Draft

Amended Parcel B Record of Decision

Hunters Point Shipyard
San Francisco, California

August 8, 2008

Prepared for:
Base Realignment and Closure
Program Management Office West
San Diego, California

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Prepared under:
Naval Facilities Engineering Command
Contract Number N62473-07-D-3213
Delivery Order 0019

CHAD.3213.0019.0011

TABLE OF CONTENTS

Attachment

FIGURES

TABLES

TABLES (Continued)

§	Section
§§	Sections
µg/L	Microgram per liter
ACHP	Advisory Council on Historic Preservation
ARAR	Applicable or relevant and appropriate requirement
ARIC	Area requiring institutional controls
BAAQMD	San Francisco Bay Area Air Quality Management District
Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin
Bay Plan	San Francisco Bay Plan
BCDC	San Francisco Bay Conservation and Development Commission
BCT	Base Realignment and Closure Cleanup Team
BHC	Benzene hexachloride, also known as hexachlorocyclohexane
bgs	Below ground surface
BRAC	Base Realignment and Closure
Cal. Code Regs.	California Code of Regulations
Cal/EPA	California Environmental Protection Agency
CE2	CE2 Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
ch.	Chapter
cm^2	Square centimeter
COC	Chemical of concern
COPC	Chemical of potential concern
CTR	California Toxics Rule
div.	Division
DNAPL	Dense nonaqueous-phase liquid
dpm	Disintegrations per minute
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
ER-M	Effects range-median
ERRG	Engineering/Remediation Resources Group
ESD	Explanation of significant differences
Fed. Reg.	Federal Register
FFA	Federal facility agreement

FS	Feasibility study
ft^2	Square feet
HGAL	Hunters Point groundwater ambient level
HHRA	Human health risk assessment
HI	Hazard index
HPAL	Hunters Point ambient level
HPS	Hunters Point Shipyard
HRA	Historical radiological assessment
IC	Institutional control
IR	Installation Restoration
IT Corp.	IT Corporation
ITSI	Innovative Technical Solutions, Inc.
LFR	Levine-Fricke-Recon, Inc.
LUC RD	Land use control remedial design
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
MOA	Memorandum of agreement
NAVSEA	Naval Sea Systems Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRC	U.S. Nuclear Regulatory Commission
NRDL	Naval Radiological Defense Laboratory
O&M	Operations and maintenance
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
pCi/g	Picocurie per gram
pCi/L	Picocurie per liter
POC	Point of compliance
ppt	Part per thousand
PQL	Practical quantitation limit
PRC	PRC Environmental Management, Inc.
PRG	Preliminary remediation goal

RAB	Restoration Advisory Board
RAMP	Remedial action monitoring program
RAO	Remedial action objective
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
Res.	Resolution
RESRAD	Residual radioactive (model)
RESRAD -BUILD	Residual radioactive-building (model)
Rfd	Reference dose
RI	Remedial investigation
RMP	Risk management plan
ROD	Record of decision
RU	Remedial unit
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SES-TECH	SES-TECH, Inc.
SF	Slope factor
SFRA	San Francisco Redevelopment Agency
Shaw	Shaw Environmental Inc.
SHPO	State Historic Preservation Office
SI	Site inspection
SLERA	Screening-level ecological risk assessment
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
SWRCB	State Water Resources Control Board
TBC	To be considered
TCRA	Time-critical removal action
TDS	Total dissolved solids
Tetra Tech	Tetra Tech EM Inc.
TPH	Total petroleum hydrocarbons
tit.	Title
TMSRA	Technical memorandum in support of a record of decision amendment
TtEC	Tetra Tech EC, Inc.
URS	URS Corporation
U.S.C.	United States Code

VOC	Volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board
WQO	Water quality objective
ZVI	Zero-valent iron

DECLARATION STATEMENT FOR PARCEL B

SITE NAME AND LOCATION

This amended Record of Decision (ROD) addresses Parcel B at Hunters Point Shipyard in San Francisco, California. The U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Information System identification (ID) number is CA1170090087.

STATEMENT OF BASIS AND PURPOSE

This amended ROD presents the amended selected remedy to remediate soil, groundwater, and structures at Parcel B. The document was developed and the amended remedy was selected in accordance with CERCLA of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (Title 42 *United States Code* Section 9601, et seq.) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 *Code of Federal Regulations* Part 300). This decision is supported by information contained in the administrative record file (see Attachment A). The Department of the Navy, EPA, the California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board) concur on the amended selected remedy for Parcel B [concurrence to follow the final amended ROD].

ASSESSMENT OF THE SITE

The amended selected remedy in this amended ROD is necessary to protect the public health and welfare and the environment from actual or threatened releases of pollutants, chemicals, or hazardous substances from soil, groundwater, and structures at Parcel B. The amended selected remedy was based on the following:

- Site histories
- Field investigations
- Laboratory analytical results
- Evaluation of potential human health and ecological risks
- Current and reasonably anticipated future land use
- 1997 Parcel B ROD

Results of the previous investigations indicated Parcel B poses a potential risk to human health and the environment based on current and reasonably anticipated future land and groundwater uses. The human health risk assessment (HHRA) identified the following chemicals (listed by medium) as posing risk to human health:

- Soil: Metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), pesticides, polychlorinated biphenyls (PCB), and radionuclides

- Groundwater: VOCs and SVOCs

- Structures: Radionuclides

The screening-level ecological risk assessment (SLERA) identified the following chemicals in sediment as posing risk to ecological receptors along the shoreline of Parcel B: metals, SVOCs, pesticides, and PCBs.

The SLERA identified a potential risk to saltwater aquatic organisms from concentrations of chromium VI, copper, lead, and mercury in groundwater at Parcel B that could discharge into San Francisco Bay. The SLERA did not identify other ecological risks because, other than the shoreline, Parcel B supports only limited habitat, the presence of terrestrial receptors is limited, and future land uses would not create additional ecological habitat.

DESCRIPTION OF THE AMENDED SELECTED REMEDY

The Navy has prepared this amended ROD for Parcel B because the Navy has concluded that the remedy selected in the 1997 ROD needs to be amended to be protective of human health and the environment in the long term and that the proposed amendments to the remedy will fundamentally alter its basic features. The original remedy for soil involved excavation and off-site disposal; however, this strategy was unable to achieve cleanup goals across Parcel B. The widespread distribution of metals, especially arsenic and manganese, in soil was the primary obstacle to this strategy. The amended remedy leaves hazardous substances in place that have not been excavated via CERCLA time-critical removal actions (TCRA) and incorporates covers for the remaining soil containing hazardous substances to prevent exposure. Likewise, groundwater contamination has been found to be more widespread and at higher concentrations than was known when the original remedy for groundwater was selected. The original remedy relied on monitoring; the amended remedy includes active treatment for groundwater. Finally, the original remedy did not address radiological contaminants, and the amended remedy incorporates actions to address radioactive chemicals found in soil and structures at Parcel B.

This amended ROD selects further action for soil, groundwater, and structures at Parcel B. The amended selected remedy includes the following components:

- Alternative S-5

    - Excavate soil in select areas where concentrations of chemicals of concern (COC) exceed remediation goals. Screen and separate radioactive anomalies from the excavated soil. Transport the excavated contaminated soil and materials off site to an appropriate disposal facility. Transport radioactive anomalies and contaminated soil off site to an appropriate low-level radioactive waste disposal facility. Backfill excavated areas with clean fill material.

- Install durable covers over the entire parcel to prevent contact with any COCs that are not excavated. Covers would be maintained to laterally contain the soil at the shoreline.

- Install a revetment along the shoreline of Redevelopment Blocks BOS-1 (at Installation Restoration [IR] Site 7) and BOS-3 (at IR-26).

- Install a soil vapor extraction (SVE) system at IR-10 (Redevelopment Block 8) to remove VOCs from soil.

- Conduct a soil gas survey following the remedial actions. The results of the survey will be used to provide data to establish risk-based numeric goals for VOCs in soil gas based on cumulative risk at a 10^{-6} risk level and to evaluate potential vapor intrusion risks. The results of the survey will be used to evaluate the need for additional remedial action and to identify where the initial areas requiring institutional controls (ARIC) for VOCs described in Section 12.2.1.5 shall be retained and areas where they shall be released. In some areas, site-specific pre-remediation soil gas surveys may be necessary to support the remedial design (RD). Monitoring for methane that will follow removal of the methane source would be used to evaluate whether contingencies such as additional engineering controls (for example, methane venting or vapor barriers) or additional institutional controls (IC) would be necessary.

- Implement ICs, including controls to maintain the integrity of the covers (as well as where the covers meet the shoreline). Legal instruments known as restrictive covenants in Quitclaim Deed(s) between the Navy and the property recipient and in "Covenant(s) to Restrict Use of Property" between DTSC and the Navy will be implemented to establish land use restrictions to limit exposure to contaminated soil and groundwater. A risk management plan (RMP) will be prepared by the City and County of San Francisco and will specify soil and groundwater management procedures for implementation of the ICs. Section 12.2.1.5 contains more details on ICs.

- Alternative GW-3A

  - Treat groundwater by injecting a biological amendment in the plume near IR-10 (Redevelopment Blocks 8 and 9) to break down VOCs where concentrations exceed remediation goals.

  - Treat groundwater, if necessary, by injecting an organo-sulfur compound to immobilize metal COCs (chromium VI, copper, lead, and mercury). The need to treat these metals will be based on further analysis of groundwater data against trigger levels; this analysis will occur during the RD.

  - Implement a groundwater monitoring program to verify treatment effectiveness during and after treatment. The monitoring program will be flexible to allow modifications as data are collected.

  - Implement ICs (see Section 12.2.1.5).

- Alternative R-3

  - Decontaminate radiologically impacted structures and dismantle them if necessary. Remove radiologically impacted storm drain and sanitary sewer lines throughout Parcel B. Survey former building sites and the discharge tunnel from Building 140. Screen removed materials and transport contaminated material off site to an appropriate disposal facility.

  - Conduct a surface scan for radiological materials at IR-07 and IR-18. Remove all radiological anomalies to a depth of 1 foot. Install a demarcation layer on the surveyed soil surface before a new 2-foot-thick soil cover is installed. Transport radioactive anomalies and contaminated soil off site to an appropriate low-level radioactive waste facility. Monitor groundwater at IR-07 and IR-18 for radionuclides of concern.

  - Close the pump shaft beneath Building 140 in place using backfilled stone and a concrete cap.

  - Implement ICs (see Section 12.2.1.5).

The Navy decided to address some of the newly identified sources (that is, methane and mercury sources and radiologically impacted storm drains, sanitary sewers, and former building sites) using TCRAs. Although the TCRAs may not be completed by the time the amended ROD is signed, the Navy anticipates that the TCRAs will meet the remedial action objectives described in this amended ROD.

STATUTORY DETERMINATIONS

The amended selected remedies for soil, groundwater, and structures at Parcel B are protective of human health and the environment, comply with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, are cost-effective, and use permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The amended selected remedy for soil (limited excavation and covers) and sediment (revetment) does not satisfy the statutory preference for remedies that employ treatment to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element. Treatment is not practical to address contaminants in soil or sediment because the contaminants are too widespread and effective treatment technologies are not available for some of the contaminants (especially metals and radionuclides). The amended selected remedy for groundwater (in situ treatment) satisfies the statutory preference for treatment as a principal element of the remedy; the remedy will reduce the toxicity, mobility, or volume of pollutants, chemicals, or hazardous substances as a principal element.

A statutory review pursuant to CERCLA Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan will be conducted within 5 years after the remedial action is initiated to ensure that the remedy is, or will be, protective of human health and the environment. This review is needed because the amended remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited

use and unrestricted exposure. Statutory 5-year reviews are in progress for remedial actions at Hunters Point Shipyard, including Parcel B, based on the original remedial actions started in 1998. The first 5-year review was completed in 2003, the second 5-year review is in progress and will be completed in 2008, and the next 5-year review is scheduled for 2013.

DATA CERTIFICATION CHECKLIST

Checklist Item	Description
Chemicals of potential concern (COPC) and their concentrations	COPCs were characterized throughout Parcel B based on data from previous investigations. A description of these investigations is provided in Section 2.2.2 of this amended ROD. A description of the nature and extent of contamination at Parcel B is presented in Section 5.5 of this amended ROD.
Risk assessments representative of the COPCs	A human health risk assessment (HHRA) and screening-level ecological risk assessment (SLERA) were conducted using data representative of current conditions at Parcel B. Results of these risk assessments are presented in Section 7.0 of this amended ROD.
Remediation goals established for the chemicals of concern (COC) and the basis for these goals	The amended selected remedies for soil, groundwater, and structures at Parcel B are designed to protect human health and the environment. Remediation goals were selected, by chemical, based on a comparison of (1) the concentration calculated in the risk assessment corresponding to a cancer risk of 10^{-6} or a noncancer hazard index of 1, (2) the laboratory practical quantitation limit (PQL), and (3) for metals only, the ambient level at Hunters Point Shipyard (called the HPAL for soil and the HGAL for groundwater). The highest of the three values was selected as the remediation goal for each chemical. For groundwater, if a legal requirement (see the discussion of applicable or relevant and appropriate requirements [ARAR] later) applied to the chemical, that value was selected; otherwise, the same comparison was made. The remediation goals are presented in Section 8.0 of this amended ROD.
How source materials constituting principal threats are addressed	Former buildings and surrounding areas were investigated and evaluated as potential sources. Results of previous investigations have not identified any significant soil or groundwater contamination or suggested the presence of a continuing source of CERCLA chemicals that would constitute a principal threat waste. The nature and extent of remaining contamination at Parcel B is discussed in Section 5.5 of this amended ROD.
Current and reasonably anticipated future land-use assumptions and current and potential beneficial uses of groundwater used in the HHRA and ROD	Small portions of Parcel B are currently used for commercial purposes. Risks were evaluated based on planned reuses including: residential, industrial, recreational, and construction workers. Planned reuses for Parcel B are described by the San Francisco Redevelopment Agency in the "Hunters Point Shipyard Redevelopment Plan." Current and reasonably anticipated future land use and beneficial groundwater use assumptions used in the HHRA are discussed in Section 7.1 of this amended ROD.
Potential land and groundwater use that will be available at the sites as a result of the selected remedies for soil and groundwater	Planned reuses at Parcel B include: research and development, mixed uses, educational and cultural, and open space. The remedies for Parcel B will support these long-term uses. Although the amended selected remedies will reduce the land use restrictions that are necessary to protect human health and the environment, future land and groundwater use at Parcel B is envisioned to always be subject to some ICs.
Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	Estimated capital and operation and maintenance costs are presented in Section 12.3.

DATA CERTIFICATION CHECKLIST (CONTINUED)

Checklist Item	Description
Key factors that led to selecting the remedies	The key factors for selecting the amended remedy for soil, sediment, and structures at Parcel B were (1) the remedy provides the best long-term effectiveness by permanently removing the greatest volume of contamination (by excavation) and preventing exposure to the remaining contamination (by covers); (2) the remedy includes the largest amount of treatment to destroy contaminants (using SVE); and (3) the remedy contains the most active remediation components and involves the least reliance on ICs to prevent exposure. The key factors for selecting the amended remedy for groundwater at Parcel B were (1) the remedy reduces the toxicity, mobility, and volume of VOCs by implementing an expedient and aggressive active treatment strategy; (2) the remedy provides long-term protection by reducing concentrations of VOCs and their associated risk; and (3) the remedy is the most cost effective of the active treatment options. Section 12.0 of this amended ROD describes the selected remedy for Parcel B. Section 13.0 describes the statutory determinations that were made regarding the amended selected remedies. Section 14.0 documents that the Navy has reviewed all written and oral comments submitted during the public comment period and that the Navy has determined that no significant changes to the amended selected remedies are necessary or appropriate.

AUTHORIZING SIGNATURES

This signature sheet documents the Navy's and EPA's co-selection of the amended remedy in this amended ROD. This signature sheet also documents the State of California's (DTSC and Water Board) concurrence with this amended ROD. The parties may sign this sheet in counterparts.

AUTHORIZING SIGNATURES

Signature **Date**

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BRAC Environmental Coordinator
BRAC Program Management Office West
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Signature **Date**

Mr. John Chesnutt
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Mr. Anthony Landis, P.E.
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Signature **Date**

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

1.0 INTRODUCTION

This Record of Decision (ROD) Amendment presents the amended selected remedies for Parcel B at Hunters Point Shipyard (HPS) in San Francisco, California. The document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (Title [Tit.] 42 *United States Code* [U.S.C.] Section [§] 9601 et seq.) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Tit. 40 *Code of Federal Regulations* [CFR] § 300 et seq.). The decision for Parcel B is based on the information contained in the administrative record. The administrative record index for Parcel B is found in Attachment A.

The following sections describe the site name and location, summarize the original ROD that was signed in October 1997, describe the need to revise the original remedy for Parcel B, and outline the organization of this amended ROD.

1.1 SITE NAME, LOCATION, AND DESCRIPTION

This amended ROD addresses Parcel B at HPS in San Francisco, California (see Figure 1-1). Hunters Point Shipyard includes about 866 acres (420 acres on land and 446 acres under water in San Francisco Bay). Parcel B includes 59 acres on the north side of HPS (see Figure 1-2). The U.S. Environmental Protection Agency (EPA) CERCLA Information System identification number is CA1170090087.

The Navy used HPS starting around 1940 for shipbuilding, repair, and maintenance. Most of Parcel B was formerly part of the industrial support area and was used for shipping, ship repair, training, barracks, and offices. Environmental activities at Parcel B have been conducted under the Navy's Installation Restoration (IR) Program in accordance with CERCLA and the NCP. HPS property was placed on the National Priorities List in 1989 as a Superfund site, pursuant to CERCLA as amended by SARA, because past shipyard operations left hazardous substances on site. In 1991, HPS was designated for closure under the Defense Base Closure and Realignment Act of 1990. Section 2.1 contains more details on the history of HPS and Parcel B.

According to the City and County of San Francisco's redevelopment plan (San Francisco Redevelopment Agency [SFRA] 1997), Parcel B will be zoned for the following reuses: research and development, mixed uses, educational and cultural, and open space. The table below lists the IR sites and planned reuses for Parcel B. Figure 1-3 illustrates the IR sites and redevelopment blocks at Parcel B.

Redevelopment Block	IR Site	Planned Reuse
1	Part of 18	Mixed Use
2	Parts of 07 and 18	Research and Development
3	07	Research and Development
4	Part of 62	Mixed Use
5	Parts of 62 and 23	Research and Development
6	61 and part of 23	Research and Development
7	42 and SI-31	Mixed Use
8	10	Mixed Use
9	Part of 24	Mixed Use
12	20 and part of 24	Mixed Use
15	Part of 26	Mixed Use
16	Part of 26	Educational/Cultural
BOS-1	Parts of 07 and 18	Open Space
BOS-2	60 and part of 24	Open Space
BOS-3	Part of 26	Open Space

1.2 OCTOBER 1997 ROD

The Navy and the regulatory agencies signed the ROD for Parcel B, dated October 7, 1997, on October 9, 1997 (Navy 1997). The ROD addressed both soil and groundwater contaminated by CERCLA hazardous substances at Parcel B.

The Navy selected excavation and off-site disposal as the remedy for contaminated soil at Parcel B. The major components of the soil portion of the remedy, as described in the ROD, included:

- Excavation of contaminated soil to the groundwater table or 10^{-6} cancer risk (residential) (later modified by an explanation of significant differences [ESD]; see Section 2.2.5 for additional details).
- Off-site disposal of contaminated soil (with treatment at the off-site landfill, if necessary to meet land disposal restrictions).
- Placement of clean backfill in the excavated areas.
- Deed notification indicating that soil below the groundwater table in remediated areas may be contaminated.
- Institutional controls (IC) governing the handling of residual contaminated soil.

Two subsequent changes were made to the soil portion of the selected remedy in the October 1997 ROD for Parcel B. These changes are described in the ESDs dated August 24, 1998, and May 4, 2000; Section 2.2.5 discusses the ESDs.

The Navy selected groundwater monitoring, lining storm drains, and removing steam and fuel lines as primary components of the selected remedy. The major components of the groundwater portion of the remedy, as described in the ROD, included:

- Lining the storm drains and pressure grouting the bedding material in the storm drains at IR-07 and IR-10 in those locations where the storm drain system is below the groundwater table in an affected groundwater area.
- Removal of steam and fuel lines.
- Deed restrictions on Parcel B, such as prohibiting all uses of groundwater within the shallow water-bearing zones to 90 feet below ground surface (bgs).
- Groundwater monitoring for up to 30 years to evaluate the effectiveness of the removal actions for soil and to monitor concentrations of hazardous substances that may migrate toward San Francisco Bay. Groundwater monitoring at IR-10 to monitor for the future potential degradation of trichloroethene to vinyl chloride.
- Deed notification indicating that contamination may be present in groundwater in the remediated areas and that surface discharge of contaminated groundwater is prohibited.

