GM-3b) has been implemented, risks to human health or the environment under the planned future use will be acceptable, and the RAOs will be achieved. After the ISB is completed, monitoring will confirm that the contaminant trends in groundwater continue to be stable and are decreasing over time, and ICs will restrict reuse. Monitoring is an implementable and effective strategy, particularly at a site with no groundwater consumption. Alternative GM-3b will take little time to put in place, will pose very few operational challenges, consists of proven technologies, and will be effective.

2.9.2.4 Statutory Determinations for Shallow Groundwater at OU-2B

In accordance with the NCP, Alternative GM-3a for shallow groundwater at OU-2B meets the statutory determinations, described below.

Protection of Human Health and the Environment: The selected remedy is needed to protect human health by preventing exposure to COCs through the implementation of ICs and monitoring and to confirm that concentrations of COCs continue to be stable to decreasing over time, and thus pose no risk to the environment.

Compliance with ARARs: The selected remedy will meet potential chemical-specific, location-specific, and action-specific agreed-upon ARARs.

Cost-Effectiveness: The selected remedy is the most cost-effective remedy and will provide the most overall effectiveness in proportion to its costs. The remedy is readily implementable and has been widely used, thus demonstrating its effectiveness.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable: The selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner. ISB will permanently breakdown chemical contaminants, monitoring will continue to evaluate the breakdown, and ICs will effectively achieve RAOs.

Preference for Treatment as a Principal Element: ISB will reduce toxicity, mobility, and volume of contamination directly through treatment. ISB, monitoring, and ICs will reduce contaminant toxicity, mobility, and volume by breaking down chemicals over time.

Five-Year Review Requirements: The estimated remediation duration is between 25 and 40 years. Statutory Five-Year Reviews will be necessary because the selected remedies will result in contaminants being left on-site above levels allowing for unrestricted use and unlimited exposure.

2.10 Community Participation

A Community Involvement Plan (CIP) was originally prepared for Alameda Point in February 1989. The original CIP 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. An updated CIP for Alameda Point was published in December 2013 and incorporated the most recent assessment of community issues, concerns, and informational needs related to the ongoing environmental investigation and remediation program at Alameda Point.

2.10.1 Restoration Advisory Board

In 1993, individuals from the local community began to play an increasingly significant role in the environmental restoration process with the establishment of the Alameda Point Restoration Advisory Board (RAB). Board membership was solicited by the Navy 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 Navy, the community, and regulatory agencies. Meetings are open to the public and are held in the evenings from 6:30 to 9:00 p.m., generally on the second Thursday of every other month, in Building 1, Room 140, at 950 West Mall Square at Alameda Point. RAB members also review and comment on technical documents.

The Navy and regulators report information about the CERCLA Program, including information on OU-2B and the availability of Site documents, to the RAB members during the bi-monthly RAB meetings. Copies of RAB meeting minutes and documents describing environmental investigations and removal actions are available at the following Alameda Point information repository and Administrative Record file:

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

Administrative Record
Naval Facilities Engineering Command, Southwest
Naval Base San Diego, Building 3519
2965 Mole Road
San Diego, California 92136

The Alameda Public Library also maintains new Navy 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 Navy BRAC Program Management Office website at http://www.bracpmo.navy.mil.

2.10.2 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 OU-2B 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 CIP.

Updates and fact sheets have included information concerning:

- Status of environmental investigations;
- Removal action activities;
- Remedy selection process;
- Opportunities for the public to comment on the investigation and remediation activities;
- History and geology of Alameda Point; and
- Access to the Administrative Record for Alameda Point.

Proposed Plans provide an overview of environmental investigation results (including ERA and HHRA results), present remedial alternatives for a Site or group of Sites, and describe the preferred alternative. Proposed Plans, updates, and fact sheets are mailed to up to 1,400 households, businesses, public officials, and agencies in an effort to reach as many community members as possible. To accommodate community preferences regarding Alameda Point information, the mailing list ranges from 400 to 1,400 recipients, depending upon the specific types of information included.

2.10.3 Community Participation at OU-2B

A roundtable discussion of alternatives presented in the FS Report was held at the May 5, 2011, RAB meeting and the RAB provided input on alternatives. A summary of the FS Report was presented at the December 1, 2011, RAB meeting. It included a discussion of new proposed alternatives. The FS Report was finalized in December 2011.

On March 8, 2012, the RAB received a presentation on OU-2B ERH, one of the proposed technologies for OU-2B soil. An Addendum to the FS Report was finalized in October 2012 that addressed modified groundwater alternatives.

The Proposed Plan was released to the public on April 29, 2013, at the beginning of the 30-day public comment period, to provide information and solicit public input on the Navy's recommended remedies. The Proposed Plan was presented at the May 9, 2013, RAB meeting, as was information on six-phase heating, one of the OU-2B technologies.

The 30-day public comment period for the OU-2B Proposed Plan took place from April 30 through May 31, 2013. A public meeting was held on May 15, 2013, to present the Proposed Plan and to receive public comments. A notice of the public comment period and public meeting was published in the *Alameda Journal, Alameda Sun,* and *East Bay Express* newspapers. At the May 15 public meeting, the BRAC Environmental Coordinator and the Navy Remedial Project Manager were available to discuss OU-2B and describe the selected remedies. Representatives from the Navy and environmental regulatory agencies were available to answer questions. A court reporter prepared a **public meeting transcript**. Responses to comments that were received during the public comment period are included in the Responsiveness Summary, Section 3 of this ROD.

The OU-2B 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.

3 Responsiveness Summary

The public-review period for the OU-2B Proposed Plan was conducted from April 30, 2013, to May 31, 2013. A public meeting was held on May 15, 2013, at Alameda Free Library, 1550 Oak Street, Alameda, California. Twenty-three people attended the public meeting, including interested public and representatives from the Navy, U.S. EPA, DTSC, and the Water Board. Questions and concerns received during the meeting were addressed at the meeting and are documented in the **public meeting transcript**, which is available as part of the administrative record.

Written comments on the Proposed Plan were received in a letter from RAB members Susan Galleymore, Daniel Hoy, George Humphreys, Jim Leach, Skip McIntosh, Dale Smith, Jim Sweeney, and Michael John Torrey. A second letter also was received from RAB Community Co-chair Dale Smith. These letters are addressed below.

Oral comments were also received at the RAB meeting held on May 15, 2013, and are addressed below.

Written Public Comment, RAB Members – General Comment:

"The alternatives presented in the plan and at the RAB meeting are not sufficiently defined to provide a clear indication of their relative costs. We have no basis to question the technologies used for the preferred alternative GM-3b (treatment of hot spots and shallow groundwater using in-situ bioremediation). It appears that cost was a primary determination in the selection process (see Table 7 of the Proposed Plan). Costs are presented to five significant figures in Table 6 and four significant figures in Table 7. Four significant figures imply that the cost is known within an accuracy of 0.1 to 0.01 percent. Presenting the costs for various alternatives to an implied high degree of accuracy results in a misrepresentation of true costs. The Navy previously has stated that the accuracy of such conceptual level estimates is within a range of +50 to -30 %, making groundwater alternatives GM-2, GM-3a, GM-3b, and GM-4 essentially the same from a cost standpoint. These cost estimates are really based on conceptual level design and not on final remedial design or fixed cost bids. It can be fairly stated that the costs are all in the ten to twenty million dollar range. Thus none of these four alternatives should be rated higher or lower than the others on a cost basis. We would like to see a tabulation of the Navy's original budget and the final costs for those sites where remediation has already been completed at Alameda Point. Soil remediation Alternative S-2, Institutional Controls, does not properly include the future costs of the City's engineering, legal and permitting staff to maintain surveillance into the indefinite future."