1.3 NEED FOR REEVALUATION OF ORIGINAL REMEDY

Updated information about Parcel B became available after the original 1997 ROD was signed from three major sources: (1) the original remedial action for soil conducted in 1998 through 2001, (2) groundwater monitoring from 1999 to the present, and (3) a historical radiological assessment (HRA) of HPS and subsequent removal actions to address radiological contaminants. Updated information includes items such as:

- The ubiquitous nature of metals in soil across Parcel B
- The presence of methane and mercury contaminant sources
- The findings of a screening-level ecological risk assessment (SLERA) for shoreline areas
- Changes in concentrations and toxicity criteria for volatile organic compounds (VOC) found in groundwater
- Findings from removal actions to address radiological contaminants

The first 5-year review (Tetra Tech 2003d) concluded that the remedy selected in the original ROD (Navy 1997) needed to be modified to be protective in the long term. The HPS Base Realignment and Closure (BRAC) Cleanup Team (BCT) therefore extended the schedule of CERCLA activities (contained in the federal facility agreement [FFA]) to evaluate modifications

to the Parcel B remedy and to support preparation of a Technical Memorandum in Support of a ROD Amendment (TMSRA) (ChaduxTt 2007) and the amended ROD itself. Table 1-1 summarizes the activities conducted in the CERCLA process at Parcel B.

The Navy has prepared this amended ROD for Parcel B because the Navy has concluded that the proposed changes to the selected remedy based on the evaluations in the TMSRA will "fundamentally alter the basic features of the selected remedy with respect to scope, performance, or cost," as described in the NCP at 40 CFR § 300.435(c)(2)(ii). For example, the consideration of parcel-wide covers to address soil contamination instead of excavation represents a fundamental change in the scope of the remedy for soil. Likewise, addition of active groundwater treatment methodologies to the remedy is a fundamental change in the scope of the remedy for groundwater. The updated information mentioned above and the more comprehensive understanding of groundwater, together with the planned land use, indicate the need to revise the conceptual site model, evaluate additional remedial actions, and amend the ROD.

The following sections describe the rationale for reevaluating the original remedy based on the updated information gained at the site (also see Section 5.0 for a discussion of site characteristics). The TMSRA (ChaduxTt 2007) presents a more detailed discussion of the need to reevaluate the original remedy, including a comparison of the original remedy to other remedial alternatives developed to address the updated site information.

1.3.1 Soil

The discrete release of chemicals, referred to as the "spill model," was the basis for the remedial action selected in the 1997 ROD. Under this conceptual model, high chemical concentrations occur near the center of the release and concentrations decrease outward. The delineation process used in the remedial action followed this model: successive "step-out" samples were collected from release areas identified by the remedial investigation to define the extent of the release outward until all samples contained concentrations that were less than the ROD cleanup goals. The spill model for chemical releases was appropriate for many areas at Parcel B. The Navy successfully delineated and removed all contaminants at concentrations above cleanup goals at 93 of 106 excavations implemented for the remedial action. The ubiquitous distribution of metals in soil, especially manganese, led to reevaluation of the remedy at the remaining 13 excavations at Parcel B, however.

The significant additional information gained from sampling and excavation during the remedial action indicated that the spill model did not account for all areas where chemical concentrations exceeded cleanup goals. As a result, the Navy recognized that the spill model needed to be supplemented to account for these other areas. A group of metals, especially arsenic and manganese, consistently exceeded cleanup goals at locations across Parcel B. The widespread distribution of this group of metals in soil at Parcel B (that is, their ubiquitous nature) is related to their occurrence in the local bedrock that was quarried for fill during the expansion of HPS in the 1940s. These metals occur naturally in the Franciscan Formation bedrock (especially in the serpentinite, chert, and basalt rock types) and were distributed throughout all parcels, including

Parcel B, as HPS was built. Although it is possible that some releases of these metals could have occurred from Navy activities, the range of concentrations of these metals at Parcel B is consistent with the range of concentrations in local bedrock. The resulting distribution of metals concentrations in soil is nearly random across the parcel, and the spill model for release does not apply. However, the concentrations of metals in the bedrock fill sometimes exceed the original ROD cleanup goals, and these metals concentrations are the primary reason that the "step-out" delineation process was not successful everywhere on Parcel B. Application of the spill conceptual model to the ubiquitous metals would result in excavation of most of the bedrock fill at Parcel B to a depth of 10 feet bgs, which is the depth required by the original ROD. Therefore, the Navy recognized the need to supplement the conceptual model to account for the ubiquitous distribution of metals in soil. Amended remedial alternatives in this amended ROD address ubiquitous metals using options such as containment beneath covers and institutional controls.

The term "ubiquitous" refers to metals that are naturally occurring or are in the same concentration ranges as naturally occurring metals in the source material (including material from the same geologic formations in the San Francisco area) used for filling operations at HPS. The Navy acknowledges that industrial sources of metals exist at HPS and that there is a potential that some concentrations of metals could have sources other than naturally occurring materials. The Navy has worked to remove these sources during the response actions taken to date. The Navy further acknowledges that the regulatory agencies do not agree with the Navy's position that ubiquitous metals are naturally occurring. Amended remedial alternatives included in this amended ROD address these concentrations of metals, regardless of their source.

In addition to identifying the ubiquitous nature of several metals in the bedrock fill, sampling and excavation during the remedial action found that the areas at IR-07 and IR-18 contained fill with a high proportion of demolition debris. The highly nonuniform distribution of chemicals within the debris fill also did not conform to the spill model and, consequently, excavations at IR-07 and IR-18 often greatly exceeded the originally planned extent of the removals. Furthermore, methane was detected in soil gas at a small area of the debris fill at IR-07. In addition, radiological contamination has been identified at some locations of Parcel B that was not known when the original ROD was prepared. The debris fill, methane, and radiological contamination created additional needs to update the conceptual site model, and additional remediation alternatives were prepared to address this new understanding of site conditions.

Comparison of the remedial action envisioned in the original ROD to the actions completed to date illustrates the large difference between the planned and actual site conditions at Parcel B. The estimate in the original ROD for the remedial action included removal of 38,000 cubic yards of soil over a period of 3 to 6 months at a cost of $11.2 million. The remedial action at Parcel B removed more than 100,000 cubic yards of soil over a period of 31 months at a cost of more than $40 million. (The 31 months when excavation occurred extended from July 1998 to December 2001.) Figure 1-4 compares the excavation areas estimated in the ROD with the actual remedial action excavations.

The updated site information and results from the remedial actions undertaken at Parcel B indicate the need to reevaluate the remedy selected in the original ROD. The remedy selected in the original ROD would not be protective of human health and the environment based on the updated information about the site. The following is a summary of the reevaluation of the original remedy against the two threshold and five balancing remedy selection criteria listed in the NCP at 40 CFR 300.430(e)(9)(iii). Section 6.0 of the TMSRA presents a more detailed discussion, including a comparison of the original remedy to other alternatives developed to address the updated site information. In the discussions below, the five balancing criteria are rated on a ranking scale using the following categories that were established in the TMSRA, listed from least to most highly rated: not acceptable, poor, good, very good, and excellent.

Original Soil Remedy

Protectiveness – the original ROD alternative did not consider excavation below 10 feet bgs, and it is likely that deeper excavation would be necessary to remove the sources of methane at IR-07 and mercury at IR-26. The original ROD alternative also did not account for potential radiological contamination. Therefore, the rating for the original ROD alternative for overall protection of human health and the environment would be not protective based on the methane and mercury sources that remain in place and the potential radiological contamination.

Compliance with applicable or relevant and appropriate requirements (ARAR) – the original remedy would not meet the ARARs identified in this amended ROD.

Long-term effectiveness – the original remedy would rank as poor based on the methane and mercury sources that remain in place.

Reduction of toxicity, mobility, and volume through treatment – excavation does not involve treatment; the original remedy ranks poor and would continue to rank as poor based on updated information about the site.

Short-term effectiveness – the original remedy would rank poor on this criterion based on the much longer time needed for implementation (more than 31 months to date versus 3 to 6 months) and the subsequent much longer exposure to workers and the community. The original remedy would not achieve the remedial action objectives unless much of the bedrock fill and the debris fill area were removed, resulting in more exposure to workers and the community.

Implementability – the original remedy would rank as poor based on the large-scale operation to remove bedrock fill and the debris fill area.

Cost – the original remedy would rank as poor based on the significantly higher (more than 3.5 times) cost required (more than $40 million to date versus $11.2 million). Total cost for full implementation would likely total more than $100 million.

Overall, the reevaluation of the original remedy would result in a determination of "not protective" based on lack of adequate protectiveness.

In summary, the excavation and off-site disposal remedy for soil, as described in the original ROD, would not be protective in the long term. Knowledge that the Navy has gained during the remedial action established the need to (1) supplement the conceptual model to include the random distribution of ubiquitous metals in soil, account for methane, mercury, radiological contamination, and the debris fill area at IR-07 and IR-18, (2) evaluate additional remedial actions for soil at Parcel B, and (3) amend the ROD. The amended ROD modifies the remedy for soil to support additional remedial actions that will address remaining risks.

1.3.2 Groundwater

The remedy selected in the original ROD for groundwater included lining storm drains, removing steam and fuel lines, restricting use of groundwater, and groundwater monitoring. However, the remedy selected for groundwater in the original ROD should be amended based on (1) the large amount of new information available from the more than 7 years of groundwater monitoring data gathered at Parcel B, including the detection of chromium VI and mercury in groundwater, and (2) changes in the toxicity estimates and exposure assumptions for VOCs since the ROD was prepared. Concentrations of VOCs in the area of IR-10 were found to be an order of magnitude higher than was known when the ROD was prepared. VOCs are now considered more toxic via the inhalation pathway than they were when the ROD was prepared. Consequently, intrusion of VOC vapors into buildings is a more significant human health risk. In particular, the groundwater remedy in the original ROD did not identify the VOC plume at IR-10 as requiring remediation. However, this plume may pose a much greater risk than was estimated in the original ROD. The original ROD did not contain any active remediation options to address the cleanup of VOCs in groundwater.

The Navy has investigated the area of IR-10 in considerable detail since the original ROD was prepared. The Navy installed more than 25 new groundwater monitoring wells in the area of IR-10 and conducted treatability studies to investigate methods to clean up the soil and groundwater. Treatability studies using soil vapor extraction (SVE) to remove VOCs from the unsaturated zone and injection of zero-valent iron (ZVI) to destroy VOCs in groundwater were successfully implemented at the IR-10 VOC plume. The TMSRA considered these and other remediation options to address the potential inhalation risks posed by VOCs that remain in soil and groundwater at IR-10.

Similar to the discussion above for soil, the updated site information and results from the remedial actions completed at Parcel B indicated the need to reassess remediation alternatives selected in the 1997 ROD. The original remedy would not be protective of human health and the environment based on the updated information about the site and on the revisions to human health toxicity criteria and exposure assumptions. The following is a summary of the reevaluation of the original remedy against the two threshold and five balancing criteria. Section 6.0 of the TMSRA presents a more detailed discussion, including a comparison of the original remedy to other alternatives developed to address the updated site information.

Original Groundwater Remedy

Protectiveness – the original remedy did not include institutional controls to limit access to buildings, and the remedy would not be considered protective of VOCs in groundwater that pose an unacceptable risk from vapor intrusion into buildings.

Compliance with ARARs – the original remedy would meet the ARARs identified in this amended ROD.

Long-term effectiveness – the original remedy would rank as poor based on the magnitude of remaining potential risks posed by VOCs.

Reduction of toxicity, mobility, and volume through treatment – the original remedy did not contain any treatment component and, therefore, would rank as poor for this criterion.

Short-term effectiveness – the original remedy included only groundwater monitoring and would rank as excellent based on the minimal and controllable exposure to workers during monitoring.

Implementability – the original remedy would rank as excellent based on the routine nature of groundwater monitoring.

Cost – the original remedy would rank as poor based on the higher cost required (about $8 million to date versus the ROD estimate of $3.6 million); groundwater monitoring costs would continue to be incurred into the future. Total cost for full implementation would likely total more than $10 million.

Overall, the reevaluation of the original remedy would result in a determination of "not protective" based on lack of adequate protectiveness.

In summary, the remedy for groundwater selected in the original ROD needs to be expanded to account for the increased potential risk from VOCs in groundwater and to provide remediation alternatives to address this risk. The amended ROD incorporates modifications to the remedy for groundwater soil to support additional remedial actions that will address remaining risks.

1.3.3 Shoreline

Potential ecological risk to aquatic receptors along the shoreline of Parcel B was not evaluated in the original ROD. The TMSRA included a SLERA to evaluate risks to aquatic receptors, and the TMSRA evaluated remediation alternatives to address these risks. The SLERA concluded that a variety of organic and inorganic chemicals in sediment along the shoreline and mercury in groundwater at IR-26 pose a potential unacceptable risk to aquatic receptors. The ROD needs to be amended to address potential ecological risks.

1.3.4 Radiological

Radiological contamination was not addressed by the original ROD; however, radiological contamination is present at Parcel B. The ROD needs to be amended to memorialize the methods and cleanup goals for radiological contaminants that are being addressed by the basewide radiological removal action. The radiological addendum to the TMSRA evaluated remediation alternatives for the radiological contamination (Tetra Tech EC, Inc. [TtEC] 2008).

1.4 DOCUMENT ORGANIZATION

This amended ROD is organized into 15 sections. After this introduction, this amended ROD includes the following sections:

- **Section 2.0, Site History and Enforcement Activities.** This section provides information on the history of Parcel B since the 1997 ROD was signed including: boundary changes, investigations, removal and remedial actions, and regulatory actions.

- **Section 3.0, Community Participation.** This section discusses the community participation activities for Parcel B since the 1997 ROD and summarizes activities conducted related to the original 1997 ROD.

- **Section 4.0, Scope and Role of the Response Action.** This section describes how the amended ROD for Parcel B relates to the response actions at the other parcels at HPS.

- **Section 5.0, Site Characteristics.** This section summarizes information on the physical features, ecology, geology, hydrogeology, and the nature and extent of contamination in soil and groundwater at Parcel B, with a focus on new information gained since the 1997 ROD was signed.

- **Section 6.0, Current and Potential Future Site and Resource Uses.** This section discusses (1) current and reasonably anticipated future land uses, and (2) current and potential groundwater and surface water uses.

- **Section 7.0, Summary of Site Risks.** This section summarizes the revised HHRA and the SLERA conducted at Parcel B to evaluate potential risks to human health and the environment.

- **Section 8.0, Amended Remedial Action Objectives.** This section summarizes the amended remedial action objectives for Parcel B based on the future site use and the results of the HHRA and SLERA.

- **Section 9.0, Description of Amended Remedial Alternatives.** This section describes the amended cleanup alternatives developed for soil, groundwater, and structures at Parcel B.

- **Section 10.0, Comparative Analysis of Amended Remedial Alternatives.** This section summarizes the comparative analysis that was conducted to evaluate the relative performance of each amended remedial alternative in relation to the nine criteria outlined in CERCLA.

- **Section 11.0, Principal Threat Waste.** This section discusses the principal threat wastes at Parcel B.

- **Section 12.0, Amended Selected Remedy.** This section summarizes the components of the selected remedial alternatives.

- **Section 13.0, Statutory Determinations.** This section provides a site-specific description of how the amended selected remedy satisfies the requirements of CERCLA § 121 and explains the 5-year review requirements for the amended selected remedy.

- **Section 14.0, Documentation of Significant Changes.** This section documents the significant changes in the amended selected remedy as compared with the proposed plan for Parcel B that was mailed to the public in June 2008.

- **Section 15.0**, **References.** This section lists the references used in this report.

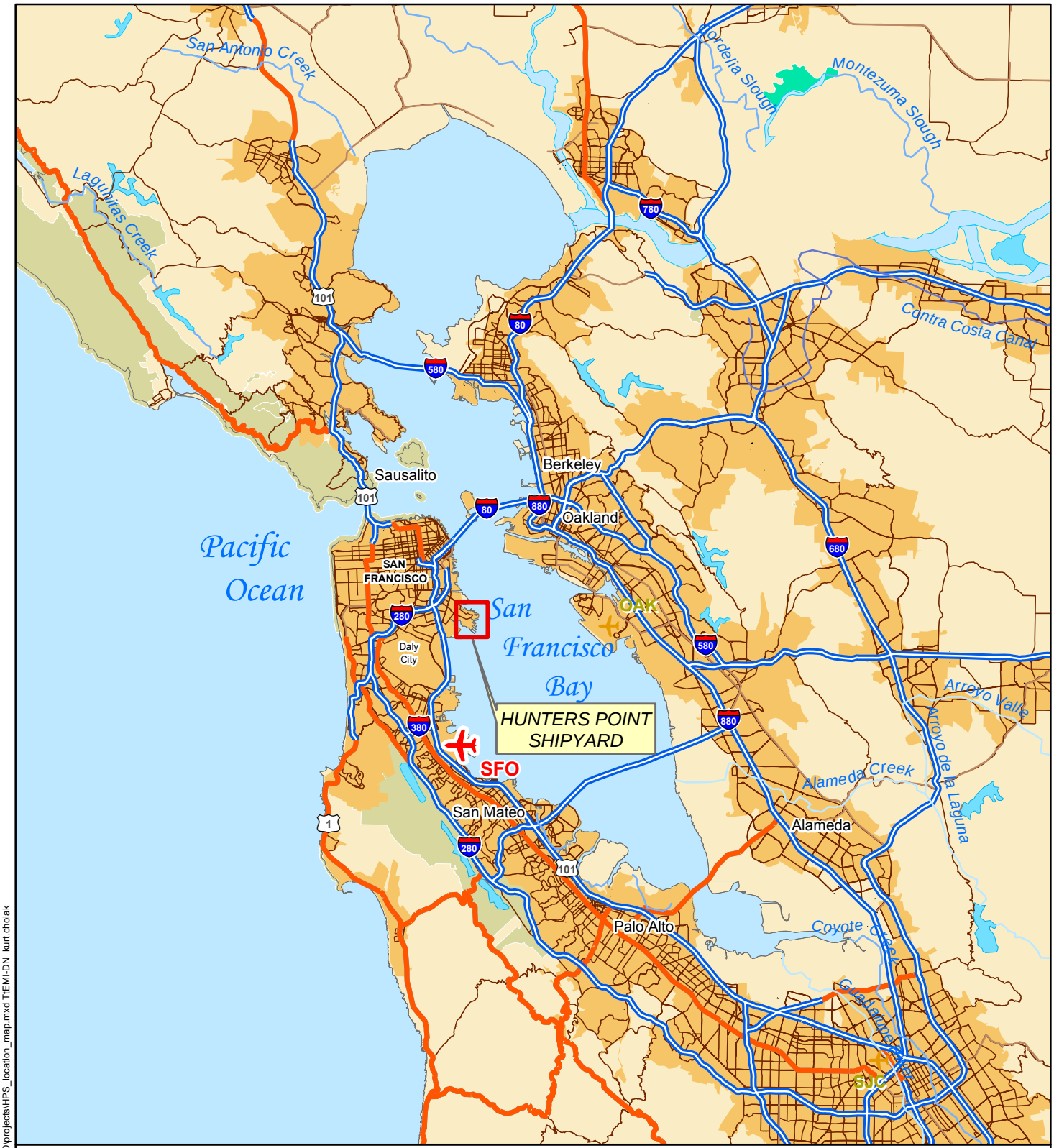
Figures and tables are presented after the section in which they are first mentioned. Additionally, the following attachments provide supplemental information for this amended ROD:

- **Attachment A, Administrative Record Index.** This attachment provides an index of the administrative record specific to Parcel B. [to be provided with draft final amended ROD]

- **Attachment B, Transcript from Public Meeting, Sign-in Sheet, and Public Notice.** This attachment provides a transcript from the public meeting on the proposed plan for Parcel B; and copies of the sign-in sheet and published public notice of the meeting. [to be provided with draft final amended ROD]

- **Attachment C, Responsiveness Summary.** This attachment provides the Navy's responses to questions raised during the public comment period.

FIGURES



Location Map

5 2.5 0 5

Miles

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California

U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 1-1
HUNTERS POINT SHIPYARD
LOCATION MAP

Amended ROD for Parcel B

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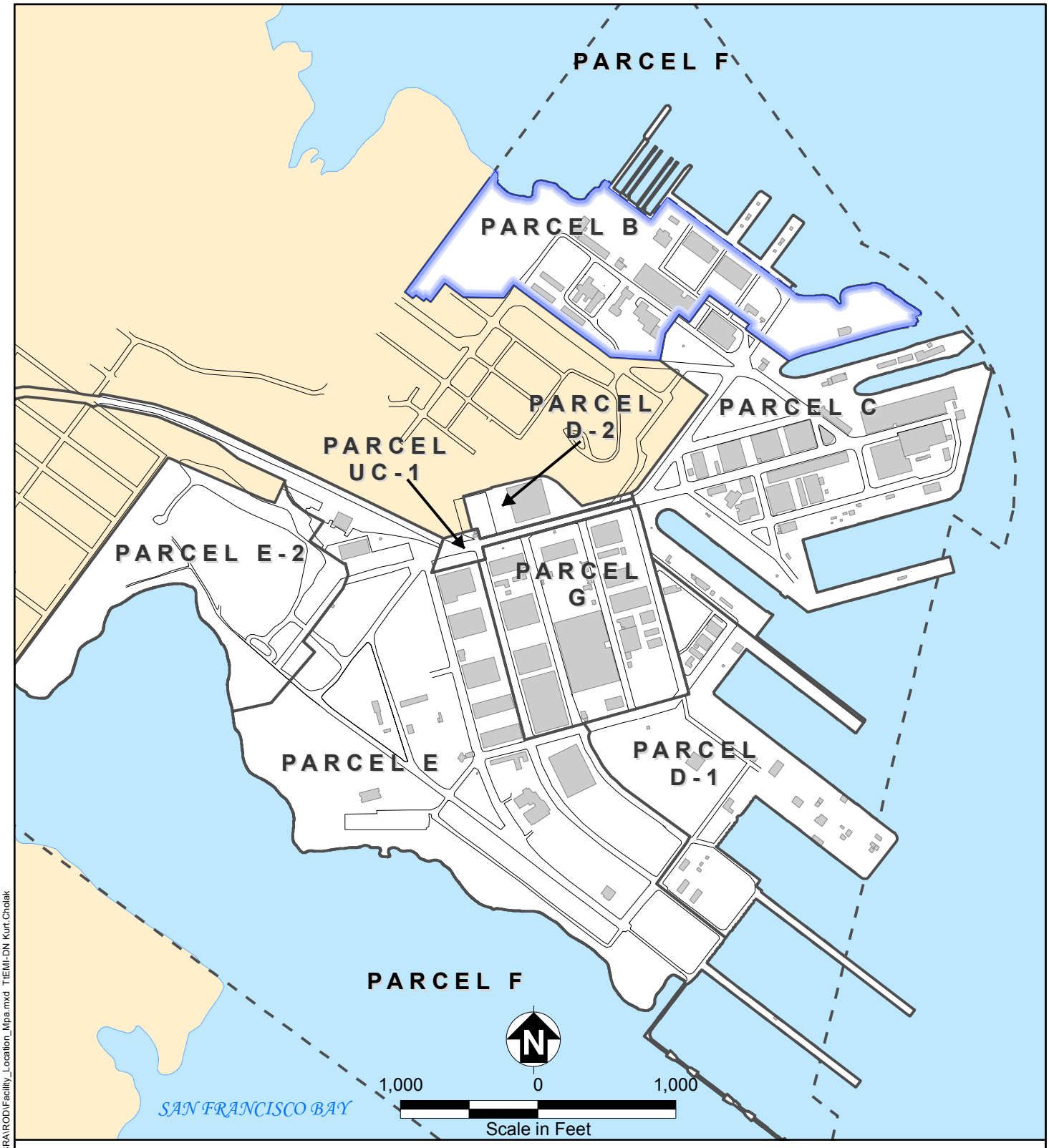

Location Map

- Parcel B Boundary
- Parcel Boundary
- Parcel F Boundary
- Building
- Non-Navy Property
- Road

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Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 1-2

FACILITY LOCATION MAP

Amended ROD for Parcel B

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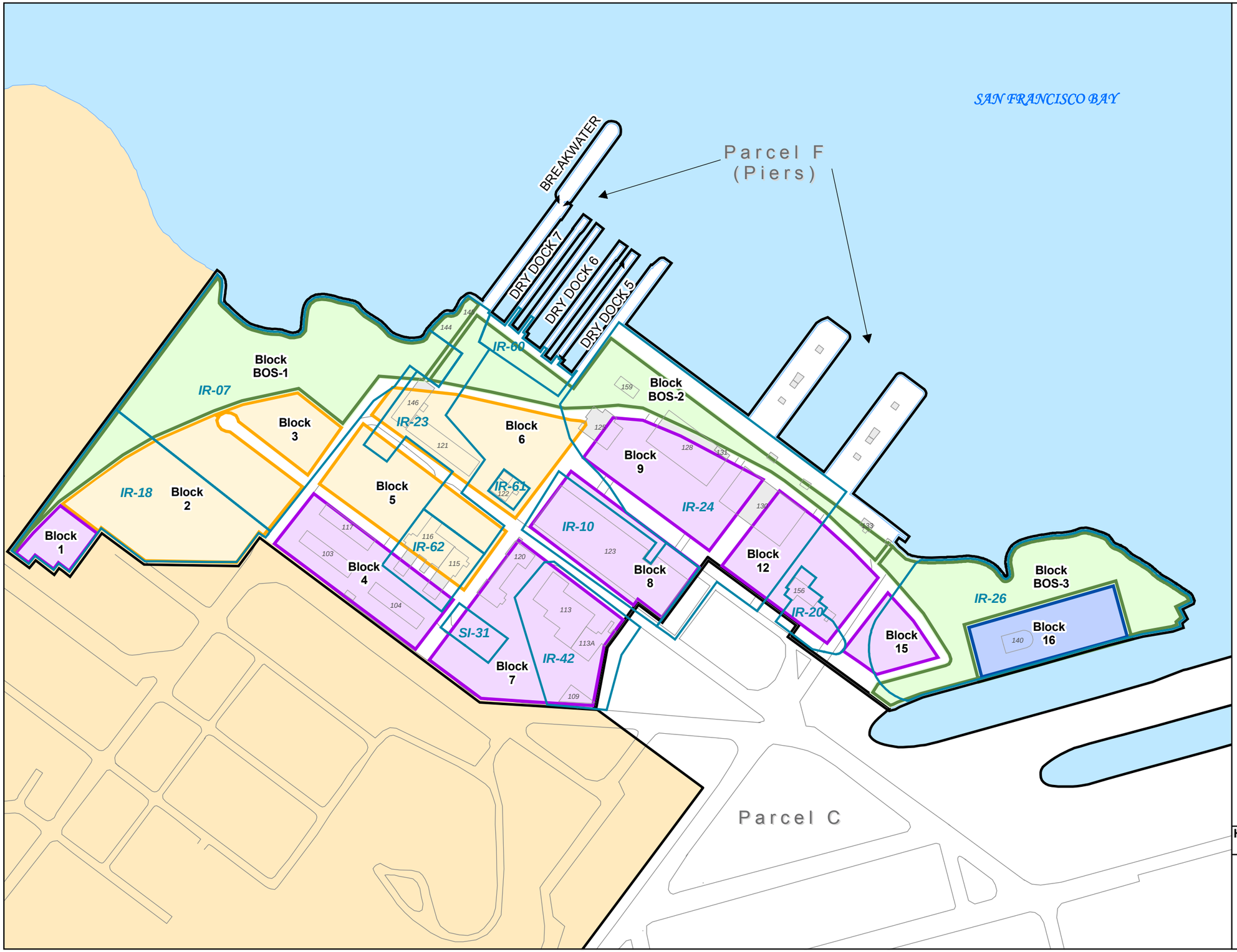

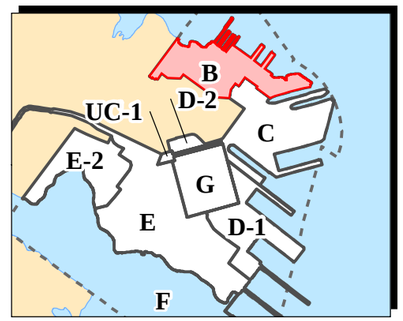

Location Map

Parcel B Redevelopment Blocks:

- Research and Development
- Mixed Use
- Open Space
- Educational/Cultural
- IR or SI Site
- Parcel Boundary
- Building
- Non-Navy Property
- San Francisco Bay

Notes:
IR Installation Restoration
SI Site Inspection

N

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 1-3
INSTALLATION RESTORATION AND SITE INSPECTION SITES AND REDEVELOPMENT BLOCKS
Amended ROD for Parcel B

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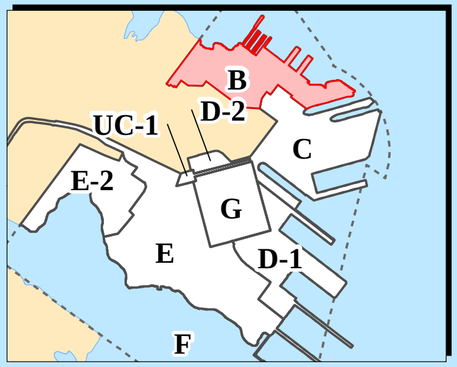

Location Map

SAN FRANCISCO BAY

145
144
146
159
125
121
128
131
122
130
117
103
116
115
120
123
133
104
113
113A
156
140
109

LOCKWOOD ST.

ROBINSON ST.

FISHER AVE.

Parcel C

VAN KEUREN AVE.

Planned Excavation, 1997 Record of Decision and Remedial Design

Extent of Excavation
Remedial Action Removals (July 1998 through December 2001)
Petroleum Removals (July 2004 through January 2005)

Building

Parcel B Boundary

Other Parcel Boundary

Non-Navy Property

San Francisco Bay

Road

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N

0 300 600

Scale in Feet

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 1-4
PLANNED VERSUS ACTUAL EXCAVATION AREAS

Amended ROD for Parcel B

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TABLES

TABLE 1-1: CERCLA CHRONOLOGY FOR PARCEL B
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

CERCLA Process Step	Document	Date Completed
Preliminary Assessment/Site Inspection	Site Inspection Report	April 1994
Remedial Investigation	Remedial Investigation Report	June 1996
Feasibility Study	Feasibility Study Report	November 1996
Proposed Plan	Proposed Plan	October 1996
Record of Decision	ROD	October 1997
Explanation of Significant Differences	Explanation of Significant Differences (first)	August 1998
Remedial Design	Remedial Design Documents	August 1999
Remedial Action (Phase I)	Field Excavations	July 1998 to September 1999
Explanation of Significant Differences	Explanation of Significant Differences (second)	May 2000
Remedial Design Amendment	Remedial Design Amendment	February 2001
Remedial Action (Phase II)	Field Excavations	July 2000 to December 2001
Remedial Action (report)	Construction Summary Report (draft) Construction Summary Report Addendum Construction Summary Report (final)	November 2002 September 2004 July 2008*
Five-Year Review	First Five-Year Review of Remedial Actions Implemented at Hunters Point Shipyard	December 2003
TMSRA (update to Feasibility Study)	Technical Memorandum in Support of a ROD Amendment	December 2007
TMSRA Radiological Addendum	TMSRA Radiological Addendum	March 2008
Proposed Plan in Support of a ROD Amendment	Proposed Plan	June 2008
Five-Year Review	Second Five-Year Review of Remedial Actions Implemented at Hunters Point Shipyard	December 2008*
Amended ROD	Amended ROD	January 2009*
Remedial Design	Remedial Design	November 2009*
Remedial Action	Field Actions and Report	September 2011*

Notes: * indicates a planned target date

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
ROD Record of decision
TMSRA Technical memorandum in support of a record of decision amendment

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section summarizes the history of HPS and Parcel B and describes the investigations and actions that have been conducted at Parcel B since the 1997 ROD.

2.1 SITE HISTORY

Hunters Point Shipyard consists of 866 acres: 420 acres on land, and 446 acres under water in San Francisco Bay. The Navy acquired ownership of the first portions of the shipyard property around 1940 and initially used the shipyard for shipbuilding, repair, and maintenance. After World War II, activities at Hunters Point Shipyard shifted to submarine maintenance and repair. However, the Navy continued to operate carrier overhaul and ship maintenance and repair facilities through the 1960s. Other significant activities after World War II included (1) potential disposal of decontamination materials from ships used during atomic weapons testing in the South Pacific during the 1950s that were decontaminated at the shipyard, (2) radiological decontamination of personnel, (3) storage of samples from atomic weapons testing, (4) radiological sample counting, (5) storage and disposal of radioluminescent devices, (6) non-destructive testing and gamma radiography, and (7) storage of low-level radioactive waste.

Hunters Point Shipyard was also the site of the Naval Radiological Defense Laboratory (NRDL) from the late 1940s until 1969. Initial tasks for the laboratory focused on the study of the effects of atomic weapons, including research into decontamination methods, personnel protection, and development of radiation detection instrumentation. Laboratory responsibilities grew to also include practical and applied research into the effects of radiation on living organisms and on natural and synthetic materials, in addition to continued decontamination experimentation. Hunters Point Shipyard was deactivated in 1974 and remained largely unused until 1976. Between 1976 and 1986, the Navy leased most of Hunters Point Shipyard to Triple A Machine Shop, Inc., a private ship repair company. The Navy resumed occupancy of Hunters Point Shipyard in 1987.

Currently, HPS is divided into nine parcels: B, C, D-1, D-2, E, E-2, F, G, and UC-1. Figure 1-2 identifies these parcels at HPS. In 1992, the Navy divided HPS into five contiguous parcels (A through E) to expedite remedial action and land reuse. In 1996, the Navy added a sixth parcel (Parcel F), also known as the offshore area. In September 2004, the Navy designated the landfill area in Parcel E as a separate parcel, Parcel E-2. In December 2004, the Navy transferred Parcel A to the San Francisco Redevelopment Agency. In July 2008, the Navy divided Parcel D into Parcels D-1, D-2, G, and UC-1. Figure 1-3 shows the IR and site inspection (SI) sites at Parcel B. Parcel B, which includes 59 acres on the north side of HPS, is the focus of this amended ROD.

Parcel B Installation Restoration and Site Inspection Sites

Remedial Investigation Sites :

07	24	51
10	26	60
18	42	61
20	46	62
23	50	

Site Inspection Sites :

31 45

*IR-06 and IR-25 moved to Parcel C

Parcel B is bounded by other portions of Hunters Point Shipyard, private property, and San Francisco Bay. Most of Parcel B was formerly part of the industrial support area

and was used for shipping, ship repair, training, barracks, and offices. Historically, Parcel B was investigated by IR site. Parcel B originally consisted of 16 IR sites, which were investigated during the remedial investigation, and two site inspection sites, which did not require further investigation. Since that time, the boundaries of Parcel B have been redefined, and IR-06 and IR-25 have become part of Parcel C. Sites SI-45 (steam line system) and IR-50 (storm drain and sanitary sewer system) are facility-wide utility sites that traverse other sites. Site IR-51 is a facility-wide site that consists of buildings and areas that formerly housed electrical transformers. Furthermore, any base infrastructure at Parcel B that is considered to be "hanging" off seawalls and quay walls into the bay, such as piers, wharves, and dry dock side walls, is considered to be part of Parcel F. Parcel B is also divided into redevelopment blocks that have been assigned redevelopment block numbers to help identify areas of Parcel B that are associated with specific planned reuses (Figure 1-3).

2.2 ACTIONS SINCE 1997 ROD

Actions since the October 1997 ROD include changes to the boundary of Parcel B, additional investigations, removal and remedial actions, treatability studies, and regulatory actions. Table 2-1 lists documents that summarize the post-ROD activities according to broad categories related to the soil remedy, groundwater remedy, treatability studies, or regulatory actions.

2.2.1 Changes in Parcel B Boundary

The boundary of Parcel B has changed twice since the October 1997 ROD. The first change affected the southeastern boundary with Parcel C. The Navy revised the boundary between Parcels B and C to consolidate the area subject to similar contamination and potential remedial action and include the area as part of Parcel C. This change moved IR-06 to Parcel C. The Navy documented the change in the boundary in a memorandum to the administrative record file on February 1, 2002 (Navy 2002). The adjustment of the parcel boundary to move IR-06 to Parcel C reduced the area of Parcel B from 63 to 59 acres.

The second change affected the southwestern boundary with the former Parcel A. Minor adjustments in the boundary in this area were made to ensure that soil contamination related to activities in Parcel B was contained within the boundary of Parcel B. The Navy documented this boundary adjustment in the finding of suitability to transfer documents for Parcel A (Tetra Tech 2004). The adjustment involved only a small fraction of an acre, and the area of Parcel B remained about 59 acres.

2.2.2 History of Investigations

This section discusses investigations the Navy has conducted at Parcel B since the October 1997 ROD. Additional investigation also occurred during remedial actions as well as during treatability studies, and these activities are discussed separately in the succeeding sections. The resulting changes to the site characterization for soil and groundwater contamination at Parcel B are discussed in Section 5.0.

Investigations at Parcel B since the 1997 ROD include the Historical Radiological Assessment, an investigation of the Bay Mud Aquitard and B-aquifer, a study of fill conditions at IR-07 and IR-18, an investigation into sediment contamination along the Parcel B shoreline, studies of ambient concentrations of nickel and manganese in soil, a soil gas investigation at IR-07 and IR-18, and an investigation of VOCs in groundwater at the boundary of Parcels B and C. More detailed descriptions of past investigations are included in Section 2.1 of the TMSRA (ChaduxTt 2007).

Historical Radiological Assessment. The HRA evaluated potential radiological contamination from use of general radioactive materials at HPS (Naval Sea Systems Command [NAVSEA] 2004). The HRA identified radiologically impacted areas at Parcel B and established the need for cleanup of radiological contamination. The term "radiologically impacted" is defined in the Historical Radiological Assessment as "an area, building, or piece of equipment that, under professional interpretation, has the distinct possibility of having residual radioactive material associated with it." Section 5.0 presents a summary of the nature and extent of radiological contamination at Parcel B. The Navy continues to investigate and clean up radiologically impacted areas throughout HPS, including some at Parcel B, under the authority of the Basewide Radiological Removal Action Memorandum (Navy 2000b).

Distribution of Bay Mud Aquitard and B-Aquifer Characterization. The Navy investigated the thickness and extent of the Bay Mud, which acts as an aquitard that separates the A- and B-aquifers, and characterized groundwater in the B-aquifer at Parcel B (Tetra Tech 2001a). The study found that the Bay Mud Aquitard separates the A- and B-aquifers or that the B-aquifer is absent in most of Parcel B. Lithologic results from the study are incorporated into the updated site characterization (see Section 5.0), and analytical results are included in the HHRA, which is Appendix A of the TMSRA (ChaduxTt 2007).

Fill Conditions Study at IR-07 and IR-18. The Navy studied the nature and extent of the debris fill at IR-07 and IR-18 to delineate further the types and distribution of debris materials observed during remedial action excavations at these IR sites (Tetra Tech 2003b). The study documented the progressive filling of San Francisco Bay in the area of IR-07 and IR-18 from 1948 to 1972 and noted widespread distribution of low-quality fill with a high debris content. Debris included wood, asphalt, concrete, brick, metal, and other demolition-type debris, as well as sandblast grit from HPS operations. The study concluded that fill conditions at IR-07 and IR-18 vary greatly from the rest of Parcel B. Potential remedial actions considered for IR-07 and IR-18 account for the unique subsurface conditions in this area.

Shoreline Sediment Investigation. The Navy investigated the nature and extent of chemicals in sediments along the shoreline at IR-07 and IR-26 (Tetra Tech and Innovative Technical Solutions, Inc. [ITSI] 2004b). Sediment samples collected during this investigation are further evaluated in the SLERA, which is Appendix B of the TMSRA.

Nickel and Manganese in Soil Studies. The Navy studied nickel and manganese to further evaluate the nature of background concentrations of these metals in HPS soils. Ambient concentrations of a broad group of metals are summarized as Hunters Point ambient levels (HPAL) (PRC Environmental Management, Inc. [PRC] 1995). However, the unique geology at HPS, and especially the presence of rock types such as serpentinite, basalt, and chert, results in

naturally higher concentrations of nickel and manganese. The Navy studied the distribution of nickel concentrations in soil across HPS and found a positive correlation among concentrations of nickel, magnesium, and cobalt. These correlations were quantified as regression equations for (1) nickel versus magnesium, and (2) nickel versus cobalt, and these regression equations replaced a single, numerical value for the HPAL for nickel (Tetra Tech 1999). The Navy also studied the distribution of manganese in soil across HPS (Tetra Tech 2001d, 2001e, 2001g). The Navy agreed to continue to use the original HPAL for manganese (1,431 milligrams per kilogram [mg/kg]). HPALs, including the regression equations for the HPAL for nickel, were considered during the HHRA.

Metals Concentrations in Franciscan Bedrock Outcrops Study. The Navy studied the ambient concentrations of metals in bedrock and bedrock-derived soil from three nonindustrial sites in San Francisco (Tetra Tech and ITSI 2004a). The geologic setting of these three sites is similar to HPS and contains serpentinite or chert and basalt bedrock typical of the Franciscan Complex. The study found elevated concentrations of arsenic, iron, and manganese associated with chert bedrock and elevated nickel concentrations associated with serpentinite. The chemical composition of soil at the three sites was found to be similar to the chemical composition of rock. Results from this study supported the assessment of the ubiquitous nature of metals in bedrock-derived fill at Parcel B.

Soil Gas Investigation at IR-07 and IR-18. The Navy investigated IR-07 and IR-18 to evaluate whether the fill is producing methane and other VOCs (SES-TECH 2005). The study consisted of active soil gas measurements across the IR-07 and IR-18 areas. The study found one area in the eastern portion of IR-07 where concentrations of methane and VOCs exceeded 5 percent methane (by volume in air) or 1,000 parts per million by volume VOCs. The Navy is conducting a time-critical removal action (TCRA) to address the methane source area (SES-TECH 2008).

VOCs in Groundwater Investigation at the Boundary of Parcels B and C. The Navy investigated the area near Building 134 along the boundary between Parcels B and C to further delineate the extent of VOC contamination in groundwater in the A-aquifer (CE2 Corporation [CE2] 2005). This VOC-contaminated area in Parcel C is termed remedial unit (RU)-C5. The investigation found (1) that dissolved-phase VOCs in groundwater in the shallow A-aquifer have migrated from Parcel C to Parcel B, but concentrations at Parcel B were below maximum contaminant levels (MCL), (2) that there was no indication of dense nonaqueous-phase liquids (DNAPL) in the aquifer at Parcel B, and (3) that there was no evidence for migration of DNAPLs onto Parcel B from Parcel C.