Response:

Costs were developed following U.S. EPA guidance[1] and represent one of the nine National Oil and Hazardous Substances Pollution Contingency Plan (NCP) criteria for evaluating remedial alternatives. The significant figures (four figures and five figures) were used for consistency with the OU-2B Final FS Report (2011)/FS Addendum (2012). This does not imply a level of accuracy, as the Proposed Plan is not an engineering design document. Costs for the selected

alternative(s) will be further evaluated and refined during the Remedial Design phase following the ROD.

EPA guidance uses the range of +50/-30 percent and cost estimates are based on conceptual-level design. It is correct that future City of Alameda costs are not included in the estimates; however, this is proper and is consistent with EPA guidance.

[1] – "USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final." EPA 540/G-89-004, OSWER Directive 9355.3-01, October 1988.

Section 6.2.3.7 of the document has been superseded by: "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study." OSWER Directive 9355.0-75, July 2000.

Written Public Comment, RAB Members – Specific Comment:

"Since the release of the Site 25 Technical Memo[1] the RAB is aware of the problems soil gas vapors will cause to the community in the future. EPA[2] and DTSC[3] both released guidelines for providing protection to residents and workers in the presence of soil gas vapors. DoD[4] released a similar document to guide environmental coordinators at operating bases in protecting individuals in the presence of soil gas. All guides recommend full clean up of contaminants in order to ensure protection of health. DoD goes farthest in stating if the plume is not remediable, the site should not be used for anything other than a parking lot. The proposed alternative would leave contaminants in place that by all standards would be harmful to future occupants."

[1] – *Final Technical Memorandum Operable Unit 5/FISCA IR-02 Groundwater Data Evaluation*, TetraTech EC, Inc. December 2012.

[2] – *Brownfields Technology Primer: Vapor Intrusion Considerations for Redevelopment*, US Environmental Protection Agency, March 2008.

[3] – *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)*, Department of Toxic Substances Control, California Environmental Protection Agency, October 2011.

[4] – *DoD Vapor Intrusion Handbook*, Department of Defense, the Tri-Service Environmental Risk Assessment Workgroup, January 2009.

Response:

The preferred shallow groundwater remedy (GM-3b) indicates that vapor intrusion risk standards will be reached; thus the plume is "remediable." Therefore, at the completion of the active portion of the remedy, groundwater will meet the remediation goals and exposure will be acceptable. The remedy also includes Institutional Controls (ICs) to protect future potential occupants (residential receptors) through use of land use controls (LUCs), a key part of the remedy. Therefore, through use of ICs, exposure levels will not be harmful to future occupants.

Written Public Comment, RAB Members – Specific Comment:

"Soils – Whatever groundwater alternative is chosen, the RAB prefers Alternative 3a, the excavation of soil contamination (primarily metals) to residential standards and offsite disposal prior to groundwater treatment. This alternative should be restored to its original scope to include excavation and offsite disposal of metals. The Navy has stated that removal of buildings in not preferred to fully remediate contamination. However, at Site 7, one third of a building was removed to allow access to incinerator ash that had heavily contaminated soil. There are

buildings, 517, 360, 14, 162 and 398, over cobalt, nickel, lead and hexavalent chromium. Lead is shown to abut Building 517 but not underneath. Lead might have been detected if testing had been done inside the building through the floor. It is likely there is contamination under the building. Although the buildings in questions are not of historical value and are not intended by the city for future use, it is imperative that a chain of responsibility is declared to stipulate who is responsible for future cleanup if – and when – buildings are torn down."

Response:

Excavation and off-site disposal of soil containing lead is the selected remedy for IR Site 3. The areas addressed only by ICs for the metals cobalt and hexavalent chromium are localized areas where contaminated soils are under (or adjacent to) buildings not slated for demolition. If the City's future land use plans change and the buildings currently not slated for demolition are planned for removal, the City will be responsible for future cleanup. A "chain of responsibility" is not detailed in the Proposed Plan, and that is not the purpose of the document. However, future transfer documents (Finding of Suitability to Transfer [FOST], deeds, etc.) will delineate future responsibilities. The ROD, which documents the final remedy(ies) for a site, is a legally binding document. Future property owners are bound by conditions put forth in the deeds. Further, California Department of Toxic Substances Control (DTSC) has oversight and will have the authority to enforce deed restrictions and requirements in the future.

Written Public Comment, RAB Members – Specific Comment:

"Navy representatives admit that if, anytime in the future, buildings are torn down and the property redeveloped by entities other than the Navy (City contractors or property developers, for example) the costs of cleaning up remaining contaminants under buildings falls to those entities. You have stated that a private contractor can excavate and dispose of soil contamination more cheaply than the Navy. This implies that the private developer/contractor would somehow be allowed to cut corners and be held to less stringent standards than the Navy. We certainly hope that this would not be the case. If excavation and disposal of the soil contamination is deferred until some unspecified future time, permitted offsite disposal capacity may no longer be available in California. Out-of-state disposal would greatly increase disposal costs. The presence of hazardous soil contaminants under and near building[s] and the possibility that other toxics may be uncovered could be a substantial deterrent to development and financing at OU-2B."

Response:

There is no implication that a private developer/contractor would be allowed to cut corners and/or held to less stringent standards than the Navy. Metals under buildings are addressed through the remedy of ICs and LUCs. Operable Unit 2B totals approximately 47 acres. The areas containing metals underneath (and adjacent to) buildings in IR Site 3 and IR Site 4 total less than 1 acre, representing a very small portion (approximately 2 percent) of the total 47 acres. Future development could easily take this acreage into account to provide for non-ground-floor residential use, such as parking, tennis courts, or other commercial-use buildings.

Written Public Comment, RAB Members – Specific Comment:

"Anna-Marie Cook, EPA, stated at a RAB meeting that the EPA requested the borax waste, consisting of bentonite contaminated with high levels of arsenic, be removed. The proposed plan does not mention removal of this waste, but the Feasibility Study does. The waste should be removed along with other soil contaminants."

Response:

More recent sampling shows that arsenic concentrations are not present in this potential borax waste/soil layer above background levels.

Written Public Comment, RAB Members – Specific Comment:

"The lead remedial goals are still unacceptably high compared to EPA and DTSC standards."

Response:

The lead RG of 208 mg/kg is protective of residential use. This is a site-specific RG agreed upon with the BCT at the time of the FS report that is lower than the current EPA residential soil screening level of 400 mg/kg, due to uncertainty in a protective lead level for residential use. The state of the science regarding recent lead studies by federal agencies confirms the protectiveness of this RG for lead. U.S. EPA and DTSC have concurred with the proposed alternatives, including the remedial goals, as protective of human health and the environment.

Written Public Comment, RAB Members – Specific Comment:

"The risk exposure calculations for metals in soil are based on averaging concentrations over the entire site; if exposures had been based on higher concentrations at localized sites, the exposure risk would have been greater. The RAB has in the past criticized this approach as reducing localized high contamination to insignificance through a mathematical process not a health based analysis[5]. As in the previous comment, these sites of highly contaminated metals may actually be quite small overall and this easily (where not under buildings) remediated."

[5] – "Comments on the Proposed Plan," IR Site 34, RAB, August 2010

Response:

Risk exposure calculations were not based on averaging concentrations across OU-2B but are statistically based on a 95-percent Upper Confidence Limit. In addition, localized areas of higher concentrations were considered in the evaluation of the areas for remedial action. This approach is consistent with U.S. EPA and DTSC risk guidance.