2.2.3 History of Removal and Remedial Actions

The 1997 ROD identified soil excavation and disposal and groundwater monitoring as major components of the remedy for Parcel B (Navy 1997). The following sections discuss these remedial actions and other, related removal actions by medium.

2.2.3.1 History of Soil Actions

The 1997 ROD identified excavation of contaminated soil, off-site disposal, and placement of clean backfill as the primary components of the selected remedy. The Navy conducted a series of excavations at Parcel B to remove contaminated soil, including (1) pre-ROD exploratory excavations in 1996, (2) remedial action excavations from 1998 to 2001, and (3) a removal action to excavate soil contaminated by fuel-related compounds in 2004. Figure 1-4 shows the locations of these previous excavations at Parcel B; additional details about the excavations are provided below.

Exploratory Excavations. The Navy conducted exploratory excavations at 18 sites across HPS between July 1996 and January 1997 (IT Corporation [IT Corp.] 1999). These excavations included removal actions at five sites at Parcel B. The volume of the excavations was limited during this initial, exploratory phase. A total of approximately 1,700 cubic yards of soil was removed from the five sites at Parcel B.

Remedial Actions. The Navy conducted remedial actions for soil in two phases: 1998 to 1999, and 2000 to 2001. The Navy excavated about 54,400 cubic yards of soil from 84 areas at Parcel B between July 1998 and September 1999. The RD (Tetra Tech and Morrison Knudsen Corporation 1999a) for this phase included confirmation sampling after an excavation had been completed. However, the excavations failed to remove contaminants to below cleanup goals for soil in many excavations, and the soil remedial action paused in September 1999 while the Navy reevaluated the cleanup goals presented in the 1997 ROD (see Section 2.2.5 for more discussion).

The Navy summarized revised cleanup goals in the May 2000 ESD (Navy 2000a). Between May 2000 and December 2001, the Navy excavated and disposed of off site approximately 47,200 cubic yards of soil from 43 areas, some of which had been originally excavated from 1998 to 1999. This second phase of excavation followed an amended remedial design (RD) that included pre-excavation sampling to delineate excavation areas (Tetra Tech 2001b). New excavation areas were opened during the second phase, and some excavations begun in 1998 to 1999 were reopened. Similar to the first phase, the second phase of excavations did not remove all contaminants to below cleanup levels for soil, and the remedial action was halted for reevaluation. The Navy excavated a total of 101,600 cubic yards of soil from 106 areas at Parcel B during both phases, compared with the estimate of 38,000 cubic yards at 85 areas in the 1997 ROD. Details of the remedial action excavations are presented in the construction summary report (ChaduxTt 2008).

Excavations to Remove Fuel-Related Contamination. The Navy removed about 29,000 cubic yards of soil from 12 excavations at sites across HPS between July 2004 and January 2005 as part of its total petroleum hydrocarbons (TPH) program to remove soil that was contaminated by fuel-related products (TPA-CKY Joint Venture 2005). The Navy removed and disposed off site about 9,800 cubic yards of soil from two areas at Parcel B during this action.

2.2.3.2 History of Groundwater Actions

The 1997 ROD identified groundwater monitoring, lining storm drains, and removing steam and fuel lines as primary components of the selected remedy. The Navy developed the remedial action monitoring program (RAMP) to describe the groundwater monitoring program for Parcel B. The Navy investigated storm drains as potential conduits for groundwater migration and excavated steam and fuel lines. In addition, the Navy investigated the extent of chromium VI in groundwater at IR-10 during implementation of the RAMP. The following sections present details of the RAMP and these related removals and investigations.

Remedial Action Monitoring Program. The Navy prepared the RAMP (Tetra Tech and Morrison Knudsen Corporation 1999b) as part of the RD in 1999. In accordance with the requirements of the 1997 ROD, the RAMP established monitoring locations (1) along the point of compliance (POC), which was defined as the high-tide line of the tidally influenced zone, and (2) at positions upgradient from the POC (sentinel wells). The RAMP originally identified 24 wells for groundwater monitoring.

In addition to the original RAMP wells, the Navy incorporated other wells during the monitoring program: (1) additional wells in and around the IR-10 VOC plume, (2) supplemental characterization wells near Excavation EE-05 in IR-26, and (3) a well to monitor chromium VI. All wells are sampled quarterly except for the sentinel wells, which are sampled semiannually. The Navy currently monitors 36 wells in the RAMP and has collected samples for 33 quarters as of March 2008.

Chromium VI Delineation Study. The Navy installed 10 temporary monitoring wells in the A-aquifer in 2002 at locations down-, cross-, and up-gradient from well IR10MW12A to monitor concentrations of chromium VI in groundwater in the area of this well. The study concluded that downward migration of chromium VI was unlikely based on the low hydraulic conductivity of the clay, the large available surface area for adsorption, and the high potential for reduction of chromium VI to chromium III by organic material, iron, and manganese contained in the clay. The study found the extent of chromium VI was limited to the immediate area around well IR10MW12A.

Storm Drain Infiltration Studies. The Navy studied potential infiltration of groundwater into storm drain lines at Parcel B in October 1997 (Tetra Tech 1998). After review and comments by the BCT, the Navy conducted a focused investigation of two reaches of the storm drain in Parcel B between April 1999 and November 2000 (Tetra Tech 2001c). The two reaches investigated were storm water Basins 2 and 4; both were below the groundwater table and intersected contaminant plumes (as mapped at that time). Basin 2 is located in eastern IR-07, north of Building 146; Basin 4 is located in eastern IR-24, roughly between Buildings 134 and 130. Overall, the study recommended no further action be taken related to the storm drains, except for continued monitoring of a group of RAMP wells.

Groundwater Evaluation Technical Memorandum. After 2 years of groundwater monitoring under the RAMP, the Navy prepared a technical memorandum (Tetra Tech 2001f) to reevaluate

the monitoring program based on the groundwater data collected by the RAMP and earlier investigations and to recommend revisions to the RAMP. The Navy and the BCT discussed the recommendations in the technical memorandum but did not agree on modifications to the RAMP. The technical memorandum was not finalized and, although wells were added to the RAMP, the RAMP document was not changed.

2.2.4 History of Treatability Studies

The Navy conducted treatability studies at IR-10 using SVE and injection of ZVI to evaluate the effectiveness of these techniques to clean up VOCs in soil and groundwater located beneath the northwestern portion of Building 123. The Navy also conducted a treatability study using sequential anaerobic and aerobic bioremediation at nearby Building 134 in Parcel C for similar contaminants (VOCs) in groundwater. The following sections briefly describe these studies.

Soil Vapor Extraction. The Navy tested a pilot-scale SVE system at Building 123 in IR-10 between December 2000 and June 2001 (IT Corp. 2002). The test used a trailer-mounted blower system and granular activated carbon for off-gas cleanup. Testing showed significant removal of VOCs, although VOC concentrations rebounded after the SVE system was shut down. The Navy confirmed the effectiveness of the pilot test by collecting soil samples in the treatment area during September 2002 (Tetra Tech 2003c). Analysis of these soil samples indicated that VOC concentrations were reduced about 80 percent during test operations.

The Navy expanded the pilot-scale SVE system at Building 123 during January through May 2005 (ITSI 2006). The SVE system operated from June through September 2005, when the system was shut down for rebound monitoring through December 2005. Vapor monitoring indicated that VOCs were reduced to below detection levels in 49 of 51 monitoring wells. The treatability study report recommended that the system be expanded to include additional vapor extraction wells and operated to remove additional VOCs. The system remains in place and operation of the SVE system is incorporated into the amended remedial actions discussed in this amended ROD.

Zero-Valent Iron Injection. The Navy evaluated the effectiveness of ZVI as a means to clean up chlorinated VOCs in groundwater at IR-10. The Navy conducted a pilot test using ZVI at Building 123 between September 2003 and March 2004 (Engineering/Remediation Resources Group, Inc. [ERRG] and URS Corporation [URS] 2004). The test included injection of a slurry of about 130,500 pounds of ZVI powder into the A-aquifer. Results from groundwater monitoring indicated about a 50-percent reduction in the mean concentration of trichloroethene. In some individual wells, trichloroethene concentrations dropped from hundreds of milligrams per liter to below detection limits. Monitoring the groundwater in the test area continues under the RAMP. The results of this treatability study were the basis for incorporating ZVI injection in the amended remedial alternatives.

Sequential Anaerobic and Aerobic Bioremediation. The Navy tested a pilot-scale system for sequential anaerobic and aerobic bioremediation at Building 134 in Parcel C from April 2004 through June 2005 (Shaw Environmental, Inc. [Shaw] 2005). The anaerobic stage of the test

continued through December 2004 and included injection of lactate and hydrogen to stimulate biological breakdown of chlorinated solvents in groundwater in the A-aquifer. The data indicate that the indigenous organisms are capable of complete degradation of the chlorinated ethenes to non-toxic ethene. The results of this treatability study supported incorporating lactate injection in the amended remedial alternatives.

2.2.5 History of Regulatory Actions

This section briefly describes the 1997 ROD and the two subsequent ESDs that apply to Parcel B. This section also summarizes the first 5-year review for HPS, which focused on Parcel B.

2.2.5.1 October 1997 ROD

The Navy and the regulatory agencies signed the ROD for Parcel B, dated October 7, 1997, on October 9, 1997 (Navy 1997). The ROD addressed both soil and groundwater contaminated by CERCLA hazardous substances at Parcel B. The ROD also addressed remediation of areas where CERCLA hazardous substances are commingled with petroleum hydrocarbons. Areas that contained only petroleum hydrocarbons, which are not hazardous substances as defined by CERCLA, are addressed in a separate petroleum hydrocarbon corrective action plan under the oversight of the San Francisco Bay Regional Water Quality Control Board (Water Board) (Shaw 2008).

The Navy selected excavation and off-site disposal as the remedy for contaminated soil at Parcel B. The Navy selected groundwater monitoring, lining of storm drains, and removal of steam and fuel lines as primary components of the selected remedy for groundwater. The major components of the remedy are listed in Section 1.2.

Two subsequent changes were made to the soil portion of the selected remedy in the October 1997 ROD for Parcel B. These changes were described in the ESDs dated August 24, 1998, and May 4, 2000.

2.2.5.2 August 1998 ESD

The first ESD to the Parcel B ROD was dated August 24, 1998, and was signed by the Navy and the regulatory agencies on October 28, 1998 (Navy 1998). This ESD revised the selected remedy to require excavation of contaminated soils to a 10^{-6} cancer risk (residential) or to a maximum depth of 10 feet bgs, instead of to groundwater as required by the 1997 ROD.

2.2.5.3 May 2000 ESD

The second ESD to the Parcel B ROD was dated May 4, 2000, and was signed by the Navy and the regulatory agencies on May 9, 2000 (Navy 2000a). The May 2000 ESD updated the cleanup goals for soil presented in Table 8 of the Parcel B ROD to incorporate (1) the methodologies and

toxicological data from EPA's 1999 preliminary remediation goals (PRG) into the site-specific cleanup goals for Parcel B, including adjustments by the Navy to incorporate the produce uptake pathway, and (2) revised ambient levels for nickel.

2.2.5.4 First Five-Year Review

The Navy summarized the first 5-year review for HPS in a report dated December 10, 2003 (Tetra Tech 2003d). The 5-year review encompassed all of HPS but focused on Parcel B because remedial actions had not been implemented yet at the other parcels at HPS.

The purpose of the 5-year review was to evaluate implementation and performance of the remedy and to assess whether the remedy is or will be protective of human health and the environment.

Protectiveness — Soil. At the time of the review, the remedy for soil at Parcel B was determined to be protective of human health and the environment because exposure pathways that could result in unacceptable risks were controlled through extensive soil excavation and the use of fencing, locked gates, warning signs, and secured buildings. The review recommended that, for the soil remedy to be protective in the long term, (1) the HHRA should be updated using new toxicological data and methodologies, (2) potential ecological risks to aquatic receptors should be evaluated, and (3) the selected remedy should be modified to address remaining areas of contamination. This amended ROD is intended to modify the selected remedy to ensure that the final soil remedy implemented at Parcel B will be protective of human health and the environment in the long term.

Recommendations for the Soil Remedy. The 5-year review identified the following actions related to the soil remedy. Each bullet also indicates how these items are addressed in this amended ROD (shown in [brackets] as sub-bullets).

- Subsurface conditions should be further evaluated at IR-07 and IR-18, the conceptual model should be updated, and a site-specific approach should be developed as part of the process to amend the Parcel B ROD.
    - [The amended ROD includes remediation alternatives to address the debris fill area at IR-07 and IR-18 (Redevelopment Blocks 2, 3, and BOS-1).]
- Potential need for remedial action at the shoreline near IR-07 and IR-26 should be evaluated during the process to amend the ROD.
    - [The alternatives in the amended ROD include remediation of the shoreline at IR-07 and IR-26 (Redevelopment Blocks BOS-1 and BOS-3).]
- Potential ecological risk to aquatic receptors from Parcel B contaminants should be evaluated.

- [The amended ROD includes remediation alternatives to address the shoreline area.]

- Effectiveness of the SVE system at IR-10 should be further evaluated during the process to amend the ROD and included in an amended ROD if SVE is selected as a remedy for VOC-contaminated soil. If SVE is not selected as the remedy, remaining portions of IR-10 that have not been excavated will need to be addressed.

  - [The amended ROD includes remediation alternatives that include SVE for VOCs in soil at IR-10 (Redevelopment Block 8). The amended ROD also contains remediation alternatives to address metals concentrations that exist in soil in the same area at IR-10 that will not be treated by SVE.]

- Remedial action objectives (RAO) for soil and remedial action alternatives should be reevaluated during the process to amend the ROD to address higher and more variable levels of ambient metals.

  - [The RAOs in the amended ROD account for higher and more variable levels of ambient metals.]

- The human health risk assessment (HHRA) should be updated with new toxicological data and calculate cumulative risk as part of the process to amend the ROD.

  - [The updated HHRA incorporated new toxicological data and provided information about total risk. The remediation alternatives addressed in the amended ROD address the total risk from chemicals in soil.]

- Enforceable land-use restrictions need to be developed before the remedy is complete.

  - [The amended ROD contains more detailed information on institutional controls.]

Protectiveness — Groundwater. At the time of the review, the groundwater remedy at Parcel B was determined to be protective of human health and the environment because the RAMP safeguards aquatic life in the bay and addresses potential risk to future occupants of Parcel B buildings. The review recommended that, for the groundwater remedy to be protective in the long term, (1) the HHRA and groundwater trigger levels should be updated, (2) potential ecological risk to aquatic receptors should be evaluated, (3) the selected remedy should be modified to address VOC contamination, (4) a POC well and other characterization wells should be installed at IR-07, and (5) appropriate responses to incidents where trigger levels are exceeded should continue to be implemented.

Recommendations for the Groundwater Remedy. The 5-year review identified the following actions related to the groundwater remedy. Each bullet also indicates how these items are addressed this amended ROD (shown in [brackets] as sub-bullets).

- Refinement of Parcel B groundwater monitoring should be discussed with the regulatory agencies and detailed in the basewide monitoring plan, which encompasses groundwater monitoring for Parcels B, C, D, E, and E-2.

    - [The remediation alternatives in the amended ROD discuss groundwater monitoring options for Parcel B.]

- Trigger levels should be reevaluated.

    - [Appendix I of the TMSRA contained recommendations for revised trigger levels. The amended ROD incorporates these trigger levels.]

- Ambient metals in groundwater may be reevaluated, if necessary, to ensure protectiveness of human health and the environment.

    - [Ambient levels of metals in groundwater were considered in the risk assessments, but were not revised.]

- The HHRA should be updated with new toxicological data and calculate cumulative risk as part of the process to amend the ROD.

    - [The updated HHRA incorporated new toxicological data and provided information about total risk. The remediation alternatives included in the amended ROD address the risk from chemicals in groundwater.]

- Potential ecological risk to aquatic receptors from Parcel B contaminants should be evaluated.

    - [The amended ROD includes remediation alternatives to address the shoreline area.]

- A POC well and characterization wells should be installed at IR-07.

    - [POC well IR07MWS-4 and post-remedial action wells IR07MW21A1, IR07MW24A, IR07MW25A, and IR07MW26A were reinstalled in March 2004, and the risk assessments used data from these wells. The amended ROD contains remediation alternatives to address the risk from chemicals in groundwater.]

- Effectiveness of SVE and ZVI treatability studies should be evaluated and included in an amended ROD if either is selected as a remedy for VOC-contaminated groundwater.

    - [The TMSRA evaluated SVE and ZVI treatability studies, and the amended ROD includes these technologies in remediation alternatives.]

- Enforceable land-use restrictions need to be developed before the remedy is complete.

    - [The amended ROD contains more detailed information on institutional controls.]

Radiological Issues and Recommendations.

- The first 5-year review indicated that the amended ROD should memorialize the methods and cleanup goals for radiological contaminants being addressed by the basewide radiological removal action.

- [Radiological issues were identified in the HRA (NAVSEA 2004) and were addressed in the radiological addendum to the TMSRA (TtEC 2008). The amended ROD includes remediation alternatives to address radiological contamination.]

2.2.5.5 Second Five-Year Review

The second 5-year review builds on the first review completed in 2003 and focuses on Parcel B where remedial actions have been implemented. The second 5-year review is in progress and will be completed in 2008 (Jonas and Associates 2008).

TABLES

TABLE 2-1: HISTORY OF INVESTIGATIONS SINCE ROD
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Report Date	Title	Author	Activity Description and Effect on the 1997 ROD
Soil Remedy-Related Documents			
8/4/99	Nickel Screening and Implementation Plan	Tetra Tech	Evaluated ambient concentrations of nickel in soil across HPS; basis for change in nickel cleanup level included in the 2000 ESD
8/19/99	Remedial Design Documents	Tetra Tech and MK	Guided first phase of soil excavations from July 1998 to September 1999
2/20/01	Remedial Design Documents Amendment	Tetra Tech	Guided second phase of soil excavations from July 2000 to December 2001
3/28/03	Interpretation of Fill Conditions at IR-07 and IR-18	Tetra Tech	Characterized subsurface conditions using soil borings, geophysics, and historical aerial photographs; together with observations during remedial actions; this report established the nature of fill at IR-07 and IR-18
3/17/04	Metals Concentrations in Franciscan Bedrock Outcrops	Tetra Tech and ITSI	Characterized metals concentrations in bedrock at off-site locations; supports the assessment of metals in bedrock-derived fill
3/23/04	Shoreline Characterization Technical Memorandum	Tetra Tech	Characterized shoreline sediments at IR-07 and IR-26; basis for distribution of chemicals in shoreline sediment and source of data used in the SLERA
8/31/04	Historical Radiological Assessment, Volume II, Use of General Radioactive Materials, 1939 to 2003	NAVSEA	Evaluated potential radiological contamination from use of general radioactive materials across HPS; established radiologically impacted areas at Parcel B and basis for radiological removal actions
9/23/05	Soil Gas Survey Technical Memorandum	SES-TECH	Soil gas survey for evaluation of methane and total volatile organic compounds to assess nature and extent of concentrations in soil gas at IR-07 and IR-18; basis for presence of methane at IR-07
7/25/08	Construction Summary Report (final)	ChaduxTt	Summary of 106 soil excavations conducted during phases I and II of remedial action (combines draft report and addendum)

TABLE 2-1: HISTORY OF INVESTIGATIONS SINCE ROD (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Report Date	Title	Author	Activity Description and Effect on the 1997 ROD
Groundwater Remedy-Related Documents			
8/19/99	Remedial Action Monitoring Plan	Tetra Tech and MK	Guided groundwater monitoring program
2/19/01	Distribution of the Bay Mud Aquitard and Characterization of the B-Aquifer at Parcel B	Tetra Tech	Described distribution and characterization of the B-aquifer and the Bay Mud aquitard that separates the A- and B-aquifers
2/28/01	Storm Drain Infiltration Study	Tetra Tech	Investigated storm drains as conduits for migration of contaminated groundwater, as required by the ROD; investigation found lining storm drains or grouting bedding material was not necessary
Groundwater Remedy-Related Documents (Continued)			
4/17/03	Groundwater Investigation of Hexavalent Chromium at IR-10	Tetra Tech	Investigated the extent of chromium VI around well IR10MW12A; supports characterization of chromium VI
11/06	Technical Memorandum for Contamination Delineation at Remedial Unit C5	CE2	Investigated groundwater near Building 134 along the boundary between Parcels B and C; supports characterization of VOCs
6/00 - 11/07	Quarterly Groundwater Monitoring Reports	various	Provided groundwater monitoring results; supports characterization of groundwater at Parcel B
Treatability Study Documents			
6/25/04	Cost and Performance Report for Zero-Valent Iron Injection Treatability Study, Building 123	ERRG and URS	Evaluated the performance of ZVI to treat VOCs in groundwater beneath Building 123; basis for use of ZVI in revised remedial alternatives
11/23/05	In Situ Sequential Anaerobic-Aerobic Bioremediation Treatability Study, Remedial Unit C5, Building 134, IR-25	Shaw	Evaluated injection of lactate and hydrogen to stimulate biological dechlorination of chlorinated solvents in groundwater; basis for use of lactate in revised remedial alternatives
11/10/06	Phase III Soil Vapor Extraction Treatability Study Report	ITSI	Expanded treatability study to evaluate soil vapor extraction for removal of TCE and other VOCs from soil beneath Building 123; basis for use of SVE in revised remedial alternatives

TABLE 2-1: HISTORY OF INVESTIGATIONS SINCE ROD (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Report Date	Title	Author	Activity Description and Effect on the 1997 ROD
Regulatory Documents			
10/7/97	Record of Decision (ROD)	Navy	Original record of decision
8/24/98	Explanation of Significant Differences	Navy	Revised remedy to include excavation to 10 feet below ground surface instead of to the groundwater table
5/4/00	Explanation of Significant Differences	Navy	Updated soil cleanup levels
12/10/03	First Five-Year Review of Remedial Actions Implemented at HPS	Tetra Tech	Assessed whether remedy at Parcel B is or will be protective
12/12/07	Technical Memorandum in Support of a Record of Decision Amendment	ChaduxTt	Explained the need for a ROD amendment and feasibility study of revised remediation alternatives
3/14/08	Technical Memorandum in Support of a Record of Decision Amendment Radiological Addendum	TtEC	Evaluated remediation alternatives to address radionuclides
6/28/08	Proposed Plan in Support of an Amended ROD	Navy	Presented revised selected remedy for public comment

Notes: Draft reports are listed when final reports are not yet published.