Written Public Comment, RAB Members – Specific Comment:

"Groundwater – Soil gas vapor intrusion has become recognized as a very complex issue, not easily controlled in a situation with a large plume in place. The OU 2B plume is approximately 650 feet wide x 1710 feet long and more than 65 feet deep (actual depth is unknown, as the Navy hasn't delineated the plume). It is unfortunate that there is unwillingness to use highly

regarded consultants on complex, demanding sites, relying instead on lesser companies with poor results. As a result, although micro ZVI (mZVI) would be a very effective, quick to implement and long-lasting solution, it would be imprudent to support its use. Given that this site is one of three that got NAS Alameda named to the National Priorities List, a partial removal of contaminants will not prevent exposure of future workers and residents to toxic and carcinogenic gases."

Response:

The proposed groundwater alternatives will all leave "some" VOCs in place and all will terminate active remediation at the attainment of the remediation goals. Alternative GM-3b (hot spot and shallow groundwater treatment using ISB, monitoring, and ICs) will be protective of human health and the environment.

Written Public Comment, RAB Members – Specific Comment:

"Experience with landfills indicates that conditions in landfills go from aerobic to anaerobic about two years after closure (this is when methane gas production starts). Similarly, it is reasonable to expect that after the cessation of biosparging with air, conditions would return to anaerobic after about two years. Any diffusion of air from the atmosphere into the ground will be counteracted by gases and vapors rising to the surface. Thus, oxygen-rich conditions should not prevail after biosparging stops and cannot be depended on to maintain low concentrations of contaminants[6]."

[6] – "Comments on OU-5/FISCA IR-02 Groundwater Presentation," Humphreys, G., May 2013

Response:

OU-2B is not a landfill site and, therefore, comparison with landfills is not appropriate. The preferred alternative will be protective of human health and the environment.

Written Public Comment, RAB Members – Specific Comment:

"The main deficiency of the groundwater remedy recommended in the Proposed Plan (GM-3b) is that it only treats shallow groundwater at a depth of 30 feet or less. This would leave deeper groundwater contamination untreated. Denser contaminants probably are situated at greater depths within the groundwater. These deeper contaminants can serve as a future source of contamination causing a "rebound" of contaminant concentrations in the shallow groundwater and/or extend the treatment period. If a major seismic event occurs after cessation of the Navy's cleanup efforts, the resulting liquefaction would agitate the contaminated zone and could bring deeper contamination into the shallow groundwater or to the soil surface. Concentrations at the top of the groundwater table and even at the soil surface could rise to dangerous levels."

Response:

The remedy will be protective of human health and the environment, with LUCs implemented, as appropriate.

Written Public Comment, RAB Members – Specific Comment:

"Our questions from the June 2, 2011 letter remain unanswered."

Response:

Mr. Robinson provided an electronic response to Ms. Smith for RAB letters regarding comments on documents relating to OU-2B, OU-2C and the Five-Year Review. Mr. Robinson distributed three hard copies of the responses to comments at the August 2011, RAB meeting.

Written Public Comment, D. Smith – Specific Comment:

"As was stated in the RAB community letter concerning this site, soil vapor intrusions are a worrisome issue that is not adequately addressed by the Navy in any of its remediations. The Navy has been very reluctant to guarantee that it would be responsible for any future problems that could develop and, in fact, has demanded that the City of Alameda be responsible for some of the costs of clean up. It would be in the best interest of human health and the environment to require full treatment of the entire plume (Alternative 4) to guard against poor quality workmanship and a lack of commitment on the federal government's part to Alameda."

"Alternative G-4 addresses these concerns effectively. It would be protective of human health and the environment. Extraction of impacted groundwater and its treatment above-ground along with installation of PRBs [permeable reactive barriers] would reduce COC [chemical of concern] concentrations in groundwater and prevent further uncontrolled discharge of COCs into Seaplane Lagoon. Alternative G-4 would include implementation of ICs [institutional controls] until the concentrations of COCs in OU-2B groundwater are reduced to less than or equal to RGs. These ICs would minimize the potential for exposure of on-site receptors to COCs that could pose unacceptable risk. Because this alternative would treat extracted groundwater above-ground and treat groundwater in situ using PRBs, this alternative would reduce toxicity, mobility, and volume of COCs in groundwater. If ex-situ treatment is conducted using technologies such as advanced oxidation, VOCs [volatile organic compounds] would be completely destroyed to potentially non-toxic products such as carbon dioxide and water."

Response:

As stated previously, each of the proposed alternatives would leave concentrations of COCs in groundwater at levels at or below remediation goals. The preferred alternative will be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (ARARs), and meet the remediation goals.

Written Public Comment, D. Smith – Specific Comment:

"Installation of extraction/injection wells for groundwater is a mature and well-known technology. The ex-situ treatment technologies including granular activated carbon adsorption, mZVI, biological reactors, and advanced oxidation processes are also mature and well-known technologies. It is understood that full-scale implementation of groundwater recirculation will require pilot testing and detailed groundwater modeling. Both trench and trenchless PRBs are

well developed technologies. Trench barriers can be installed to depths of 25 feet to 30 feet using relative inexpensive excavation equipment, such as a standard backhoe. As the plume delineation, if accurate, indicates a near-shore depth of less than 30 feet, this technology is inexpensive and readily implementable.[1]"

"However, mZVI requires the utilization of experienced personnel at companies with solid experience working successfully in bay mud environments. There are two highly-qualified companies that successfully remediated Parcel D at Hunters Point available in the Bay Area who are approved for base closure work. Unfortunately, the Navy refused to utilize either consultancy and precipitated the quitting of a highly regarded geologist as a result."

1 – *Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21,* Oneida Total Integrated Enterprises, LLC, December 2011

Response:

The preferred alternatives will be protective of human health and the environment.

Written Public Comment, D. Smith – Specific Comment:

"I agree with the RAB comment letter regarding the soil remediation alternative."

Response:

Comment acknowledged.

COMMENTS FROM THE PUBLIC MEETING (May 15, 2013):

Speaker: George Humphreys

"My name is George Humphreys. I am a member of the Restoration Advisory Board, registered engineer in California, and a member of the State Bar. I practiced engineering for over 40 years working for a large architect engineering company in Oakland. I've worked on hazardous waste disposal, sanitary landfills, nuclear power plants, water desalting plants, and waste energy plants. My questions are:

1) Does the [$]1.6 million savings achieved by using Institutional Controls for cobalt and hexavalent chromium include demolition of the buildings overlying these areas of soil contamination?

2) Does treatment with zero-valent iron leave hydrocarbons in the groundwater?

3) Has the potential combustion/explosion hazard from gases like ethylene and methane been considered?

My comments are:

1) Major seismic events may agitate volatile and dense non-aqueous phase liquids in the

groundwater and bring them to either the surface – either the groundwater surface or the ground surface.

2) The cobalt and hexavalent chromium should be excavated and disposed of off site. Otherwise, the cost of institutional controls will go on indefinitely, not just for 30 years. Also, there is the problem of possible mobilization and migration of these contaminants away from the protective cover of the floor slabs.

3) The site probably will not be suitable for residential development. People should not be asked to live in a hermetically sealed environment. If residences are built over ground-floor commercial, both the residences and commercial buildings should be equipped with some sort of vapor detectors (analogous to carbon monoxide and smoke detectors).

4) Any subgrade ventilation should be powered (active), and not rely on the vagaries of wind power (passive) ventilators. The Alameda area is subject to offshore wind flow and stagnation conditions when passive systems will be ineffective. "

Response:

Question 1: "Savings" is incorrect, as the cost did not include building demolition. If building demolition was included in the cost, the amount would be significantly greater.

Question 2: All the groundwater treatment options evaluated would result in volatile organic compounds remaining in groundwater. However, concentrations would be reduced to or below the remediation goals.

Question 3: Yes, these were evaluated in the Feasibility Study (2011)/Feasibility Study Addendum (2012). At these concentrations, the lower explosive limit gas concentrations are not expected to be reached.