CE2	CE2 Corporation`	ROD	Record of decision
ERRG	Engineering/Remediation Resources Group, Inc.	SLERA	Screening-level ecological risk assessment
HPS	Hunters Point Shipyard	TCE	Trichloroethene
IR	Installation Restoration	Tetra Tech	Tetra Tech EM Inc.
IT Corp.	International Technology Corporation	TtEC	Tetra Tech EC, Inc.
ITSI	Innovative Technical Solutions, Inc.	URS	URS Corporation
MK	Morrison Knudsen Corporation	VOC	Volatile organic compound
NAVSEA	Naval Sea Systems Command	ZVI	Zero-valent iron

3.0 COMMUNITY PARTICIPATION

This section discusses the community participation activities that have been undertaken for Parcel B since the 1997 ROD. A community involvement plan was developed to document interests, issues, and concerns raised by the community in regard to the ongoing investigation and cleanup at HPS and to describe a specific community relations program designed to address community issues and concerns (ITSI and Tetra Tech 2004). The initial plan was prepared in May 1996 and was revised in 2003 and 2004. The revisions incorporated the most recent assessment of community issues, concerns, and informational needs related to the ongoing environmental investigation and remediation program at HPS.

3.1 RESTORATION ADVISORY BOARD

In 1993, pursuant to the Defense Environmental Restoration Program, 10 U.S.C. § 2705(d), the Navy formed a Restoration Advisory Board (RAB). Original membership in the board included regulatory agency staff, business and homeowner representatives, residents, and local elected officials whom the Navy solicited through newspaper notices.

The RAB currently consists of members of the Navy, the community, and the regulatory agencies. The RAB meetings occur monthly and are open to the public. Meetings are held in the evenings after normal working hours in the Alex L. Pitcher, Jr. Room at the Southeast Community Facility Commission Building located at 1800 Oakdale Avenue in San Francisco. RAB members review and comment on technical documents.

The Navy and regulatory agencies report information about Parcel B, including the availability of documents, to the RAB members during the monthly RAB meetings. Copies of the RAB meeting minutes and documents describing environmental investigations and removal actions are available at the following HPS information repositories and administrative record file locations:

San Francisco Main Library
100 Larkin Street
Government Information Center, 5th Floor
San Francisco, California 94102
Phone: (415) 557-4500

Anne E. Waden Bayview Library
5075 Third Street
San Francisco, California 94124
Phone: (415) 355-5757

Administrative Record
Naval Facilities Engineering Command, Southwest
Attention: Diane Silva, FISC Building 1, 3rd Floor
937 N. Harbor Drive
San Diego, California 92132-5190
Phone: (619) 532-3676

RAB meeting minutes also are available at the Navy BRAC Program Management Office web site at: http://www.bracpmo.navy.mil/bracbases/california/hps/default.aspx.

3.2 PUBLIC MAILINGS

Public information updates in the form of mailings, fact sheets, newsletters, and proposed plans, are used to ensure a broad dissemination of information throughout the local community. Information updates announcing the IR Program process at HPS are mailed to residents surrounding HPS and to city, state, and federal officials; regulatory agencies; local groups; and individuals identified in the Community Involvement Plan since May 1996 (PRC 1996a, ITSI and Tetra Tech 2004). The fact sheets, newsletters, and proposed plans are mailed to approximately 2,700 households, businesses, public officials, and regulatory agencies in an effort to reach as many community members as possible. Table 3-1 summarizes the HPS fact sheets, newsletters, and proposed plans related to Parcel B prepared since the 1997 ROD.

3.3 COMMUNITY PARTICIPATION

Related to the 1997 ROD. The original proposed plan was submitted to the public on October 16, 1996, to provide information and solicit public input on the Navy's recommended action (Navy 1996). A public comment period for Parcel B was held from October 24, 1996, to November 25, 1996, and was extended at the request of the community to December 26, 1996. A public meeting was held on November 13, 1996. A notice of the availability of the proposed plan was published in the *San Francisco Chronicle* on October 24, 1996, and in the *Independent* on October 25, 1996. A notice of the extension of the public comment period was published in the *Independent* on November 26, 1996, and in the *New Bayview* on December 6, 1996. Responses to written comments received during the public comment period were included in the responsiveness summary as Appendix B of 1997 ROD.

Related to this Amended ROD. This amended ROD is based on investigations conducted since the 1997 ROD (see Table 2-1 for documents and release dates) and on the final TMSRA which was released to the public in December 2007 (ChaduxTt 2007). The proposed plan to support the amended ROD was submitted to the public on June 28, 2008, to provide information and solicit public input on the Navy's recommended action (ChaduxTt 2008). These documents are available to the public at the information repositories maintained at the San Francisco Main Library and Anna E. Waden Bayview Library and at the administrative record file. The information repository at the San Francisco Main Library also contains a complete index of the administrative record file (see Attachment A), along with information about how to access the complete file at the Naval Facilities Engineering Command Southwest offices in San Diego, California.

A public comment period for Parcel B was held from June 28, 2008, to July 28, 2008. A public meeting was held on July 8, 2008. A notice of the public comment period and public meeting was published in the *San Francisco Examiner* on July 5, 2008 and the *San Francisco Bayview* on July 2, 2008. Attachment B contains a copy of the public notice.

At the public meeting, the BRAC environmental coordinator and the Navy remedial project manager gave presentations on the conditions at Parcel B, and representatives from the Navy and environmental regulatory agencies were available to answer questions. A court reporter prepared a transcript of the meeting (see Attachment B). Responses to written comments received during the public comment period are included in the responsiveness summary as part of this amended ROD (see Attachment C). [Attachments A and B to be provided in the draft final amended ROD.]

TABLES

TABLE 3-1: SUMMARY OF HUNTERS POINT SHIPYARD FACT SHEETS AND NEWSLETTERS
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Date	Title
Fact Sheets	
May 2001	Hunters Point Annex Radiological Activities Summary
June 2001	Parcel B Sandblast Grit Fact Sheet
July 2001	Hunters Point Shipyard Formerly Utilized Defense Sites
March 2003	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
May 2003	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
September 2003	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
October 2003	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
November 2003	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
February 2004	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
March 2004	Hunters Point Shipyard Historical Radiological Assessment Fact Sheet
Newsletters	
March 1994	Hunters Point Annex Environmental Cleanup News Issue
October 1994	Hunters Point Annex Environmental Cleanup News Issue
January 1995	Hunters Point Annex Environmental Cleanup News Issue
June 2000	What is Hunters Point Shipyard
September 2000	Parcel B Cleanup Moving Forward
April – June 2001	Environmental Cleanup
October – December 2001	Parcel B Remedial Action
January – March 2002	Environmental Cleanup
April – September 2002	Environmental Cleanup
Proposed Plan	
October 1996	Proposed Plan
June 2008	Revised Proposed Plan

Note:

The Navy also provides monthly progress reports (MPR) to the community on an on-going basis (11 times per year). Preparation of MPRs began in March 2005. MPRs are distributed at monthly meetings of the Restoration Advisory Board.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

HPS is a large federal facility that contains several potential source areas. Sites on HPS have been grouped into nine parcels — Parcels B, C, D-1, D-2, E, E-2, F, G, and UC-1 — to facilitate the investigation, remediation, and property transfer process under BRAC. The Navy transferred former Parcel A to the San Francisco Redevelopment Agency in December 2004. Parcel D was further subdivided into D-1, D-2, G and UC-1. This amended ROD addresses Parcel B. RODs are planned for all parcels at HPS. The current FFA schedule for these RODs is presented below.

Parcel	Anticipated Final ROD Approval Date
B	January 2009
C	July 2009
D-1	July 2009
D-2	January 2009
E	November 2010
E-2	February 2010
F	March 2013
G	January 2009
UC-1	July 2009

Petroleum-contaminated areas of Parcel B are not part of this amended ROD and are currently addressed under the HPS TPH program, with regulatory oversight provided by the Water Board.

5.0 SITE CHARACTERISTICS

This section summarizes information on the physical features, ecology, geology, hydrogeology, and the nature and extent of contamination in soil and groundwater at Parcel B. A complete discussion of evaluation methods, sampling locations, chemicals detected, nature and extent of contamination, fate and transport, and evaluation of human and ecological risks is presented in the remedial investigation (RI) report (PRC and others 1996), feasibility study (FS) report (PRC 1996b), and the TMSRA (ChaduxTt 2007).

5.1 PHYSICAL FEATURES

More than 80 percent of HPS consists of relatively level lowlands that were mostly constructed by placing borrowed fill material from a variety of sources, including serpentinite bedrock from the shipyard, construction debris, and waste materials (such as used sandblast materials). The fill supported new buildings, construction, and in some cases filled the margin of San Francisco Bay. Most of Parcel B is located in the lowlands, with surface elevations between 0 to 10 feet above mean sea level. About 75 percent of the ground surface at Parcel B is covered by pavement and buildings; the western portion (IR-07 and IR-18) is unpaved and without structures. There is no surface water on Parcel B. The shoreline at Parcel B includes a mix of sandy beach and riprap (shoreline of Redevelopment Block BOS-1), concrete and wooden seawalls (Block BOS-2), and riprap and concrete seawalls (Block BOS-3) (see Figure 1-3).

5.2 ECOLOGY

Most of Parcel B is covered by pavement and buildings. With little open space for flora and fauna, Parcel B is considered to have insignificant terrestrial habitat value. No threatened or endangered species are known to inhabit HPS or its vicinity (PRC 1996b). However, ecological receptors may inhabit or use the shoreline areas at Redevelopment Blocks BOS-1 and BOS-3.

The shoreline of Block BOS-1 consists of about 1.5 acres that coincides with the southern portion of the India Basin. This shoreline area includes approximately 1,300 square feet (ft^2) of tidal marsh wetlands. The shoreline of Block BOS-3 consists of about 0.3 acre on the peninsula known as Point Avisadero (see Figure 1-3). The shoreline of Block BOS-3 is nearly completely covered by riprap for erosion control, with little or no interstitial soil between individual rocks, or consists of the concrete wall of a dry dock. Field observations found that mainly invertebrates and birds use the shoreline habitat.

Avian species reported or expected to forage along the shoreline or in adjacent offshore areas include the black-bellied plover, black turnstone, sanderling, long-billed curlew, dunlin, double-crested cormorant, surf scoter, American kestrel, red-tailed hawk, and peregrine falcon (Tetra Tech and Levine-Fricke-Recon, Inc. [LFR] 2000). Mammals observed in or expected to use the Parcel B shoreline include the California ground squirrel and the house mouse.

5.3 GEOLOGY

The peninsula that forms HPS is within a northwest-trending belt of Franciscan Complex bedrock known as the Hunters Point Shear Zone. HPS is underlain by five geologic units: the youngest of Quaternary age; and the oldest, the Franciscan Complex bedrock, of Jurassic-Cretaceous age. In general, the stratigraphic sequence of these geologic units, from youngest (shallowest) to oldest (deepest), is as follows: Artificial Fill; Undifferentiated Upper Sand Deposits; Bay Mud Deposits; Undifferentiated Sedimentary Deposits; and Franciscan Complex Bedrock.

Artificial Fill covers the entire surface, except for colluvium and alluvium on the hillside at the southern edge. The Bay Mud separates the Undifferentiated Upper Sands and the Artificial Fill from the lower Undifferentiated Sedimentary Deposits over most of Parcel B; however, the Bay Mud is absent in some areas in the western and central portions of the parcel, and these two formations directly contact each other in those areas. The eastern portion of Parcel B that includes the peninsula called Point Avisadero is characterized by a thin layer of Artificial Fill over bedrock.

The Franciscan Complex contains a variety of rock types, including basalt, chert, sandstone, shale, and serpentinite. Some of these rock types contain wide-ranging concentrations of naturally occurring metals; serpentinite also contains naturally occurring asbestos minerals. Both metals and asbestos influence the remediation alternatives discussed later in this amended ROD.

5.4 HYDROGEOLOGY

The hydrostratigraphic units at HPS include (1) the A-aquifer, (2) the aquitard, (3) the B-aquifer, and (4) the deep bedrock water-bearing zone. The A-aquifer at Parcel B consists mainly of unconsolidated Artificial Fill that overlies the aquitard and bedrock and forms a continuous zone of unconfined groundwater across the parcel. Alluvium and colluvium, Undifferentiated Upper Sand Deposits, and shallow bedrock also are part of the A-aquifer at various locations across Parcel B. The A-aquifer generally thickens from about 15 feet in the southwest to as much as 80 feet in the northeast, but averages about 25 feet thick over most of Parcel B.

The B-aquifer consists mainly of Undifferentiated Sedimentary Deposits that overlie bedrock or are contained within the Bay Mud Deposits at a few locations near the bay margin. The B-aquifer is not continuous across Parcel B but exists primarily in two separate areas — along the western parcel boundary, and in a portion of the central area of the parcel. The semiconfined B-aquifer includes interbedded sands and clayey silts and ranges in thickness from about 5 to 15 feet where it is present and averages 10 feet thick. The bedrock water-bearing zone is not considered an aquifer because of its low capacity for water production (primarily from fractures).

Bay Mud Deposits act as an aquitard that separates the A- and B-aquifers over most of the parcel, except for part of the western portion and some of the central portion, where the Bay Mud is absent and the A- and B-aquifers are adjacent. Hydraulic communication is restricted, although not prevented, in areas where Bay Mud Deposits are present, and the potential for communication between the A- and B-aquifers is greater where the Bay Mud Deposits are absent. However, previous investigations (Tetra Tech 2001a) concluded that, although lithologic

data suggest the potential for communication, chemical results do not indicate communication exists. The Bay Mud Deposits generally thicken from where they pinch out against the historical shoreline in the southwest to 40 feet near the bay margin in the northeast. Dredging has removed the Bay Mud and B-aquifer at various locations across Parcel B. Nearly all the groundwater monitoring wells at Parcel B are screened in the A-aquifer. Only two wells are screened in the B-aquifer, and no wells at Parcel B are screened in the bedrock water-bearing zone.

In general, groundwater flows from south to north, toward San Francisco Bay. Based on tidal influence studies conducted during the RI (PRC and others 1996) and the FS (PRC 1996b), the tidal influence zone extends inland up to about 300 feet from the shoreline. Tidal influence may also mix groundwater with bay water, but mixing usually does not occur as far inland as do the fluctuations in groundwater elevation.

5.5 NATURE AND EXTENT OF CONTAMINATION

Activities associated with known or potential chemical releases at Parcel B were identified and environmental investigations were conducted to identify and assess the nature and extent of contaminants in soil, groundwater, and sediment (see Section 2.2.2).

5.5.1 Soil

The chemicals of concern (COC) in soil at Parcel B after the remedial and removal actions of 1998 through 2005 have not changed substantially compared with those identified in the 1997 ROD and the subsequent RD. Table 5-1 lists the broad categories of COCs in soil at Parcel B, potential sources for these chemicals, and volumes of soil removed during previous remedial actions. Although the list of COCs has not changed significantly, the volume of soil contaminated by these COCs, and especially by organic chemicals, is much smaller now than in 1997. The Navy's knowledge of the distribution of inorganic chemicals in native soil and artificial fill has increased greatly as a result of the extensive excavations and sampling at Parcel B since 1998. In particular, the ubiquitous nature of metals in fill is much clearer now than during the initial design of the remedial action and is a large part of the reason for the reevaluation of the soil remedy considered in this amended ROD. Table 5-2 summarizes concentrations of COCs remaining in soil at Parcel B.

In this document, the term "ubiquitous" refers to metals that are naturally occurring or are in the same concentration ranges as naturally occurring metals in the source material (including material from the same geologic formations in the San Francisco area) used for filling at HPS. The Navy acknowledges that industrial sources of metals exist at HPS, and there is a potential that some concentrations of metals could have sources other than naturally occurring materials. The Navy has worked to remove these sources during the response actions taken to date. The Navy acknowledges that the regulatory agencies do not agree with the Navy's position that ubiquitous metals are naturally occurring. Remedial alternatives developed in this amended ROD address these concentrations of metals, regardless of their source.

The original conceptual site model for Parcel B assumed that the distribution of contaminants was the result of discrete releases of chemicals (the "spill model") from industrial activities by the Navy or other tenants, except for several ubiquitous metals present throughout Parcel B. However, the spill model for chemical releases does not apply to the debris fill at IR-07/18 or for other areas where quarried native rock was used as fill. Although the Navy successfully achieved the 1997 ROD remediation goals at the majority of excavations conducted during the remedial actions, the conceptual site model needed to account for the ubiquitous nature of metals contained in the fill used to construct many areas of Parcel B, and to address the use of debris as fill at IR-07/18. The remedial alternatives proposed in the amended ROD address these changes to the conceptual site model.

5.5.2 Groundwater

The characterization of COCs in groundwater at Parcel B has increased greatly since the 1997 ROD. The implementation of the RAMP in 1999 and the subsequent, continuous quarterly monitoring have increased the knowledge of the distribution of chemicals in groundwater.

The COCs in groundwater have not changed considerably since 1997; however, much more is known about the distribution and concentrations of COCs. No chemical plumes in groundwater were identified in the 1997 ROD. However, subsequent sampling found concentrations of VOCs in the area of IR-10 to be an order of magnitude higher than was known when the ROD was prepared and to form a recognizable plume. This new information contributed to the need to amend the original ROD. Table 5-3 summarizes concentrations of COCs in groundwater based on samples collected through November 2004. The Navy also has reviewed the results of samples collected after November 2004 and has found that the post-2004 data are consistent in terms of COCs and would not change the updated groundwater characterization. The Navy will review current data from groundwater samples during the RD to focus the remediation activities for groundwater.

COCs in groundwater in the A-aquifer include (1) VOCs, especially trichloroethene and its breakdown products, (2) chromium VI, and (3) mercury. An additional screening evaluation of surface water quality to evaluate potential ecological risks from exposure to groundwater as it interacts with surface water indicated that potential risk may be posed by chromium VI, copper, lead, and mercury. Some of these COCs are found in samples from multiple wells and represent plumes in groundwater. Other COCs are found in only individual wells and are not referred to as plumes. Figure 5-1 shows the locations of VOCs, chromium VI, and mercury in groundwater at Parcel B. Copper and lead were detected infrequently at individual wells with no defined groundwater plumes.

The areal extent of the IR-10A VOC plume near Building 123 is stable, and concentrations within the plume are decreasing as the result of ZVI injection during treatability study testing in 2003 and 2004. Maximum concentrations of VOCs measured in samples collected during November 2004 include 340 micrograms per liter (µg/L) of trichloroethene, 200 µg/L of cis-1,2-dichloroethene, and 170 µg/L of vinyl chloride. Current maximum concentrations of these VOCs measured in samples collected in October 2007 are lower than were measured in

November 2004: 5 µg/L for trichloroethene, 93 µg/L for cis-1,2-dichloroethene, and 23 µg/L for vinyl chloride.

The plume of chromium VI (IR-10B) near Building 123 was found to be confined to a single well (IR10MW12A) during a delineation investigation in 2002. (Refer to Appendix H of the TMSRA for more details.) The maximum concentration of chromium VI detected at well IR10MW12A was 680 µg/L (in a sample collected in December 2005). Well IR10MW12A was decommissioned in July 2006 and replaced by well IR10MW82A, located about 13 feet northeast of former well IR10MW12A. Chromium VI was not detected at the reporting limit of 0.5 µg/L in samples collected from well IR10MW82A in August and October 2007.

Groundwater samples from well IR26MW47A have indicated consistent detections of mercury since March 2002, when the well was installed. Mercury concentrations ranged up to 3.1 µg/L (measured in October 2007). Mercury was also detected in groundwater samples collected at new well IR26MW49A that was installed in July 2006 downgradient from well IR26MW47A. Concentrations of mercury in samples collected from well IR26MW49A range about 1 to 2.5 µg/L in samples collected since this well was installed. Mercury detections in samples from wells IR26MW47A and IR26MW49A may be related to mercury observed in soil samples at nearby Excavation EE-05. Mercury in soil deeper than 10 feet bgs at Excavation EE-05 is suspected as a source to groundwater. The Navy is conducting a TCRA to address the mercury source area, and remedial alternatives in this amended ROD consider options to address mercury in groundwater in this area.

The surface water quality evaluation indicated that copper and lead were COCs (copper at well IR07MW20A and lead at wells IR07MWS-2 and IR26MW48A). Detections of copper and lead in groundwater samples collected from these wells were infrequent and sporadic; however, copper and lead were conservatively included as COCs, and remedial alternatives in this amended ROD consider options to address copper and lead in groundwater in these areas.

5.5.3 Sediment

The Navy investigated the nature and extent of chemicals in sediments along the shoreline at IR-07 and IR-26 (Tetra Tech and ITSI 2004b). COCs in sediment include metals, pesticides, polychlorinated biphenyls (PCB), and polycyclic aromatic hydrocarbons (PAH). Table 5-4 summarizes concentrations of COCs sediment.

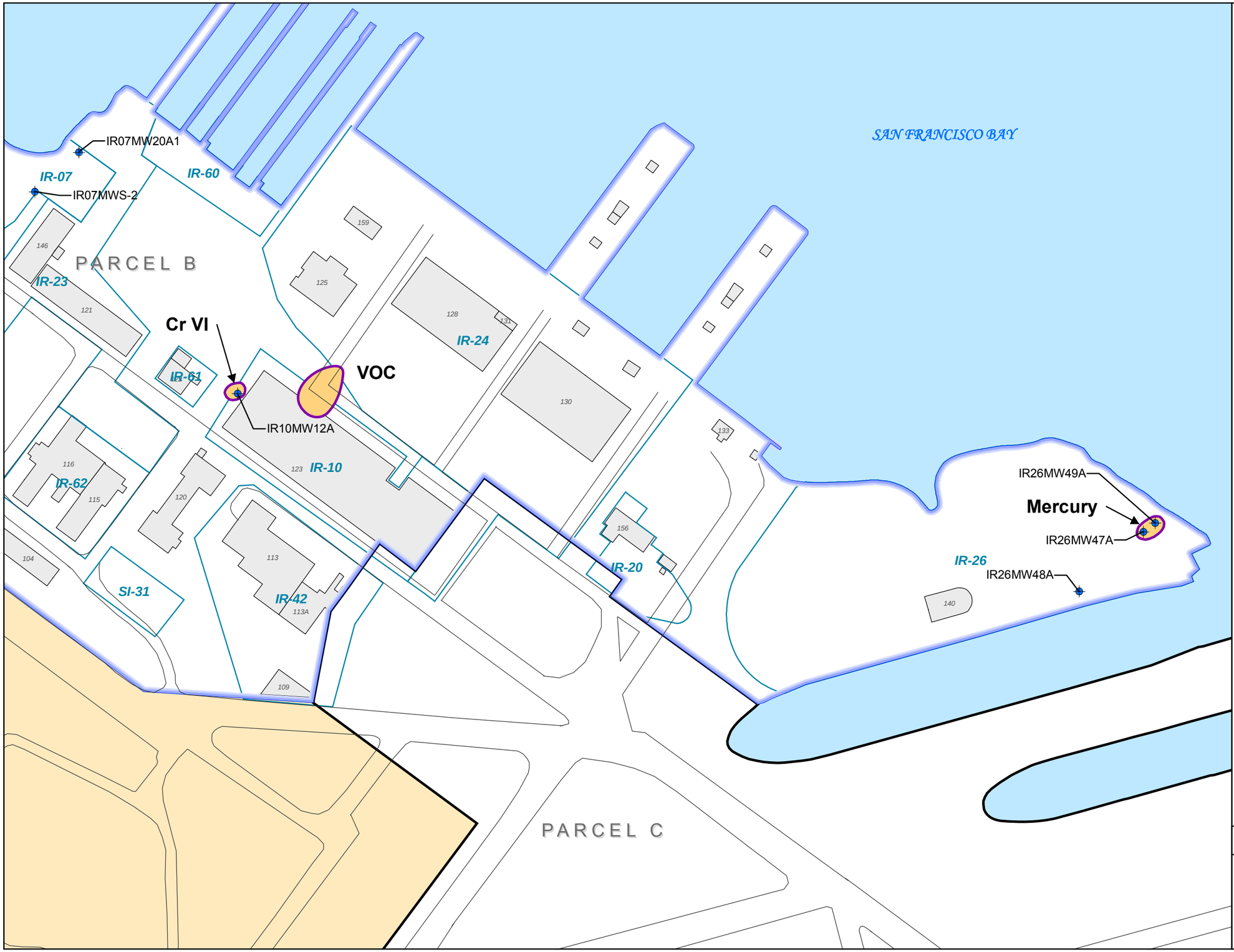
5.5.4 Radionuclides

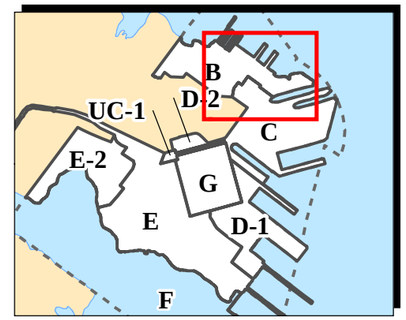
The Navy investigated the use of radionuclides at HPS under the HRA (NAVSEA 2004). Radiological surveys have been performed on the grounds and buildings at Parcel B to assess the extent of contamination and the types of radionuclides present. The HRA lists the structures and areas considered to be radiologically impacted. The potential for residual radioactive contamination at each impacted site was identified through an evaluation of historical information, previous radiological survey results, and site reconnaissance. Table 5-5 lists the radiologically impacted buildings, former building sites and areas, and infrastructure (sanitary sewers and storm

drains) at Parcel B and the radionuclides potentially present. Table 5-6 summarizes the evaluation of residual radioactivity in these impacted buildings, areas, and infrastructure. Figure 5-2 shows the locations of radiologically impacted areas and buildings. Detailed descriptions of the assessments of residual contamination from radiological operations are contained in the HRA (NAVSEA 2004) and the radiological addendum to the TMSRA (TtEC 2008).

The HRA identified the potential radionuclides of concern at Parcel B; these chemicals include cobalt-60 (^{60}Co), strontium-90 (^{90}Sr), cesium-137 (^{137}Cs), radium-226 (^{226}Ra), and plutonium-239 (^{239}Pu) (NAVSEA 2004). The potential sources of contamination included (1) potential disposal of decontamination materials from ships used during atomic weapons testing in the South Pacific during the 1950s that were decontaminated at the shipyard, (2) radiological decontamination of personnel, (3) storage of samples from atomic weapons testing, (4) radiological sample counting, (5) storage and disposal of radioluminescent devices, (6) non-destructive testing and gamma radiography, and (7) storage of low-level radioactive waste.

FIGURES





Location Map

- Groundwater Monitoring Well
- IR or SI Site
- Approximate Extent of Current Groundwater Plume
- Parcel B Boundary
- Other Parcel Boundary
- Non-Navy Property
- 128 Building
- San Francisco Bay

Notes:

Cr VI Chromium VI
IR Installation Restoration
RU Remedial unit
SI Site Inspection
VOC Volatile organic compound

Plume locations based on samples collected in March 2007.

0 200 400

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 5-1
LOCATION OF CURRENT GROUNDWATER PLUMES

Admended ROD for Parcel B

07/09/2008 O:\Hunters_Point\Projects\Parcel_B\ROD\projects\Fig5-1_Current_GW_Plumes.mxd TtEMI-DN Kurt.Cholak

SAN FRANCISCO BAY

BREAKWATER

DRY DOCK 7

DRY DOCK 6

DRY DOCK 5

Parcel B

Parcel C

IR-07

IR-18

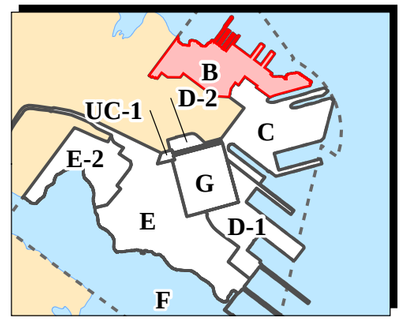
LOCKWOOD ST.

ROBINSON ST.

FISHER AVE.

VAN KEUREN AVE.

146 159 125 121 128 122 130 123 117 103 116 115 120 113 113A 114 104 109 156 157 142 140



Location Map

- Road
- Radiologically Impacted Areas[1]
- Parcel B Boundary
- Other Parcel Boundary
- 128 Building
- San Francisco Bay
- Non-Navy Property

[1] As defined in the Historical Radiological Assessment

Notes:

1. Buildings 114, 142, and 157 have been demolished.
2. Ship berths, dry docks, and piers are considered to be radiologically impacted, but are considered part of Parcel F.
3. Storm drains and sanitary sewers are also radiologically impacted. Refer to the individual radiological survey unit reports for the locations of radiologically impacted storm drains and sanitary sewers at Parcel B.

Reference: Naval Sea Systems Command. 2004. Historical Radiological Assessment, Volume II, Use of General Radioactive Materials, 1939 to 2003, Hunters Point Shipyard. August 31.

IR Installation Restoration

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California

U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 5-2
RADIOLOGICALLY IMPACTED AREAS AND BUILDINGS

Amended ROD for Parcel B

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TABLES

TABLE 5-1: OVERVIEW OF CHEMICALS REMAINING IN SOIL

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Site Name[a]	Redevelopment Blocks	Site Description	Chemicals of Concern[b]	Possible Sources[c]	Volume of Contaminated Soil Removed[d] (Cubic Yards)
IR-07	2, 3, BOS-1	Sub-Base Area	Metals, SVOCs, and PCBs	Disposal of sandblast waste, disposal of waste oil at IR-07 and IR-18, and bedrock-derived fill	52,500
IR-10	8	Building 123 (Battery and Electroplating Shop)	Metals, VOCs, SVOCs, and PCBs	Naturally occurring or anthropogenic metals, releases of waste acids and plating solutions into the floor drains inside Building 123, leaks from acid drain lines	1,400
IR-18	1, 2, BOS-1	Waste Oil Disposal Area	Metals, SVOCs, and PCBs	Disposal of waste oil containing lead or placement of lead-contaminated fill material, disposal of waste oil, and bedrock-derived fill	22,000
IR-20	12	Building 156 (Rubber Shop)	Metals, VOCs, SVOCs, and PCBs	Naturally occurring or anthropogenic metals and storage of waste oils and chemicals in Building 156	3,100
IR-23	5, 6, BOS-1, BOS-2	Building 146 (Tactical Air Navigation Facility), Building 161 (Maintenance Service), Building 162 (Paint Storage), and Tank S-136	Metals, VOCs, SVOCs, and PCBs	Petroleum hydrocarbon surface spill and naturally occurring or anthropogenic metals	2,800
IR-24	9, 12, BOS-2	Building 124 (Acid Mixing Plant), Building 125 (Submarine Cafeteria), and Buildings 128 and 130 (Machine Shop)	Metals, VOCs, SVOCs, and PCBs	Naturally occurring or anthropogenic metals, lead-containing fuel and waste paint, releases of diesel fuel and lubrication oil along the distribution pipelines that make up IR-46, and leakage of fuel from the fuel distribution lines	4,200
IR-26	15, 16, BOS-3	Building 157 (Nondestructive Testing Laboratory) and Area XIV	Metals, VOCs, SVOCs, and PCBs	Naturally occurring or anthropogenic metals and petroleum-related contamination	7,500
IR-42	7	Building 109 (Police Station), Building 113 (Tug Maintenance Shop and Salvage Divers Shop), and Building 113A (Machine Shop, Torpedo Maintenance Shop, Tug Maintenance Shop, and Electrical Substation)	Metals, SVOCs, and PCBs	Naturally occurring or anthropogenic metals and petroleum-related contamination	300
IR-46 (Fuel Lines)	9, 12, BOS-2	Fuel Distribution Lines	Metals, SVOCs, and PCBs	Naturally occurring or anthropogenic metals, releases from fuel line system, spilled fuel or oil from tanks and distribution pipelines, diesel fuel and lube oil pipelines (and waste fuel and oil lines), and other petroleum-related contamination	19,100

TABLE 5-1: OVERVIEW OF CHEMICALS REMAINING IN SOIL AT PARCEL B (CONTINUED)

Parcel B Amended Record of Decision Hunters Point Shipyard, San Francisco, California

Site Name[a]	Redevelopment Blocks	Site Description	Chemicals of Concern[b]	Possible Sources[c]	Volume of Contaminated Soil Removed[d] (Cubic Yards)
IR-60	BOS-2	Dry Docks 5, 6, and 7	Metals and SVOCs	Naturally occurring or anthropogenic metals and ship painting	600
IR-61	6	Building 122 (Electrical Substation V and Compressor Plant)	Metals and PCBs	Naturally occurring or anthropogenic metals and transformer release of PCBs	100
IR-62	4, 5	Buildings 115 and 116, Submarine Training Buildings and School	None[e]	Not applicable	Not applicable
SI-31	7	Building 114, Offices	None[e]	Not applicable	Not applicable
SI-45	7	Steam Line System	None[e]	Not applicable	Not applicable

Notes:

a IR-06 is not included in this table because it will be addressed as part of Parcel C and will be evaluated in future 5-year reviews that will be issued after a Parcel C ROD. Although portions of IR-50 (storm drain and sanitary sewer systems) and IR-51 (former transformer sites) within Parcel B are addressed by the Parcel B ROD, information on contamination associated with these sites is presented with the IR sites that contain the contamination associated with IR-50 and IR-51.

b Chemical groups listed include chemicals evaluated in the human health risk assessment; these chemicals also exceed the soil cleanup levels defined in the ROD (Navy 1997) and subsequent ESDs (Navy 1998, 2000).

c Sources listed were identified in the Parcel B remedial investigation and feasibility study (PRC, HLA, Levine-Fricke, and Uribe and Associates 1996; PRC 1996), and information gathered during the remedial action.

d Volumes of contaminated soil are based on the volumes excavated according to the construction summary report (ChaduxTt 2008) and TPH closeout report (TPA-CKY Joint Venture 2005), and other estimates from remedial action activities.

e No chemicals were detected at levels that exceed remedial action objectives defined in the ROD (Navy 1997) and subsequent ESDs (Navy 1998, 2000). IR-62 contained only fuel-related contamination that was not commingled with chemicals identified in the ROD and ESDs.

ESD	Explanation of significant difference	PRC	PRC Environmental Management, Inc.	SVOC	Semivolatile organic compound
HLA	Harding Lawson Associates	ROD	Record of decision	TPH	Total petroleum hydrocarbons
IR	Installation Restoration	SI	Site inspection	VOC	Volatile organic compound
PCB	Polychlorinated biphenyl				

Sources:

ChaduxTt. 2008. "Final Parcel B Construction Summary Report, Hunters Point Shipyard, San Francisco, California." July 25.
Navy. 1997. "Hunters Point Shipyard, Parcel B, Record of Decision." November 16.
Navy. 1998. "Explanation of Significant Difference, Naval Station Treasure Island, Hunters Point Annex." August 24.
Navy. 2000. "Final Explanation of Significant differences, Parcel B, Hunters Point Shipyard, San Francisco, California." May 4.
PRC. 1996. "Parcel B Feasibility Study Final Report, Hunters Point Shipyard, San Francisco, California." November 26.
PRC, HLA, Levine-Fricke, and Uribe & Associates. 1996. "Parcel B Remedial Investigation, Draft Final Report, Hunters Point Shipyard, San Francisco, California." June 3.
TPA-CKY Joint Venture. 2005. "Draft Final Site Closeout Report, Total Petroleum Hydrocarbon Program Corrective Action Implementation Soil Removal for Parcels B, C, D, and E, Hunters Point Shipyard, San Francisco, California." June.

TABLE 5-2: DATA SUMMARY FOR CHEMICALS OF CONCERN IN SOIL

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Chemical	Sample Size		Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
	Detected	Total		
Antimony	236	461	0.69	78.1
Aroclor-1254	54	619	0.005	6.5
Aroclor-1260	335	939	0.004	50
Arsenic	540	761	0.43	240
Benzo(a)anthracene	593	1,479	0.008	2.6
Benzo(a)pyrene	598	1,475	0.008	2.8
Benzo(b)fluoranthene	651	1,498	0.008	2.9
Benzo(k)fluoranthene	399	1,456	0.008	3.1
Beta-BHC	8	477	0.001	0.008
Bis(2-ethylhexyl)phthalate	38	668	0.01	9.3
Cadmium	240	535	0.11	7.9
Copper	1,046	1,061	1.9	5,400
Dibenz(a,h)anthracene	157	1,263	0.009	0.43
Dieldrin	34	480	0.002	0.18
Heptachlor epoxide	23	477	0.001	0.015
Indeno(1,2,3-cd)pyrene	356	1,309	0.008	0.99
Iron	506	506	3000	83,200
Lead	998	1,030	0.33	8,540
Manganese	892	892	55	41,400
Mercury	493	683	0.027	90.1
Naphthalene	141	1,164	0.008	5.6
Tetrachloroethene	36	368	0.0013	2.8
Trichloroethene	243	514	0.00023	230
Vanadium	506	506	6.7	149
Zinc	943	966	12.6	1,880

Notes:

Data summary includes samples collected from 0 to 10 feet below ground surface

BHC Benzene hexachloride

mg/kg Milligram per kilogram

TABLE 5-3: DATA SUMMARY FOR CHEMICALS OF CONCERN IN GROUNDWATER

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Chemical	Volatile?[a]	Sample Size		Minimum Concentration (ug/L)	Maximum Concentration (ug/L)
		Detected	Total		
A-Aquifer					
1,2,4-Trichlorobenzene	Y	24	724	0.45	200
1,2,4-Trimethylbenzene	Y	7	50	3.4	93
1,2-Dichlorobenzene	Y	91	728	0.27	62,000
1,2-Dichloroethane	Y	77	782	0.14	150,000
1,2-Dichloroethene (total)	Y	48	373	0.3	57,000
1,2-Dichloropropane	Y	18	767	2	350
1,3,5-Trimethylbenzene	Y	4	50	0.79	22
1,4-Dichlorobenzene	Y	74	730	0.22	15,000
2,4,6-Trichlorophenol		1	390	24	24
2,4-Dimethylphenol		18	390	8	16,000
2,4-Dinitrotoluene		1	415	4,900	4,900
2-Methylnaphthalene		36	450	0.45	920
4-Methylphenol		12	377	1.5	9,100
Arsenic		207	557	1.125	51.1
Benzene	Y	86	799	0.12	400
Benzo(a)anthracene		7	484	0.01	3.5
Benzo(a)pyrene		2	481	0.21	3.5
Bromodichloromethane	Y	3	767	5.6	130
Chlorobenzene	Y	53	764	0.22	2,300
Chloroethane	Y	12	767	13	81
Chloroform	Y	34	782	0.2	39
Chrysene		5	485	0.015	200
cis-1,2-Dichloroethene	Y	182	507	0.16	58,000
Dichlorodifluoromethane	Y	13	453	1.7	59
Mercury	Y	62	549	0.0275	8
Methylene chloride	Y	10	767	0.4	200
Naphthalene	Y	62	506	0.055	370
Pentachlorophenol		4	391	0.65	6,100
Tetrachloroethene	Y	78	782	0.18	72,000
trans-1,2-Dichloroethene	Y	72	507	0.14	2,400
Trichloroethene	Y	183	782	0.18	18,000
Trichlorofluoromethane	Y	28	453	0.25	5,900
Vinyl chloride	Y	115	782	0.4	6,600
B-Aquifer[b]					
1,4-Dichlorobenzene	Y	3	27	0.27	0.41
Antimony		3	27	2.7	21.1
Arsenic		5	26	2.5	9.5
Benzene	Y	1	27	1	1
Chloroethane	Y	1	27	13	13
Manganese		24	27	26.7	2,410
Pentachlorophenol		1	28	24	24
Thallium		3	23	1.4	8.35
Trichloroethene	Y	1	27	2	2

TABLE 5-3: DATA SUMMARY FOR CHEMICALS OF CONCERN IN GROUNDWATER (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Notes:

Data summary is based on the groundwater data set used for the HHRA, which evaluated data collected through November 2004.

a Volatile chemicals in the A-aquifer were evaluated for potential health risks from subsurface vapor intrusion to indoor air.

b Data summary is based on B-aquifer data combined with A-aquifer data to address potential hydraulic communication between the A- and B-aquifers.

ug/L Microgram per liter

HHRA Human health risk assessment

TABLE 5-4: DATA SUMMARY FOR CHEMICALS OF CONCERN IN SEDIMENT

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Chemical	Sample Size		Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
	Detected	Total		
4,4'-DDD[a]	2	63	0.0023	0.0055
4,4'-DDE[a]	7	63	0.0018	0.03
4,4'-DDT[a]	39	64	0.0022	0.12
Aluminum	64	64	1,300	22,000
Aroclor-1248[b]	1	64	0.11	0.11
Aroclor-1254[b]	4	64	0.15	1.1
Aroclor-1260[b]	51	64	0.016	5.9
Copper	64	64	16	5,400
Dibenz(a,h)anthracene	19	64	0.011	0.43
Dieldrin	15	64	0.0027	0.045
Lead	64	64	6.6	1,200
Methoxychlor	2	63	0.017	0.046
Zinc	64	64	26	1,300