Comment 1: The remedy will be protective of human health and the environment, with LUCs implemented, as appropriate.

Comment 2: The preferred remedy to address cobalt and hexavalent chromium is in compliance with the NCP. LUCs are one part of the overall preferred remedy. Thirty years is used by U.S. EPA Guidance for cost comparison only. The existing data for OU-2B do not indicate that migration has occurred or is likely to occur.

Comment 3: The preferred remedy will allow for restricted residential use with LUCs and ICs. "Detectors" could be used, consistent with LUCs, by future developers.

Comment 4: Ventilation is feasible and could be part of future controls.

COMMENTS FROM THE PUBLIC MEETING (May 15, 2013):

Speaker: George Humphreys

"The cost estimates for the various alternatives are conceptual level; i.e., not based on remedial design. Therefore, the Groundwater Alternatives 3a, 3b, and 4 are essentially the same, say, [$]15 million, plus or minus [$]5 million."

Response:

The various alternatives presented in the Proposed Plan, Feasibility Study, and Feasibility Study Addendum are consistent with U.S. EPA Feasibility Study Guidance and are conceptual in nature. Development of the cost estimates are also presented consistent with U.S. EPA Feasibility Study Guidance, including the cost estimate range of +50/-30 percent.

COMMENTS FROM THE PUBLIC MEETING (May 15, 2013):

Speaker: Kent Peterson

"I'm a 40-year resident and property homeowner in Alameda. And the question is, how do we know that these things that are talked about will be actually taken care of in the fullest of time? And one of the questions about that is, who has the oversight and who has the authority to make sure it's going to happen that we can rely on? And the answer, of course, is the Congress. That's the end of my statement."

Response:

The ROD, which documents the final remedy(ies) for a site, is a legally binding document. Future property owners are bound by conditions put forth in the deed. Further, California DTSC has oversight and will have the authority to enforce the deed restrictions in the future.

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Applicable or Relevant and Appropriate Requirements (ARARs)

Federal Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste	Cal. Code Regs. tit. 22, §66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether waste is hazardous.
Clean Water Act of 1977, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)[c]				
Water quality standards. National Toxics Rule (NTR) and California Toxics Rules (CTR).	Discharges to waters of the United States.	40 C.F.R. §131.36(b) and 131.38	Relevant and Appropriate	The Federal Water Quality Criteria at 40 C.F.R. § 131.36 and 131.38 (referred to as the NTR and the CTR are relevant and appropriate federal requirements since OU-2B groundwater discharges into the Seaplane Lagoon.
	Discharges to the San Francisco Bay/ Sacramento–San Joaquin Delta Estuary.	40 C.F.R. §131.37	Relevant and Appropriate	The cited regulations are relevant and appropriate federal requirements since OU-2B groundwater discharges into the Seaplane Lagoon.
SOIL				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991 [i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste	Cal. Code Regs tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261. 100	Applicable	Applicable for determining whether the excavated impacted soil and soil cuttings generated as a result of well development at OU- 2B is hazardous.

Federal Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments

Notes:

[a] Many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[b] Only the substantive provisions of the requirements cited in this table are ARARs.

[c] Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only pertinent substantive requirements of the specific citations are considered ARARs.

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – California Code of Regulations
COC – contaminant of concern
CTR – California Toxics Rule
IR – Installation Restoration
Navy – Department of the Navy
NTR – National Toxics Rule
OU – Operable Unit
POC – point of compliance
RCRA – Resource Conservation and Recovery Act
§ – section
TCLP – toxicity characteristic leaching procedure
tit. – title

State Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Cal/EPA Department of Toxic Substances Control[c]				
Definition of "non-RCRA hazardous waste."	Waste	Cal. Code Regs. tit. 22, § 66261 .3(a)(2)(C) or 66261 .3(a)(2)(F), 66261 .22(a)(3) and (4), 66261 .24(a)(2)–(a)(8), 66261.101(a)(1) and (a)(2)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.
GROUNDWATER AND SOIL				
State and Regional Water Quality Control Boards[c]				
Authorizes the SWRCB and RWQCB to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.		Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Act)	Applicable	The Navy accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, WQOs, waste discharge requirements, promulgated policies of the Basin Plan for the San Francisco Bay, as ARARs.

State Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
Describes the water basins in San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes WQOs, including narrative and numerical standards, establishes implementation plans to meet WQOs and protect beneficial uses, and incorporates statewide water quality control plans and policies.		Comprehensive Water Quality Control Plan for the San Francisco Bay Region (Basin Plan) (Cal. Water Code § 13240)	Applicable	Substantive requirements pertaining to beneficial uses, WQOs, and certain statewide water quality control plans are state ARARs for the surface water and groundwater components of this response action.
Prescribes requirements for public water systems and potential public water systems.		22 CCR Section 64400:	Not Applicable to groundwater above the Yerba Buena Mud Aquitard. These requirements are to be considered (TBC) for purposes of assuring that the known VOC plume does not impact the deeper aquifer.	These requirements pertaining to public water systems are not applicable to the "shallow" groundwater, which is defined in the Water Board's letter as above the Yerba Buena Mud Aquitard. These requirements are cited as TBCs because the Navy's response to the known VOC plume in the shallow groundwater includes an obligation assure that there is no impact to the deep aquifer.

State Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
Establishes requirements for investigation and cleanup and abatement of discharges. Among other requirements, dischargers must clean up and abate the effects of discharges in a manner that promotes the attainment of either background water quality, or the best water quality that is reasonable if background water quality cannot be restored. Requires the application of Title 23, CCR, Section 2550.4, requirements to cleanups.		State Water Resources Control Board Resolution No. 92-49 (As amended April 21, 1994)	Navy and State disagree on whether Resolution 92-49 is a potential ARAR. As a practical matter, Navy and State have been able to reach agreement on cleanup levels at specific sites.	Applies to groundwater remedial actions.
Requires that high quality surface and ground waters be maintained to the maximum extent possible. Degradation of waters will be allowed (or allowed to remain) only if it is consistent with the maximum benefit to the people of the state, does not unreasonably affect present and anticipated beneficial uses, and does not result in water quality less than that prescribed in RWQCB and SWRCB policies. If degradation is allowed, the discharge must meet best practicable treatment or control, which must prevent pollution or nuisance and result in the highest water quality consistent with maximum benefit to the people of the state.		State Water Resources Control Board Resolution No. 68-16 ("Anti-degradation Policy").	Navy and State disagree on whether Reso. 68-16 is a potential ARAR. As a practical matter, Navy and State have been able to reach agreement on concentrations of waste left in place to ensure beneficial uses are not impacted and water quality objectives are not exceeded.	Applies to discharges of waste to waters, including discharges to soil that may affect surface or ground waters. In-situ cleanup levels for contaminated ground waters must be set at background level, unless allowing continued degradation is consistent with the maximum benefit of the people of the state. If degradation of waters is allowed, or allowed to remain, the discharge must meet best practical treatment or control standards, and result in the highest water quality possible that is consistent with the maximum benefit to the people of the state. In no case may water quality objectives be exceeded.

State Chemical-Specific[a] ARARs by Medium

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.		SWRCB Res. 88-63 (Sources of Drinking Water Policy)	Applicable (only for groundwater remedial action)	Substantive requirements are ARARs.
Definitions of designated waste, nonhazardous waste, and inert waste.		Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	Applicable	ARARs for classifying waste and determining ARAR status of other requirements.

Notes:

[a] Many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[b] Only the substantive provisions of the requirements cited in this table are ARARs.

[c] Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only pertinent substantive requirements of specific citations are considered ARARs.