Notes:

a Evaluated in the SLERA as total DDT (summed concentration of DDT and its metabolites DDD and DDE)

b Evaluated in the SLERA as total Aroclors (summed concentration of Aroclors)

DDD Dichlorodiphenyldichloroethane

DDE Dichlorodiphenyldichloroethene

DDT Dichlorodiphenyltrichloroethane

mg/kg Milligram per kilogram

SLERA Screening-level ecological risk assessment

TABLE 5-5: RADIOLOGICALLY IMPACTED SITES
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Building/ Site Number	Isotopes of Interest	Redevelopment Block(s)	Former Use	Current Status
103	Strontium-90, Cesium-137, Plutonium-239	4	Submarine barracks (1951); personnel decontamination center for Operation Crossroads personnel	Leased to San Francisco Redevelopment Agency; used by artists from The Point
113	Strontium-90, Cesium-137, Plutonium-239	7	Tug maintenance facility; salvage diver facility; torpedo storage and overhaul (1951-1964); sample storage from atomic weapons tests	San Francisco Police Department storage
113A	Cesium-137, Radium-226	7	Torpedo storage building; nondestructive testing facility (radiography); machine and maintenance shop; shipyard analytical laboratory; radioactive material storage building; radiographer's vault; waste disposal and storage building; used to store sheet lead from Building 364	Smith-Emery
114	Strontium-90, Cesium-137, Radium-226	7	Naval Radiological Defense Laboratory design branch and technical library (1951)	Demolished
130	Cesium-137, Radium-226	9, 12	Pipefitter shop; general shops; ship repair shop; machine shop; metal working shop; shop service (1968-1973); occupied by Protective Finishes Co. (1994); used by Navy for low-level radioactive waste and investigation-derived waste storage (1994)	Environmental storage
140 and discharge channel	Strontium-90 Cesium-137, Radium-226, Plutonium-239	16, BOS-3	Dry Dock 3 and pumphouse and discharge channel	Unoccupied
142	Strontium-90, Cesium-137, Radium-226, Plutonium-239	16	Air raid shelter A; storage; high-level sample counting room; low background counting room	Demolished

TABLE 5-5: RADIOLOGICALLY IMPACTED SITES (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Building/ Site Number	Isotopes of Interest	Redevelopment Block(s)	Former Use	Current Status
146	Strontium-90, Cesium-137, Radium-226	6	Industrial and photo laboratory (1951-1964); general shops; radioactive waste storage area; radioluminescent device turn-in building; tactical air navigation facility; lead-lined vault for shipyard x-ray sources	Unoccupied
157	Cobalt-60, Cesium-137, Radium-226,	15	Industrial laboratory; nondestructive testing; sound laboratory; testing center for metals (radiography); metal shop	Demolished
IR-07	Strontium-90, Cesium-137, Radium-226, Plutonium-239	2, 3, BOS-1	Flat land area built by the Navy to support conventional (non-nuclear) submarine maintenance; potential disposal of ship decontamination debris and burial of radioluminescent devices	Undeveloped open land
IR-18	Strontium-90, Cesium-137, Radium-226, Plutonium-239	1, 2, BOS-1	Flat land area built by the Navy; waste oil disposal area; potential disposal of ship decontamination debris and burial of radioluminescent devices; recreational vehicle camping and parking	Undeveloped open land
Sanitary Sewers and Strom Drains	Strontium-90, Cesium-137, Radium-226	All	Disposal of sanitary waste and conveyance of storm water; potentially contaminated by radiological waste from buildings	Demolished

Notes: Ship berths and piers are considered to be radiologically impacted, but are considered part of Parcel F.

IR Installation Restoration

Sources:

Naval Sea Systems Command. 2004. "Historical Radiological Assessment, Volume II, Use of General Radioactive Materials, 1939-2003, Hunters Point Shipyard." August 31.

Tetra Tech EC Inc. 2008. "Final Parcel B Technical Memorandum in Support of a Record of Decision Amendment Radiological Addendum, Hunters Point Shipyard, San Francisco, California." March 14.

TABLE 5-6: BUILDING AND AREA ASSESSMENT AND CLASSIFICATION FOR RADIOLOGICAL CONTAMINATION

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Building No. or Area	Contamination Potential					Contaminated Medium							Potential Migration Pathway						
	Known-restricted Access	Known-continued Access	Likely	Unlikely	Unknown	Surface Soil	Subsurface Soils	Surface Water	Groundwater	Air	Structures	Drainage System	Surface Soil	Subsurface Soil	Surface Water	Groundwater	Air	Structures	Drainage System
103				✓		N	N	N	N	N	L	L	N	N	N	N	N	L	N
113				✓		N	N	N	N	N	L	N	N	N	N	N	N	L	N
113A				✓		N	N	N	N	N	L	N	N	N	N	N	N	L	N
114 Site				✓		L	N	N	N	N	L	N	N	N	N	N	N	L	N
130				✓		N	N	N	N	N	N	N	L	N	N	N	N	N	N
140 and Discharge Channel				✓		N	N	N	N	N	L	L	N	N	N	N	N	L	L
142				✓		L	N	N	N	N	L	N	L	N	N	N	N	L	N
146			✓			N	N	N	N	N	L	N	N	N	N	N	N	L	N
157 Site				✓		N	N	N	N	N	L	N	N	N	N	N	N	L	N
IR-07				✓		L	L	N	N	N	L	N	L	L	N	N	N	N	N
IR-18				✓		L	L	N	N	N	L	N	L	L	N	N	N	N	N
Storm Drains		✓				N	L	N	N	N	L	H	N	L	N	N	N	L	M
Sanitary Sewers		✓				N	L	N	N	N	L	H	N	L	N	N	N	L	M

Notes:

H High – Evidence of contamination in the medium or migration pathway has been identified.

IR Installation Restoration

L Low – The potential for contamination in the type of medium or migration pathway is remote.

M Moderate – The potential for contamination in the medium or migration pathway exists, although the extent has not been fully assessed.

N None – Evidence of contamination in the specific medium or migration pathway has not been found, or known contamination has been removed, and surveys indicate that the medium or migration pathway meets current remedial action objectives.

6.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

This section discusses (1) current and reasonably anticipated future land uses, and (2) current and potential groundwater and surface water uses. This information was incorporated into development of exposure scenarios for the HHRA and development and evaluation of remediation alternatives.

6.1 LAND USES

Parcel B is owned by the federal government and is under the jurisdiction of the Navy. Most of the buildings at Parcel B are vacant, although a small number are used for commercial enterprises such as artist studios. Except for the few occupied buildings, Parcel B is unoccupied and unused. Most of Parcel B is fenced, and access is limited.

Based on the City and County of San Francisco's reuse plan (SFRA 1997), Parcel B is expected to be zoned to accommodate mixed uses, including a mixed residential/retail area, a research and development area, a cultural and educational area, and open space. The mixed-use and research and development areas could include single-family homes, upper-story housing, or live/work arrangements, and a variety of commercial enterprises, artist studios, retail, and business services on the ground floor. The cultural and educational area could include museums. The open space areas will provide public access and use of the waterfront as well as provide a corridor for the Bay Trail (hiking and bicycle access) close to the shoreline (SFRA 1997). The table below lists the planned reuses for Parcel B as currently envisioned. Figure 1-3 shows the locations of the types of reuses and the redevelopment blocks.

Redevelopment Block	Planned Reuse
1	Mixed Use
2	Research and Development
3	Research and Development
4	Mixed Use
5	Research and Development
6	Research and Development
7	Mixed Use
8	Mixed Use
9	Mixed Use
12	Mixed Use
15	Mixed Use
16	Educational/Cultural
BOS-1	Open Space
BOS-2	Open Space
BOS-3	Open Space

Reuse plans are subject to change by the local government. Changes in the planned reuse could cause additional changes to the RAOs and remediation goals (see Section 8.0) and could cause further modifications to the ROD for Parcel B. CERCLA requires public involvement in changes to the remedy that are significant or fundamental.

6.2 GROUNDWATER USES

Groundwater beneath HPS is not currently used for drinking water, irrigation, or industrial supply. Drinking water is supplied to HPS by the City and County of San Francisco through its municipal supply from the Hetch Hetchy watershed in the Sierra Nevada. The evaluation of beneficial use considers the current Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin (Water Board 2004), which identifies the following existing and potential beneficial uses for groundwater: municipal and domestic water supply, industrial water supply, industrial process water supply, and agricultural water supply.

6.2.1 A-Aquifer

The Water Board has concluded that the A-aquifer at HPS is unsuitable as a potential source of drinking water (Water Board 2003). The Navy also considers the A-aquifer at Parcel B unsuitable as a potential source of drinking water based on an evaluation of the site-specific factors identified in EPA's letter to the Navy (EPA 1999a).

6.2.2 B-Aquifer

Based on total dissolved solids data alone, the B-aquifer at Parcel B would be considered suitable as a potential source of drinking water. However, results of the evaluation of site-specific factors indicate that the B-aquifer has a low potential for use as a source of drinking water. These site-specific factors include (1) the City and County of San Francisco's prohibition on installing domestic wells and the proximity of sewer lines and storm drains, (2) the lack of current or historical use of the aquifer for water supply, (3) the limited size of this groundwater resource, and (4) the proximity of saltwater to the aquifer and the potential for saltwater intrusion if significant quantities of groundwater are withdrawn from the aquifer.

The evaluation of the B-aquifer suggests that it has a low potential as a source of drinking water. However, the groundwater ingestion pathway was included in the HHRA for the B-aquifer groundwater because of agreements with the BCT on the methodology.

6.3 SURFACE WATER USES

Parcel B does not have any naturally occurring surface streams or ponds. Storm water at Parcel B is currently handled via surface swales and storm sewers.

7.0 SUMMARY OF SITE RISKS

An HHRA and SLERA were conducted for Parcel B using data collected during previous investigations (ChaduxTt 2007). The objective of the risk assessments was to estimate the risks to human and ecological receptors from exposure to chemicals in soil and groundwater at Parcel B. They provide the basis for taking action and identify the COCs and exposure pathways that need to be addressed by the amended remedial action. Human health risks were characterized separately for radioactive and nonradioactive chemicals. The HHRA for nonradioactive chemicals is presented in the TMSRA (ChaduxTt 2007), and the HHRA for radioactive chemicals is included in the radiological addendum to the TMSRA (TtEC 2008). Section 7.1 and Section 7.2 summarize the methods used and results for the HHRA and SLERA. Section 7.3 describes trigger levels for groundwater that were established to evaluate potential impacts from groundwater to the surface water of San Francisco Bay.

7.1 HUMAN HEALTH RISK ASSESSMENT

A conceptual site model for human exposure was developed in the TMSRA to identify chemical sources at Parcel B, affected environmental media, chemical release and transport mechanisms for affected media, potentially exposed receptors, and potential exposure pathways for each receptor. Figure 7-1 and Figure 7-2 illustrate the conceptual site models for exposure to nonradioactive and radioactive chemicals. Section 7.1.3 presents details on the exposure assessment. Parcel B was formerly part of the industrial support area at HPS and was used for shipping, ship repair, training, barracks, and offices. Activities supporting these uses, such as painting, metalworking, and storage, use, and disposal of liquids and fuels, are potential sources of chemicals.

The HHRA for Parcel B identified chemicals of potential concern (COPC) in soil and groundwater, evaluated exposure scenarios based on possible future land uses, assessed toxicity, and characterized cancer and noncancer health risks based on conservative assumptions. Details of the HHRA are provided in Appendix A of the TMSRA (ChaduxTt 2007) and Appendix A of the TMSRA radiological addendum (TtEC 2008). The HHRA methods and the results are discussed below. Updates to the methodology for the HHRA were one of the central reasons supporting the need for amending the original ROD.

7.1.1 Methodology

The following sections discuss the overall approach for the HHRA for non-radioactive chemicals in soil and groundwater as well as specific details associated with the risk evaluations for radionuclides.

7.1.1.1 Overall Approach for Non-radioactive Chemicals

The Navy developed the methodology used to prepare the HHRA in consultation with EPA Region 9 and the California EPA Department of Toxic Substances Control (DTSC). Guidance documents used to develop the methodology are provided in Appendix A of the TMSRA (ChaduxTt 2007).

In addition, the following approaches developed by the HPS BCT (Tetra Tech 2003a; Navy 2004) and the Navy were used in the HHRA. These approaches were developed specifically for HHRAs at HPS.

- Use of 2,500-square-foot exposure areas (grids) to evaluate residential exposures and 0.5-acre exposure areas to evaluate nonresidential exposures
- Evaluation of the homegrown produce pathway for residential exposures
- Evaluation of recreational exposures
- For evaluation of exposures to groundwater, use of 12 rounds of groundwater monitoring data to delineate groundwater plumes, establish exposure areas, and develop representative exposure concentrations
- Use of a risk-based screening approach to evaluate exposures to groundwater from vapor intrusion and domestic use
- Quantitative analysis of the uncertainties associated with the toxicity criteria for trichloroethene on risk estimates
- Inclusion of both a total risk assessment and an incremental risk assessment for the evaluation of risks from exposure to soil at Parcel B. All chemicals were included as COPCs for the total risk evaluation, regardless of concentration. The total risk evaluation estimated the risks posed by chemicals at the site, including any present at concentrations at or below ambient levels. The incremental risk evaluation also estimated risks posed by chemicals at the site, but did not include the risks from chemicals present at or below ambient levels.

Details of the HHRA methodology are provided in Appendix A of the TMSRA (ChaduxTt 2007) and Appendix A of the TMSRA radiological addendum (TtEC 2008).

7.1.1.2 Approach for Groundwater (Non-radioactive Chemicals)

Groundwater data collected through monitoring quarter 20 (October to December 2004) were included for quantitative evaluation in the HHRA. The groundwater data set, which consisted of both historical and current groundwater data for Parcel B, was based on meetings with EPA, DTSC, and the Navy in 2003 and 2004. Groundwater monitoring data collected at Parcel B since 2004 were not included in the HHRA. Navy review of these data showed that they are consistent with pre-November 2004 data in terms of COCs and would not change the updated groundwater characterization. The evaluation of the effects of more recent (post-2004) concentrations in groundwater on the results of the HHRA is presented in Section A9.9 of Appendix A of the TMSRA (ChaduxTt 2007).

Exposure to volatile chemicals in groundwater in the A-aquifer may occur to residential and industrial receptors as a result of subsurface vapor intrusion to indoor air. Two steps were used to establish the areal extent for assessing vapor intrusion risks at Parcel B. First, plume boundaries were established based on delineation of measured concentrations of VOCs in A-aquifer groundwater to nondetectable levels; these plumes were termed "risk plumes" in the HHRA. Next, groundwater data for the A-aquifer were grouped based on the delineated plume boundaries. The groundwater data set used for plume delineation included all groundwater data collected for Parcel B, consisting of the last 12 rounds of sampling at each well and for each chemical through monitoring quarter 20 (October to December 2004). Groundwater data from Parcel B and Parcel C within the plume boundary were included in the plume data set because one of the groundwater plumes extended into Parcel C.

The following three A-aquifer plume areas were identified for Parcel B (see Figure 7-3): Each of these plume areas was evaluated as a separate A-aquifer exposure area in the HHRA.

- IR-10A plume
- IR-10B plume
- IR-25 plume

Data collected from the A-aquifer that did not fall within a delineated plume boundary were grouped by associated residential exposure areas (2,500-square-foot grids) and industrial exposure areas (0.5-acre grids).

Data collected from the B-aquifer were grouped by using the same plume delineation boundaries developed for the A-aquifer to evaluate residential exposure to groundwater in the B-aquifer from domestic use. In addition, the grouping assumed a vertical extrapolation of the plume boundary from the A-aquifer to the B-aquifer. Although plumes have not been identified in the B-aquifer at Parcel B, this approach was used to aid reporting risk results over collocated exposure areas.

Specific details on the plume delineation methodology and the nature and extent of contamination associated with each of the plumes are provided in Attachment A4 to Appendix A of the TMSRA (ChaduxTt 2007).

The groundwater risk plumes described here were used only in the HHRA evaluation. The risk plumes do not represent current-day plume sizes at Parcel B because the plume delineation was based on the groundwater data set for the HHRA, which consisted of the last 12 rounds of sampling at each well and for each chemical through monitoring quarter 20 (October to December 2004). Figure 7-3 shows a comparison of the plume boundaries in November 2004 and the plume boundaries established for the HHRA. The plumes, based on the 2004 data, are substantially smaller than the sizes established for use in the HHRA. In addition, current concentrations of chemicals measured in each plume area are substantially less than historical concentrations. As such, the HHRA likely overestimates risks from exposure to groundwater at Parcel B.

7.1.1.3 Approach for Radionuclides

The computer codes Residual Radioactive (RESRAD) and RESRAD-BUILD (Argonne National Laboratory 2008) were used to perform dose and risk modeling for radiologically impacted sites at Parcel B. RESRAD was used to model the risk associated with affected land areas (for example, former building sites 114, 142, and 157) and fill areas (IR-07 and IR-18). RESRAD-BUILD was used to model the impacted buildings (for example, Buildings 103, 113, 113A, 130, 140, and 146). RESRAD was used to model the risk associated with affected land areas (for example, former building sites 114, 142, and 157) and fill areas (IR-07 and IR-18). Both RESRAD and RESRAD-BUILD automatically include the long-lived daughter products of the isotopes of the radionuclides of concern (see Section 7.1.2).

RESRAD and RESRAD-BUILD were used to analyze the exposure scenarios that match the planned reuse (SFRA 1997). The majority of the input parameters for RESRAD and RESRAD-BUILD were the default values. The residential receptor was identified as the critical receptor, and all models were run using the resident scenario.

7.1.2 Identification of Chemicals of Potential Concern

COPCs are chemicals that are carried through the quantitative exposure and risk characterization portions of the HHRA. COPCs represent the chemicals assumed to account for the majority of any estimated health effects at a site. Analytical data for soil and groundwater were evaluated for usability, grouped by exposure area and by medium, and then used to identify COPCs. All detected chemicals except essential human nutrients (that is, calcium, magnesium, potassium, and sodium) were identified as COPCs. COPCs were identified for surface soil (0 to 2 feet bgs), subsurface soil (0 to 10 feet bgs), A-aquifer groundwater, and B-aquifer groundwater.

The HHRA included both a total and an incremental risk assessment for soil. Metals measured at maximum concentrations that were equal to or below HPALs were excluded as COPCs for the incremental risk assessment. HPALs represent ambient concentrations of metals in soil in the HPS area and are available for most of the metals detected in soil at Parcel B (PRC 1995).

The incremental risk assessment for soil excluded metals when the maximum measured concentrations do not exceed HPALs. However, some metals at ambient levels are associated with cancer risks or noncancer hazards above levels typically considered thresholds. Appendix A of the TMSRA contains the analysis of cancer risks and noncancer hazards associated with ambient levels of metals in soil at HPS.

The potential radionuclides of concern at Parcel B were identified during the HRA based on past activities and surveys and include ^{60}Co, ^{90}Sr, ^{137}Cs, ^{226}Ra, and ^{239}Pu (NAVSEA 2004). These radionuclides are the COCs for the assessment of radiological risk.

7.1.3 Exposure Assessment

The redevelopment plan outlines the planned reuses for Parcel B (SFRA 1997). Parcel B was divided into redevelopment blocks to help identify the areas associated with specific planned reuses. Each redevelopment block was then assigned a number (see Figure 1-3). The table below summarizes the planned reuses for each redevelopment block at Parcel B and how each was evaluated in the HHRA for non-radioactive chemicals.

Redevelopment Block	Planned Reuse	HHRA Exposure Scenario
1	Mixed Use	Residential
2	Research and Development	
3	Research and Development	
4	Mixed Use	
5	Research and Development	
6	Research and Development	
7	Mixed Use	
8	Mixed Use	
9	Mixed Use	
12	Mixed Use	Residential
15	Mixed Use	
16	Educational/Cultural	Industrial
BOS-1	Open Space	Recreational
BOS-2	Open Space	
BOS-3	Open Space	

The following receptors were selected for evaluation in the HHRA for Parcel B based on the planned reuses and the likelihood that excavation and trenching will be required during development for the planned reuses:

- Resident (adult and child)
- Industrial worker (adult)
- Recreational user (adult and child)
- Construction worker (adult)

Both direct exposure pathways (for example, ingestion) and indirect exposure pathways (for example, ingestion of homegrown produce) for soil and groundwater were identified as potentially complete.

Residential exposure to groundwater in the A-aquifer from domestic use (such as ingestion) was not evaluated in the HHRA because the A-aquifer at HPS is not considered a potential source of drinking water (see Section 6.2). The beneficial use evaluation of the B-aquifer suggests that it

has a low potential as a source of drinking water. However, the groundwater ingestion pathway was included in the HHRA for the B-aquifer groundwater because of agreements with the BCT on the methodology for the HHRA.

7.1.3.1 Soil Exposures

Exposure to soil was evaluated for each grid where sampling data were available and the sampling locations had not been subject to removal actions. Residential grids were used to assess residential exposures, while industrial grids were used to assess industrial, recreational, and construction worker exposures.

7.1.3.2 Groundwater Exposures

Exposure to COPCs in the A-aquifer was assessed for residential, industrial, and construction worker exposure for three exposure areas: the IR-10A, IR-10B, and IR-25 risk plumes (see Figure 7-3). The risk plumes were developed using a specific methodology developed for the HHRA based on agreements made with the BCT (see Attachment A4 of Appendix A of the TMSRA).