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Basin Plan – Water Quality Control Plan (RWQCB Region) Basin
Cal. Code Regs. – California Code of Regulations
Cal/EPA – California Environmental Protection Agency
Cal. Water Code – California Water Code
div. – division
gpd – gallons per day
Navy – Department of the Navy
NPDES – National Pollutant Discharge Elimination System
Porter-Cologne Act – Porter-Cologne Water Quality Control Act
ppm – parts per million
RCRA – Resource Conservation and Recovery Act
Res. – Resolution
RWQCB – (California) Regional Water Quality Control Board
§ – section
SWRCB – (California) State Water Resources Control Board
TDS – total dissolved solids
tit. – title
WQO – water quality objective

Federal Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination	Comments
National Historic Preservation Act of 1966, as Amended (16 U.S.C. § 470-470x-6)[b]					
Historic project owned or controlled by federal agency	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	Property included in or eligible for the National Register of Historic Places.	16 U.S.C. § 470–470x-6 36 C.F.R. pt. 800 40 C.F.R. § 6.301(b)	Relevant and Appropriate	The substantive provisions of the cited regulation would be relevant and appropriate federal ARARs if the Navy concludes that buildings at OU-2B are eligible for inclusion on the National Register of Historic Places.
Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)[b]					
Migratory bird area	Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds.	16 U.S.C. § 703	Relevant and Appropriate	Because migratory birds are known to be present near Alameda Point that could stop at OU-2B, substantive provisions are relevant and appropriate.
Coastal Zone Management Act (16 U.S.C. §§ 1451–1464)[b]					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	16 U.S.C. § 1456(c) 15 C.F.R. § 930	Relevant and Appropriate	The Coastal Zone Management Act (CZMA) specifically excludes federal lands from the coastal zone (16 U.S.C. § 1453[1]). Therefore, the CZMA is not potentially applicable to OU-2B. Substantive provisions of the CZMA will be evaluated as a relevant and appropriate requirement because a state coastal zone management program is developed under state law guided by the CZMA and its accompanying implementing regulations in 15 C.F.R. § 930.

Notes:

[a] Only the substantive provisions of the requirements cited in this table are ARARs.

[b] Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.

Federal Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination	Comments

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement
C.F.R. – Code of Federal Regulations
CZMA – Coastal Zone Management Act
Navy – Department of the Navy
OU – operable unit
pt. – part
§ – section
U.S. – United States
U.S.C. – United States Code

State Location-Specific ARARs

Location	Requirements	Prerequisite	Citation	ARAR Determination	Comments
No additional State requirements were identified as location-specific ARARs.					

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901-6991[i])*				
On-site waste generation	Person who generates waste shall determine if that waste is a hazardous waste	Generator of waste	Cal. Code Regs. tit. 22,§ 66262.10(a), 66262.11	Applicable for any operation where waste is generated. The determination of whether groundwater and/or wastes generated during remedial activities, such as soil excavation, soil cutting from well installation and treatment residues, are hazardous will be made at the time the wastes are generated.
	Requirements for analyzing waste for determining whether waste is hazardous	Generator of waste	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	Applicable when analyzing waste generated during the groundwater remedial action and impacted soil excavation activities at OU-2B.
Hazardous waste accumulation	Onsite hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.171–178 or in tanks, on drip pads, inside buildings, and is labeled and dated, etc.	Accumulate hazardous waste	Cal. Code Regs. tit. 22 § 66262.34	Substantive generator requirements are applicable for accumulation of waste for less than 90 days if the waste is hazardous waste and is stored on site. Wastes will not be stored on site for greater than 90 days without complying with the substantive requirements for hazardous waste treatment, storage, and disposal facilities..

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Clean Closure	During the partial and final closure periods, all contaminated equipment, structures and soils shall be properly disposed or decontaminated by removing all hazardous waste and residues	Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66264.114	The substantive requirements of the cited regulation are determined to be relevant and appropriate for Alternative S-3A for the impacted soil. This alternative would include removal of impacted soil at OU-2B.
Container storage	Containers of RCRA hazardous waste must be: maintained in good condition, compatible with hazardous waste to be stored, and closed during storage except to add or remove waste	Storage of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere, in a container	Cal. Code Regs. tit. 22, § 66264.171, .172, .173	Substantive requirements are applicable for accumulation of waste stored on site.
	Inspect container storage areas weekly for deterioration		Cal. Code Regs. tit. 22, § 66264.174	Substantive requirements are applicable if hazardous wastes are generated and stored on site.
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system	Storage in a container of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere	Cal. Code Regs. tit. 22, § 66264.175(a) and (b)	Applicable if hazardous wastes are generated and stored on site.
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier		Cal. Code Regs. tit. 22, § 66264.177	Applicable for temporary storage of incompatible materials
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners		Cal. Code Regs. tit. 22, § 66264.178	Applicable if RCRA hazardous wastes are generated and stored.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Use of tank systems	Requirements for the design and installation of new tank systems including strength, tightness testing, damage control, support, corrosion control, etc.	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, § 66264.192(a), (b), (c), (e), (f) and (g)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.
	Requirements for secondary containment of tank systems	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, § 66264.193 (b), (c), (d), and (e)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.
	Requirements for secondary containment of ancillary equipment	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, § 66264.193 (f)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.
	Requirements for operation of tank systems including spill prevention and prohibitions of material that could cause failure	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, § 66264.194(a) and (b)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.
	Requirements for inspection of tank systems including inspection of overflow protection, corrosion, release, detection equipment, and cathodic protection	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, §66264.195(a), (b), and (c)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Use of tank systems (continued)	Requirements for response to leaks and spills from tank systems including removal of system from use if appropriate, containment, cleanup, emergency procedures, etc.	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, § 66264.196(b) except (b)(5) and (b)(7)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.
	Requirements for closure and post-closure care of tank systems decontamination, clean closure and leaving waste in place at closure	Tank systems for transferring, storing, or treating hazardous waste	Cal. Code Regs. tit. 22, § 66264.197(a) and (b)	If the groundwater extracted from the aquifer is characterized as RCRA hazardous waste and tank systems are used for its storage, the substantive requirements of the cited regulation are applicable.
Waste Pile	Allows generators to accumulate solid remediation waste in a U.S. EPA designated pile for storage only, up to 2 years, during remedial operations without triggering LDRs.	Hazardous remediation waste temporarily stored in piles	40 C.F.R. § 264.554(d) (1) (i–ii) and (d)(2), (e), (f), (h), (i), (j), and (k)	The substantive requirements are relevant and appropriate for storage of excavated impacted soil at OU-2B. The staging pile will be designed to prevent or minimize the releases of COCs into the environment, and minimize or adequately control cross-media transfer of pollutants.
Closure of Staging Pile	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste.	Waste pile used to store hazardous waste	Cal. Code Regs. tit. 22, § 66264.258(a)	Relevant and appropriate for the closure of the staging pile.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Monitoring	The RCRA monitoring regulations apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this article apply during the post closure care period under Cal. Code Regs. tit. 22, § 66264.117 of article 7 of this chapter and during any compliance period under Cal. Code Regs. tit. 22, § 66264.96 unless: (1) the regulated unit has been in compliance with the water quality protection standard for a period of 3 consecutive years; and (2) all waste, waste residues, contaminated containment system components, contaminated subsoils, and all other contaminated geologic materials are removed or decontaminated at closure.	Surface impoundment, waste pile, land treatment unit, or landfill for which constituents in or derived from waste in the unit may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.90(c)	Substantive provisions are relevant and appropriate for groundwater monitoring.
	Owners/operators of RCRA surface impoundment, waste pile, land treatment unit, or landfill shall conduct a monitoring and response program for each regulated unit.	Surface impoundment, waste pile, land treatment unit, or landfill for which constituents in or derived from waste in the unit may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.91(a)(4) and (c), except as it cross-references permit requirements	Relevant and appropriate for groundwater monitoring conducted as part of groundwater response action for VOCs.
Monitoring constituents of concern	Constituents of concern are the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from waste contained in the regulated unit.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.93	Substantive provisions are relevant and appropriate for the groundwater remedial action for VOCs.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Monitoring constituents of concern (continued)	Requirements for monitoring groundwater, surface water, and the vadose zone.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97 (b)(1)(A), (b)(1)(D)(1) and (2), (b) (4-7), (e)(6), (12)(A) and (B), (13), and (15)	Relevant and appropriate for groundwater remedial action for VOCs.
	Requirements for a detection monitoring program.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.98(e) (1-5), (i), (j), (k)(1-3), (4)(A) and (D),(5), (7)(C) and (D),(n)(1),(2) (B), and (C)	The requirements of detection monitoring program are only relevant and appropriate following completion of corrective action monitoring.
Corrective action	An owner or operator required pursuant to section 66264.91 to establish a corrective action program for a regulated unit shall, at a minimum, comply with the requirements of this section for that unit.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(a)	Relevant and appropriate for groundwater remedial action for VOCs.
	The owner or operator shall establish and implement, in conjunction with the corrective action measures, a water quality monitoring program that will demonstrate the effectiveness of the corrective action program and be effective in determining compliance with the water quality protection standard and in determining the success of the corrective action measures under subsection (c) of this section.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(d)	Relevant and appropriate for groundwater remedial action for VOCs.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Corrective action (continued)	The corrective action program is complete when compliance with the water quality standard is demonstrated based on the results of sampling and analysis for all constituents of concern for a period of 1 year.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(g) (1)	Relevant and appropriate for groundwater remedial action for VOCs.
Clean Air Act (42 U.S.C. §§ 7401 – 7671)*				
Discharge to air	Provisions of State Implementation Plan approved by U.S. EPA under Section 110 of Clean Air Act.	Major sources of air pollutants.	42 U.S.C. § 7410; portions of 40 C.F.R. §52.20	Applicable to fugitive dust emissions and stationary source that emits carcinogenic air contaminants. Specific pertinent rules are listed below.
	BACT shall be applied to any new source or modified source which results in an emission with the potential to emit 10.0 pounds or more per highest day of precursor organic compounds, non-precursor organic compounds, nitrogen oxides, sulfur dioxide, PM10 or carbon monoxide.	New source or modified source.	BAAQMD Regulation 2, Rule 2-301	Substantive provisions are applicable if there is potential to emit 10 pounds of the regulated compounds.
	A person shall not emit from any source for a period or periods aggregating more than 3 minutes in any hour a visible emission which is as dark as or darker than No. 1 on the Ringelmann Chart or of such opacity as to obscure an observer's view to an equivalent or greater degree.		BAAQMD Regulation 6- 301	Substantive provisions are applicable for the excavation activities.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Discharge to air (continued)	Emission rate limits for particulate matter based on process weight rate. A table of rates is given.		BAAQMD Regulation 6- 311	Substantive provisions are applicable for any miscellaneous operation if there is potential to emit 6.8 kg/day and containing a concentration of more than 300 ppm total carbon on a dry basis.
	A person shall not discharge into the atmosphere from any miscellaneous operation an emission containing more than 6.8 kg/day and containing a concentration of more than 300 ppm total carbon on a dry basis.		BAAQMD Regulation 8-2-301	Substantive provisions are applicable for any miscellaneous operation if there is potential to emit 6.8 kg/day and containing a concentration of more than 300 ppm total carbon on a dry basis.
Soil Staging	For active storage piles, contaminated soil shall be kept visibly moist by water spray, treated with a vapor suppressant, or covered with continuous heavy duty plastic sheeting or other covering to minimize emissions of organic compounds to the atmosphere. Covering shall be in good condition, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate. The surface area not covered by plastic sheeting or other covering shall not exceed 6,000 square feet.		BAAQMD Regulation 8-40-304	Substantive provisions are applicable for the staging of excavated soil if the prerequisite contamination may exist.
	For inactive storage piles, contaminated soil shall be covered during periods of inactivity longer than 1 hour as required above for Regulation 8-40-304.		BAAQMD Regulation 8-40-305	Substantive provisions are applicable for the staging of excavated soil if the prerequisite contamination may exist.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Staging piles	During excavation, all exposed contaminated soil surfaces above existing grade level shall be kept visibly moist or covered as described above for Regulation 8-40-304.		BAAQMD Regulation 8-40-306.1	Substantive provisions are applicable for the staging of excavated soil.
	All contaminated soils loaded into trucks or trailers for off-site disposal or treatment shall be covered with continuous heavy duty plastic sheeting or other covering so as to minimize emissions to the atmosphere as described above for Regulation 8-40-304.		BAAQMD Regulation 8-40-306.2	Substantive provisions are applicable for the staging of excavated soil.
	All contaminated soil shall be stockpiled separately from soil that is not contaminated unless emissions from the storage pile are minimized according to provisions of this rule.		BAAQMD Regulation 8-40-306.3	Substantive provisions are applicable for the staging of excavated soil.
	Within 45 days of excavation, or within 90 days for soil of organic content less than 500 ppm_w: 4.1) all contaminated soil shall be backfilled and covered with at least 6 inches of uncontaminated soil; or 4.2) all contaminated soil shall be removed from the site; or 4.3) treatment to remove the contamination shall be initiated.		BAAQMD Regulation 8-40-306.4	Substantive provisions are applicable for the staging of excavated soil if the prerequisite contamination may exist.

Federal Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs

Action	Requirements	Prerequisite	Citation	Comments
Soil excavation	During backfilling, all exposed contaminated soil surfaces shall be kept visibly moist by water spray, treated with a vapor suppressant, or covered with continuous heavy duty plastic sheeting or other covering to minimize emissions of organic compounds to the atmosphere. During periods of inactivity longer than 12 hours, backfilled contaminated soil shall be covered with at least 6 inches of uncontaminated soil, or covered as described above.		BAAQMD Regulation 8-40-306.6	Substantive provisions are applicable for the staging of excavated soil if the prerequisite contamination may exist.

Note:

***** Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered ARARs.

Acronyms/Abbreviations:

A – applicable
ARAR – applicable or relevant and appropriate requirement
BAAQMD – Bay Area Air Quality Management District
BACT – best available control technology
Cal. Code Regs. – California Code of Regulations
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – Code of Federal Regulations
COC – contaminant of concern
°F – degrees Fahrenheit
IR – Installation Restoration (Program)
kg/day – kilograms per day
LDR – land disposal restriction
MCL – maximum contaminant level
Navy – Department of the Navy
OU – operable unit
PM_{10} – particulate matter, less than 10 micrometers in diameter
ppm – parts per million
ppm_w – parts per million by weight
RA – relevant and appropriate
RCRA – Resource Conservation and Recovery Act
§ – section
subpt. – subpart
TBC – to be considered
tit. – title
UIC – underground injection control
U.S. – United States
U.S.C. – United States Code
USDW – underground source of drinking water
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

State Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs.

Action	Requirements	Prerequisite	Citation	Comments
Cal/EPA Department of Toxic Substances Control*				
Waste discharge to land	Remedial actions to contain wastes at the place of release shall implement this chapter to the extent feasible.		23 CCR 2510 et seq.	For wastes contained or left in place, State must identify specific provisions of Title 23 to address each action or site for ARAR consideration. Some provisions may be feasible, some may not.
Promotes the use of recycled water	Encourages the use of water recycling, water conservation, and use of stormwater (including dry-weather urban runoff).		Recycled Water Policy (State Water Resources Control Board Resolution 2009-0011 and as amended by Resolution 2013-0003).	This Policy is not an ARAR but it is to be considered (TBC) for purposes of promoting recycled water use from groundwater extraction systems and stormwater run-off.
Storm water controls during industrial activities	Implemented by a storm water permit for industrial activities.		40 CFR Parts 122, 123 and 124	The **substantive** requirements of stormwater permit are applicable to circumstances where storm water may come into contact with contaminated soil and carry pollutants to surface waters.

State Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs.

Action	Requirements	Prerequisite	Citation	Comments
Land Use Covenants	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when Facility closure, corrective action, remedial or removal action, or other response actions are undertaken and Hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Property transfer by the federal government to a non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1(a) and (e)(1)	These requirements are ARARs in the event of the transfer of the OU-2B property to a non-federal entity. Cal. Code Regs. tit. 22, § 67391.1 provides for a land-use covenant to be executed and recorded when remedial actions are taken and hazardous substances will remain at the property at concentrations that are unsuitable for unrestricted use of the land. The substantive provisions of this regulation have been determined to be “relevant and appropriate” state ARARs by the Navy. EPA agrees that the substantive portions of the regulations referenced are ARARs. EPA specifically considers Sections (a), (d), and (e) of Cal. Code Regs Title 22 §67391.1 to be ARARs for this ROD. DTSC’s position is that all of the state regulation is an ARAR.

State Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs.

Action	Requirements	Prerequisite	Citation	Comments
California Civil Code*				
Land-use controls	Provides conditions under which land-use restrictions will apply to successive owners of land.	Transfer property from the Navy to a non-federal agency.	Cal. Civ. Code §1471	These requirements are ARARs in the event of the transfer of the OU-2B property to a non-federal entity. Generally, Cal. Civ. Code § 1471 allows an owner of land to make a covenant to restrict the use of land for the benefit of a covenantee. The covenant runs with the land to bind successive owners, and the restrictions must be reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in Cal. Health & Safety Code § 25260. Substantive provisions are the following general narrative standard: “to do or refrain from doing some act on his or her own land . . . where each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence of hazardous materials, as defined in Section 25260 of the California Health and Safety Code.” This narrative standard would be implemented through incorporation of restrictive covenants in the deed and Environmental Restriction and Covenant Agreement at the time of transfer.

State Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
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Action	Requirements	Prerequisite	Citation	Comments
California Health and Safety Code*				
Land-use controls (continued)	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the Navy to a non-federal agency.	Cal. Health & Safety Code §25202.5	These requirements are ARARs in the event of the transfer of the OU-2B property to a non-federal entity. The substantive provisions of Cal. Health & Safety Code § 25202.5 are the general narrative standards to restrict “present and future uses of all or part of the land on which the ... facility ... is located ...”

State Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil.
OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs.

Action	Requirements	Prerequisite	Citation	Comments
Land-use controls (continued)	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions of Cal. Health & Safety Code § 25232(b)(1)(A)– (E).	Transfer property from the Navy to a non-federal agency.	Cal. Health & Safety Code § 25221 and 25355.5(a)(1)(C)	These requirements are ARARs in the event of the transfer of the OU-2B property to a non-federal entity. Generally, Cal. Health & Safety Code §§ 25221and 25355.5(a)(1)(C) provide the authority for the DTSC to enter into voluntary agreements with land owners to restrict the use of property. The agreements run with the land restricting present and future uses of the land. The substantive requirements of the following Cal. Health & Safety Code § 25221 provisions are "relevant and appropriate": (1) the general narrative standard: "restricting specified uses of the property…" and (2) "…the agreement is irrevocable, and shall be recorded by the owner, …as a hazardous waste easement, covenant, restriction or servitude, or any combination thereof, as appropriate, upon the present and future uses of the land." The substantive requirements of the following Cal. Health & Safety Code § 25355.5(a)(1)(C) provisions are "relevant and appropriate": "…execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof , as appropriate, upon the present and future uses of the land."

State Action-Specific ARARs

Impacted Soil at IR Sites 3 and 4: Institutional Controls; Excavation and Disposal of Impacted Soil. OU-2B Groundwater: Hot Spots and Shallow Groundwater Treatment using In-Situ Bioremediation, Monitoring, and ICs.

Action	Requirements	Prerequisite	Citation	Comments
Land-use controls (continued)	Provides processes and criteria for obtaining written variances from a land use restriction and for removal of the land use restrictions.	Transfer property from the Navy to a non-federal agency.	Cal. Health & Safety Code §§ 25223 and 25224	These requirements are ARARs in the event of the transfer of the OU-2B property to a non-federal entity. Cal. Health & Safety Code § 25223 sets forth "relevant and appropriate" substantive criteria for granting variances based upon specified environmental and health criteria. Cal. Health & Safety Code § 25224 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land-use restriction on the grounds that "…the waste no longer creates a significant existing or potential hazard to present or future public health or safety."

Note:

* Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs; specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific actions are considered ARARs.

Acronyms/Abbreviations:
A – applicable
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – California Code of Regulations
Cal/EPA – California Environmental Protection Agency
Cal. Health & Safety Code – California Health and Safety Code
Cal. Water Code – California Water Code
C.F.R. – Code of Federal Regulations
ch. – chapter
CWA – Clean Water Act
div. – division
DTSC – (Cal/EPA) Department of Toxic Substances Control
mg/L – milligrams per liter
NAVY – Department of the Navy
RA – relevant and appropriate
Res. – resolution
§ – section
SWRCB – (California) State Water Resources Control Board
TBC – to be considered
tit. – title
VOC – volatile organic compound

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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 file. For access to information contained in the Administrative Record file for Former NAS Alameda, please contact: Administrative Record, Naval Facilities Engineering Command, Southwest, Attn: Ms. Diane Silva, 2965 Mole Road, NBSD Building 3519, San Diego, California, 92136.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
1	**Administrative Record**	Section 1.2	Administrative Record Index for OU-2B, IR Sites 3, 4, 11, and 21. April 7, 2014.
2	**Proposed Plan**	Section 1.3	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013.
3	**Final ISTT Treatability Study**	Section 1.3, 2.3.3 and 2.9.2.2	Final Treatability Study Report In Situ Thermal Treatment of Chlorinated Solvents in Groundwater, Installation Restoration Operable Unit – 2B Site 11, Alameda Point, Alameda, California. December 2013.
4	**January 23, 2012**	Section 1.3.2	Letter from Alameda Reuse and Redevelopment Authority to Navy, et al. regarding beneficial use of shallow groundwater in southeast portion of Alameda Point. Dated January 23, 2012.
5	**August 6, 2012**	Section 1.3.2	Letter from Department of Navy to San Francisco Bay Regional Water Quality Control Board regarding request for groundwater use exception from consideration as a municipal or domestic water supply in the southeast portion of the Former Naval Air Station Alameda Point, Alameda, California. Dated August 6, 2012.
6	**Water Board concurrence letter**	Sections 1.3.2 2.2, 2.3.5, 2.5.3, 2.8.1, 2.8.4, 2.9.1, and 2.9.2.2	Letter from Water Board to Navy regarding concurrence with request for beneficial use exception for shallow groundwater at southeast portion of the former Naval Air Station, Alameda Point, Alameda County. Dated September 13, 2012.
7	**September 28, 2012**	Section 1.3.2	Letter from U.S. EPA to Navy regarding concurrence with groundwater use exception. Dated September 28, 2012.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
8	**Alameda Point**	Section 2.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 2.1.1, Page 2-1, Figure 1.
9	**OU-2B**	Section 2.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 2.1.2, Page 2-1, Figures 2 and 3.
10	**13-acre**	Section 2.1.1	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Page 3.
11	**IR Site 3**	Section 2.1.1	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 5.1.1; pages 5-1 through 5-6; Figures 5-1 and 5-2
12	**22 acres**	Section 2.1.2	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Page 3.
13	**Aircraft Engine Facility**	Section 2.1.2	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 6.1.1; pages 6-1 through 6-11; Figures 6-1 and 6-2
14	**5.4 acres**	Section 2.1.3	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Page 3.
15	**IR Site 11**	Section 2.1.3	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 7.1.1; pages 7-1 through 7-5; Figures 7-1 and 7-2
16	**5.1 acres**	Section 2.1.4	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Page 3.
17	**IR Site 21**	Section 2.1.4	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 8.1.1; pages 8-1 through 8-6; Figures 8-1 and 8-2
18	**geology**	Section 2.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.1.1, Pages 3-1 and 3-2.
19	**hydrogeology**	Section 2.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.1.2, Pages 3-2 through 3-5. Figures 8 through 16, Tables 3, 4, and 5.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
20	**RI Report for IR Site 3**	Section 2.3.1	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 5.2; pages 5-7 through 5-15; Figures 5-1, 5-3 and 5-4; Tables 5-1 through 5-16.
21	**nature and extent of contamination in soil at IR Site 3**	Section 2.3.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.2.1, Pages 3-6 through 3-9; Figures 18 and 19; Table 7.
22	**RI Report for IR Site 4**	Section 2.3.2	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 6.2; pages 6-11 through 6-25; Figures 6-1, 6-3 through 6-9; Tables 6-1 through 6-19.
23	**nature and extent of contamination in soil at IR Site 4**	Section 2.3.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.2.2, Pages 3-9 through 3-12; Figures 20, 20A, 21 and 22; Table 8, Appendix G, Attachment 7 (Figures 4 and 5; Table 1).
24	**RI Report for IR Site 11**	Section 2.3.3	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 7.2; pages 7-5 through 7-13; Figures 7-1 through 7-4; Tables 7-1 through 7-14.
25	**nature and extent of contamination in soil at IR Site 11**	Section 2.3.3	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.2.3, Pages 3-12 through 3-14; Figures 23 and 24; Table 9.
26	**RI Report for IR Site 21**	Section 2.3.4	Final OU-2B Remedial Investigation Report, Sites 3, 4, 11, and 21. SulTech 2005. Section 8.2; pages 8-7 through 8-15; Figures 8-1, 8-3 and 8-4; Tables 8-1 through 8-16.
27	**nature and extent of contamination in soil at IR Site 21**	Section 2.3.4	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.2.4, Pages 3-14 through 3-16; Figures 25 and 26; Table 10.
28	**FS Report for Groundwater**	Section 2.3.5	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.3, Pages 3-16 through 3-29; Figures 8, 22 and 27 through 40; Tables 11 through 15; Appendix G.
29	**revised HHRA**	Section 2.5	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Appendix B.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
30	**ERA**	Sections 2.5 and 2.5.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.9, Pages 3-41 through 3-47, Tables 26 through 31.
31	**below background**	Section 2.5.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Appendix B page 4; tables 8-1 through 8-8, 9-1 through 9-4, 9-6, and 9-9.
32	**Site 3, only the HHRA results for soil**	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Appendix B, tables 8-1 and 8-2.
33	**soil COCs at IR Site 3**	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.6.1, Pages 3-31 through 3-33, Tables 16 through 19.
34	**total cancer risk for cobalt**	Section 2.5.1.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Appendix B, Tables 8-7 and 8-8.
35	**HHRA results for soil at IR Site 4**	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Appendix B, Tables 8-3 and 8-4.
36	**soil COCs at IR Site 4**	Section 2.5.1.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.6.2, Pages 3-33 through 3-35, Tables 16, 20, and 21.
37	**HHRA results for soil at IR Site 11**	Section 2.5.1.3	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Appendix B, Tables 8-5 and 8-6.
38	**risk for OU-2B sites**	Section 2.5.1.5	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 3.6.1.3, Pages 3-32 through 3-33, Tables 16 and 19.
39	**updated residential risk for the groundwater plume**	Section 2.5.1.5	Final Feasibility Study Report Addendum Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2012. Page 2-2.
40	**values derived based on the ARARs**	Section 2.5.1.5	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Table 2, Page 13.

	Reference Phrase In ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
41	**FS Addendum**	Section 2.5.1.5	Final Feasibility Study Report Addendum Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2012. Section 2.0, Pages 2-1 through 2-3; Tables 1 through 3; and Appendix A, Sections 2-1 and 2-2, Pages 3-4; Tables 1 and 2.
42	**the nine NCP evaluation criteria**	Sections 2.8, 2.8.2, 2.8.4, and 2.9.1.1	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 4.3.1, Pages 4-8 through 4-10.
43	**IR Sites 3 and 4**	Section 2.8	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Pages 12-17; Tables 4 and 5.
44	**OU-2B-wide groundwater**	Section 2.8	Proposed Plan for Operable Unit (OU) 2B Installation Restoration Program Sites 3, 4, 11 and 21, Former NAS Alameda, Alameda, California. April 30, 2013. Pages 13-15; Tables 6 and 7.
45	**OU-2B FS Report**	Section 2.8.2	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 4.3, Pages 4-7 through 4-17, Table 36.
46	**OU-2B FS**	Section 2.8.3	Final Feasibility Study Report, Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2011. Section 5.6, Pages 5-21 through 5-37, Tables 38 and 40.
47	**amended in the addendum**	Section 2.8.3	Final Feasibility Study Report Addendum Operable Unit 2B, Installation Restoration Sites 3, 4, 11, and 21, Alameda Point, Alameda, California. OTIE 2012. Appendix A.
48	**public meeting transcript**	Sections 2.10.3 and 3	OU-2B Public Meeting Transcript

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ACRONYMS AND ABBREVIATIONS

§	Section
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
AST	above ground storage tank
B(a)P	Benzo(a)pyrene
BCT	BRAC Cleanup Team
bcy	bank cubic yards
bgs	below ground surface
BRAC	Base Realignment and Closure
BSU	bay sediment unit
CAA	(Petroleum Program) Corrective Action Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CIP	Community Involvement Plan
COC	chemical of concern
CSM	Conceptual Site Model
DCA	dichloroethane
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
DTSC	Department of Toxic Substances Control
EBS	Environmental Baseline Survey
EPC	exposure point concentration
ERA	ecological risk assessment
ERH	electrical resistance heating
FFA	Federal Facility Agreement
FS	feasibility study

GAP	generator accumulation point
GHG	greenhouse gas
HHRA	human health risk assessment
HI	Hazard Index
HQ	hazard quotient
IC	institutional control
IR	Installation Restoration
ISB	in-situ bioremediation
ISCO	in-situ chemical oxidation
ISTT	in-situ thermal treatment
LUC	land-use control
LUC RD	land-use control remedial design
M	miscellaneous area identifiied in RFA
mg/kg	milligram per kilogram
MNA	monitored natural attenuation
NA	not applicable
NADEP	Naval Aviation Depot
NAS	Naval Air Station
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NPV	net present value
O&M	operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
OWS	oil/water separators
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene (or perchloroethene)
PRB	permeable reactive barrier
PRC	preliminary remediation criteria
PRG	preliminary remediation goal
RA	remedial action
RAB	Restoration Advisory Board
RAO	remedial action objective

RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFA	RCRA Facility Assessment
RG	remediation goal
RI	remedial investigation
ROD	Record of Decision
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
SWRCB	State Water Resources Control Board
TCA	trichloroethane
TCE	trichloroethene
TP	Tiered Permit
TPH	total petroleum hydrocarbon
U.S. EPA	U.S. Environmental Protection Agency
UCL	
USC	*United States Code*
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board

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