Residential and industrial exposure to groundwater in the A-aquifer from inhalation of volatile COPCs in groundwater that migrate through the subsurface to indoor air (vapor intrusion) was the only complete exposure pathway for the planned reuses of Parcel B. For the construction worker scenario, exposure to groundwater in the A-aquifer was assumed to occur during trenching. Residential exposure to groundwater in the A-aquifer from domestic use (such as ingestion) was not evaluated in the HHRA because the A-aquifer at HPS is not considered a potential source of drinking water.

Exposure to COPCs in the B-aquifer was assessed for residential domestic use because groundwater in the B-aquifer is considered to have a low potential as a source of drinking water. Residential domestic use of groundwater in the A-aquifer was not evaluated in the HHRA because the A-aquifer at HPS is not considered a potential source of drinking water.

7.1.3.3 Radiological Exposures

Potentially complete exposure pathways for radioactive chemicals in impacted soils include external radiation, soil ingestion, inhalation, and ingestion of groundwater. The exposure pathways for potentially contaminated structure surfaces are direct radiation from contaminated surfaces and inhalation of resuspended contaminated dust. Input parameters for RESRAD were adjusted, as needed, to match the receptor-specific exposure parameters used in the HHRA for nonradioactive chemicals. The residential receptor was identified as the critical receptor for exposure to radionuclides, and all models were run using the resident scenario. Additionally, the Unity Rule was used to evaluate incremental as well as combined risks. The radiological addendum to the TMSRA (TtEC 2008) contains more information on the specific exposure assumptions.

7.1.4 Toxicity Assessment

The toxicity assessment identifies toxicity values used to quantify potential adverse health effects associated with exposure to COPCs at Parcel B. These toxicity values include references doses (RfD) for noncancer health effects and slope factors (SF) for estimating cancer risks.

Toxicity values were obtained using a hierarchy of sources from EPA and California EPA (Cal/EPA). If the SF from an EPA source was higher than the Cal/EPA SF, then the more conservative (higher) SF was used in the HHRA. The SFs and RfDs used in the HHRA and the methodologies used to select them are presented in Appendix A of the TMSRA (see Tables A-11 and A-12) (ChaduxTt 2007).

Lead

No RfD or SF is currently available for evaluating health risks from exposure to lead. Therefore, the HHRA evaluated the potential for human health effects from exposure to lead by comparing exposure point concentrations (EPC) for lead with an HPS-specific risk-based concentration for lead (155 mg/kg) for residential and recreational receptors and the EPA (2004) Region 9 industrial PRG for lead (800 mg/kg) for industrial and construction worker receptors. The HPS risk-based concentration for lead was developed using the Cal/EPA (1999b) LeadSpread model and EPA's Integrated Exposure Uptake Biokinetic model. The methodology for development of the HPS risk-based concentration for lead is presented in Attachment 6 of Appendix A of the TMSRA (ChaduxTt 2007).

7.1.5 Risk Characterization

Risks from exposure to COPCs in soil and groundwater for each redevelopment block were evaluated using two methods: (1) the specific exposure scenario associated with the planned reuse of the redevelopment block, and (2) for the other potential exposure scenarios identified for Parcel B, regardless of the planned reuse of the redevelopment block. Appendix A of the TMSRA for Parcel B (ChaduxTt 2007) contains the risk results for both methods. Results of the HHRA for soil, groundwater, and radioactive chemicals are summarized below; this summary is limited to results for the first method (that is, results associated with the planned reuses for Parcel B). The risk summary identifies which COPCs caused a chemical-specific risk greater than 10^{-6} or a chemical-specific hazard index (HI) greater than 1.0 and were considered COCs.

7.1.5.1 Risk Summary for Soil (Incremental Risk Evaluation)

Risks from exposure to COPCs in soil were assessed for both surface soil (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs) for the incremental risk evaluation. Figure 7-4 and Figure 7-5 summarize the grid-specific incremental risk results for surface and subsurface soil based on the planned reuse of the redevelopment block associated with each grid. Table 7-1 summarizes the incremental cancer risk and noncancer HI results; Table 7-1 incorporates risk results for both surface and subsurface soil and includes the maximum risk value for each redevelopment block. Appendix A of the TMSRA (ChaduxTt 2007) contains tables that summarize the specific

calculated incremental cancer risk and noncancer HI results for each grid, including the COCs identified and the percent contribution by each potentially complete exposure pathway.

The following chemicals were identified as COCs in at least one grid, based on planned reuse and the results of the incremental risk evaluation for soil. Approximately 70 percent of the grids identified in the total risk evaluation for surface soil as posing a cancer risk that exceeded 10^{-6} or a noncancer HI greater than 1.0, no longer exceeded those risk thresholds after the incremental risk evaluation. Similarly, approximately 45 percent of the grids identified in the total risk evaluation for subsurface soil where risk values were exceeded no longer exceeded the cancer and noncancer risk thresholds after the incremental risk evaluation.

Exposure Scenario	Chemicals of Concern in Surface Soil, Incremental Risk	Chemicals of Concern in Subsurface Soil, Incremental Risk
Industrial[1]	None	Arsenic, Benzo(a)anthracene, and Benzo(a)pyrene
Recreational[1]	Aroclor-1254, Aroclor-1260, Arsenic, Benzo(a)pyrene, and Lead	Not applicable
Residential[1]	Antimony, Arsenic, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, bis(2-Ethylhexyl)phthalate, Copper, Dibenz(a,h)anthracene, Dieldrin, Heptachlor Epoxide, Indeno(1,2,3-cd)pyrene, Lead, Manganese, Tetrachloroethene, Trichloroethene, and Zinc	Antimony, Aroclor-1254, Aroclor-1260, Arsenic, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, beta-BHC, bis(2-Ethylhexyl)phthalate, Cadmium, Copper, Dibenz(a,h)anthracene, Dieldrin, Heptachlor Epoxide, Indeno(1,2,3-cd)pyrene, Iron, Lead, Manganese, Naphthalene, Tetrachloroethene, Trichloroethene, Vanadium, and Zinc
Construction Worker[2]	Not applicable	Aroclor-1260, Arsenic, Benzo(a)pyrene, Lead, and Trichloroethene

Notes:

1 Chemicals of concern identified for this exposure scenario were based on the planned reuse for Parcel B.
2 The construction worker exposure scenario is not associated with a specific planned reuse for Parcel B.

BHC Benzene hexachloride

7.1.5.2 Risk Summary for Groundwater

Risks from exposure to COPCs in groundwater were assessed for the A- and B-aquifers. Three plumes were identified for Parcel B that present a potential risk to human health: the IR-10A, IR-10B, and IR-25 risk plumes. Exposure to groundwater from inhalation of volatile COPCs in groundwater that migrates through the subsurface to indoor air (vapor intrusion) was the only complete exposure pathway for the A-aquifer for the planned reuses of Parcel B. Exposure to A-aquifer groundwater may occur during trenching for the construction worker scenario. Figure 7-6 summarizes the risk results for groundwater in the A-aquifer based on the planned reuse for each redevelopment block. Figure 7-7 summarizes the risk results for exposure to groundwater in the B-aquifer. The risk results for groundwater in the B-aquifer, which was evaluated for residential exposure from domestic use, were based on each exposure area evaluated, regardless of planned reuse. Table 7-2 summarizes the risk results for groundwater. Appendix A of the TMSRA (ChaduxTt 2007) contains tables that summarize the specific calculated cancer risk and noncancer HI results for each plume (and grid for nonplume wells), including the COCs identified and the percent contribution by each potentially complete exposure pathway.

The following chemicals were identified as COCs in groundwater in the A-aquifer based on planned reuse.

Exposure Scenario	Chemicals of Concern in Groundwater, A-Aquifer		
Industrial[1]	Chloroform		
Recreational[1]	Not applicable		
Residential[1]	1,2,4-Trichlorobenzene 1,2,4-Trimethylbenzene 1,2-Dichlorobenzene 1,2-Dichloroethane 1,2-Dichloroethene (total) 1,2-Dichloropropane 1,3,5-Trimethylbenzene 1,4-Dichlorobenzene	Chloroethane Chloroform cis-1,2-Dichloroethene 2-Methylnaphthalene[2] Benzene Bromodichloromethane Chlorobenzene Dichlorodifluoromethane	Methylene chloride Naphthalene Tetrachloroethene trans-1,2-Dichloroethene Trichloroethene Trichlorofluoromethane Vinyl chloride
Construction Worker[3]	1,2,4-Trichlorobenzene 1,2,4-Trimethylbenzene 1,2-Dichlorobenzene 1,2-Dichloroethane 1,2-Dichloroethene (total) 1,2-Dichloropropane 1,4-Dichlorobenzene 2,4,6-Trichlorophenol 2,4-Dimethylphenol 2,4-Dinitrotoluene	2-Methylnaphthalene 4-Methylphenol Arsenic Benzene Benzo(a)anthracene Benzo(a)pyrene Bromodichloromethane Chlorobenzene Chloroform[2]	Chrysene cis-1,2-Dichloroethene Mercury[2] Naphthalene Pentachlorophenol Tetrachloroethene trans-1,2-Dichloroethene Trichloroethene Vinyl chloride

Notes:

1 Chemicals of concern identified for this exposure scenario were based on the planned reuse for Parcel B.

2 Chemical is a COC based on the maximum concentration scenario (see Sections A5.1.2 and A8.0 of Appendix A of the TMSRA).

3 The construction worker exposure scenario is not associated with a specific planned reuse for Parcel B.

The B-aquifer is predominantly absent from most areas of Parcel B, except in the western portion of the parcel. Exposure areas evaluated for domestic use exposure to groundwater in the B-aquifer were limited to two non-plume exposure areas in Redevelopment Block 2 and two non-plume exposure areas in Redevelopment Block BOS-1. The HHRA evaluated potential risks from domestic use of groundwater under two cases because the potential for hydraulic communication between the A- and B-aquifers exists in the western portion of Parcel B: first using solely B-aquifer data, and second using a combination of B- and A-aquifer data, when available, to account for potential hydraulic communication between the two aquifers in some areas of Parcel B. The risk characterization analysis and identification of COCs for the B-aquifer were limited to risk results that account for potential hydraulic communication between the A- and B-aquifer because these results provide a more conservative estimate of potential risks from exposure to the B-aquifer. (That is, risks evaluated for the B-aquifer using a combination of A- and B-aquifer data result in more COCs than risks evaluated using solely B-aquifer data.) COCs for the B-aquifer were identified for grids B0139, B0237, and B0238 and are summarized below.

Exposure Scenario	COCs in Groundwater, B-Aquifer[1]	
Residential	1,4-Dichlorobenzene; Antimony Arsenic; Benzene; Chloroethane	Manganese; Pentachlorophenol Thallium; Trichloroethene

Note:

1 COCs in the B-aquifer were identified based on evaluation of risks using a combination of A- and B-aquifer data, when available, to account for potential hydraulic communication in some areas of Parcel B.

7.1.5.3 Radiological Dose and Risk

Exposure to radiation at each radiologically impacted site was modeled using RESRAD for former building sites and open land areas and using RESRAD-BUILD for buildings. Table 7-3 presents the results of this evaluation. Table 7-1 summarizes the risk by redevelopment block.

^{226}Ra is the only naturally occurring radionuclide of concern at Parcel B. ^{137}Cs and ^{90}Sr may be present in trace quantities because of fallout from nuclear weapons testing. The radiological dose and risk modeling considered the background concentration for radionuclides of concern other than ^{226}Ra to be 0 picocuries per gram (pCi/g). The ^{226}Ra background concentration was assumed to be the measured background level of 0.5 pCi/g.

The background concentrations of radionuclides of concern were assumed to be 0 disintegrations per minute (dpm) per 100 square centimeters for surfaces to model total risk from radiologically impacted buildings. This assumption was made because none of the radionuclides of concern are found in building materials, except for ^{226}Ra which can be found in earthen materials (such as cement and ceramic tile).

Appendix A of the TMSRA radiological addendum (TtEC 2008) discusses the input parameters and modeling results for the radiological dose and risk for each radiologically impacted site.

7.2 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

The majority of Parcel B, approximately 75 percent, is covered by pavement and buildings. With little open space for flora and fauna, Parcel B is considered to have insignificant habitat value and poses an insignificant risk to terrestrial ecological receptors. Exposure pathways to terrestrial species are incomplete because of a lack of habitat and the predominance of paved areas in Parcel B (PRC 1996b). However, potential ecological risk to receptors near the shoreline was not previously evaluated. Therefore, a SLERA was conducted to evaluate potential ecological risks from exposure to shoreline sediment. Appendix B of the TMSRA (ChaduxTt 2007) presents the details of the SLERA.

The focus of the SLERA was the intertidal zone of the Parcel B shoreline, which incorporates portions of IR-07 and IR-26. The shoreline of IR-07 consists of about 1.5 acres and includes approximately 1,300 ft^2 of tidal marsh wetlands. A detailed description of the wetlands can be found in the Wetlands Delineation and Functions and Values Assessment report (Tetra Tech 2002). The shoreline of IR-26 consists of about 0.3 acre on the Point Avisadero peninsula. Field observations found that mainly invertebrates and birds use the shoreline habitat. Invertebrates included crabs and isopods that hide under rocks and feed on other small invertebrates. Mussels and barnacles were visible on the rocks at low tide.

The SLERA considered exposures to the following ecological receptor groups in the evaluation of the Parcel B shoreline:

- Benthic invertebrates
- Diving ducks (represented by the surf scoter)
- Carnivorous shorebirds (represented by the willet)
- Carnivorous birds (represented by the red-tailed hawk)
- Omnivorous small mammals (represented by the house mouse)

Figure 7-8 presents the conceptual site model for ecological receptors. Exposures to benthic invertebrates were evaluated by direct comparison of chemical concentrations in sediment to a benchmark value (the effects range-median [ER-M]). Exposures to birds and mammals were assessed based on calculating daily ingested chemical doses using food chain modeling and comparison of site-specific ingested doses of chemicals to toxicity reference values. Dose calculations incorporated several types of data, including (1) chemical concentrations in sediment, (2) estimated prey tissue concentrations based on biotransfer factors from terrestrial areas of Parcel E (Battelle and others 2002; Tetra Tech and LFR 2000; EPA 1999c), (3) ecological field studies, and (4) the natural history of selected receptors.

Some potentially toxic chemicals were detected in sediment and groundwater at the Parcel B shoreline at concentrations that exceed ambient levels and toxicological benchmarks, with exposure pathways to receptors that are complete. The data presented in the SLERA indicated potential unacceptable risk to benthic invertebrates, birds, and mammals from several metals, pesticides, and PCBs in sediment along the Parcel B shoreline. Likewise, data in the SLERA indicated potential unacceptable risk may be caused by concentrations of mercury, which was identified as a COC in groundwater. VOCs in groundwater were not found to pose a risk to San Francisco Bay. The following COCs were identified for ecological exposure at Parcel B:

Chemicals of Concern in Sediment	Chemical of Concern in Groundwater
Aluminum, Copper, Dibenz(a,h)anthracene, Dieldrin, Lead, Methoxychlor, Total Aroclors, Total Dichlorodiphenyltrichloroethane, and Zinc	Mercury

7.3 GROUNDWATER TRIGGER LEVELS

Groundwater at Parcel B is in contact with the surface water of the bay; however, the 1997 ROD did not evaluate potential interactions between groundwater and the surface water of the bay. Therefore, a screening evaluation was performed to assess whether the concentrations of chemicals detected in groundwater could affect the surface water of the bay. This evaluation involved comparison of surface water quality criteria with detected concentrations in the groundwater at Parcel B and included a point-by-point evaluation of the analytical history where concentrations in groundwater exceeded the surface water quality criteria. Appendix I of the TMSRA (ChaduxTt 2007) presents the details of this screening evaluation.

The surface water quality screening at Parcel B indicated that five metals (chromium VI, copper, lead, mercury, and nickel) in the A-aquifer consistently exceeded the screening criteria and, therefore, could affect the bay. No chemicals were identified to be of concern in the B-aquifer at Parcel B.

The Navy used highly conservative measures throughout the surface water quality evaluation, as agreed to with the regulatory agencies. The table below summarizes the derived attenuation factors and the trigger levels calculated for specific well locations for the chemicals identified as potential threats to the bay.

Well, COC	Attenuation Factor	HGAL (µg/L)	Surface Water Quality Criterion (µg/L)	Proposed Trigger Level at Source Well (µg/L)	Conc. at Source Well (µg/L)[a]	Date of Sample	Source Well Conc. Exceeds Proposed Trigger Level?
IR07MW20A2, copper	1	28.04	3.1	28.04	40.6	Jul-91	**YES**
IR07MWS-1, nickel	4	96.48	8.2	386	322	Dec-91	NO
IR07MWS-2, lead	1	14.44	8.1	14.44	114	Sep-04	**YES**
IR10MW12A, chromium VI	4.5	NA	50	225	550	Mar-04	**YES**
IR20MW01A, mercury	4	0.6	0.025	2.4	2	Jan-94	NO
IR26MW47A, mercury	1	0.6	0.025	0.6	2.8	Nov-04	**YES**
IR26MW48A, lead	1	14.44	8.1	14.44	71.5	Sep-04	**YES**
PA50MW02A, mercury	1	0.6	0.025	0.6	0.91	Aug-94	**YES**

Note: a = Data set includes samples collected through November 2004.

Inclusion of the six wells listed above in the groundwater monitoring program to be developed during the RD will be based on the concentrations observed in groundwater at these wells when the design is prepared. Evaluations in the RD will consider current data for the six wells listed above and will not be limited to the data set ending in November 2004 that was used for the trigger level analysis. These newer data collected since November 2004 may indicate that monitoring is no longer necessary (for example, if the data show concentrations are consistently below the trigger level). Wells that were installed after the cut-off date for the surface water quality evaluation (November 2004) will also be included in the assessment during the RD. These evaluations will be described in the RD for review by the regulatory agencies.

The following additional evaluations may occur for the cases where current data indicate concentrations consistently exceed a trigger level. The details of these evaluations will be included in the RD.

- Increasing the frequency of monitoring in the well where the trigger level was exceeded to evaluate whether the elevated level is persistent;
    - Evaluation of whether an elevated level is persistent may include statistical analysis of trends and multiple verification of statistically significant exceedances;

- Monitoring groundwater at a location farther downgradient to evaluate whether the attenuation estimated in establishing the trigger level has occurred;
  - Downgradient monitoring may include evaluation of plume stability;
- Using site-specific detailed information to more accurately estimate attenuation (including processes such as adsorption and degradation);
- Monitoring groundwater along the interface between groundwater and the surface water of the bay; or
- Implementing a selected remediation alternative for groundwater treatment.

FIGURES

PRIMARY SOURCE	PRIMARY RELEASE MECHANISM	SECONDARY SOURCE	SECONDARY RELEASE MECHANISM	TERTIARY SOURCE	TERTIARY RELEASE MECHANISM	QUATERNARY SOURCE	EXPOSURE ROUTE	PRIMARY RECEPTORS			
								Future Industrial Worker	Future Construction Worker	Future Recreational User	Future Resident
Parcel B IR Sites	Spills and Leaks	Surface Soil (0-2 feet bgs)					Ingestion	C	I*	C	C
							Dermal Contact	C	I*	C	C
			Root Uptake	Homegrown Produce			Ingestion	I	I	I	C
			Wind Suspension	Outdoor Air (Particulates)			Inhalation	C	I*	C	C
			Volatilization	Outdoor Air (VOCs)			Inhalation	C	I*	C	C
		Subsurface Soil (0-10 feet bgs)					Ingestion	C	C	I	C
							Dermal Contact	C	C	I	C
			Root Uptake	Homegrown Produce			Ingestion	I	I	I	C
			Wind Suspension	Outdoor Air (Particulates)			Inhalation	C	C	I	C
			Volatilization	Outdoor Air (VOCs)			Inhalation	C	C	I	C
				Indoor Air (VOCs)			Inhalation	I	I	I	I
			Infiltration and Percolation	Groundwater (A-aquifer)			Ingestion	I	I	I	I[a]
							Dermal Contact	I	C	I	I[a]
					Volatilization (Construction)	Construction Trench Air (VOCs)	Inhalation	I	C	I	I
					Volatilization (Domestic Use)	Indoor Air (VOCs)	Inhalation	I	I	I	I[a]
					Volatilization (Vapor Intrusion)	Indoor Air (VOCs)	Inhalation	C	I	I	C
				Groundwater (B-aquifer)			Ingestion	I	I	I	C
							Dermal Contact	I	I	I	C
					Volatilization (Domestic Use)	Indoor Air (VOCs)	Inhalation	I	I	I	C

Notes:

* See subsurface soil exposure pathways

a Although groundwater domestic use exposure pathways are complete for the A-aquifer, to address the potential for exposure resulting from hydraulic communication between the A- and B-aquifers for exposure areas B0139 and B0237, A-aquifer data were used to evaluate potential risks for these exposure areas.

bgs Below ground surface

C Potentially complete exposure pathway

I Incomplete or negligible exposure pathway

IR Installation Restoration

VOC Volatile organic compound

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Hunters Point Shipyard, San Francisco, California

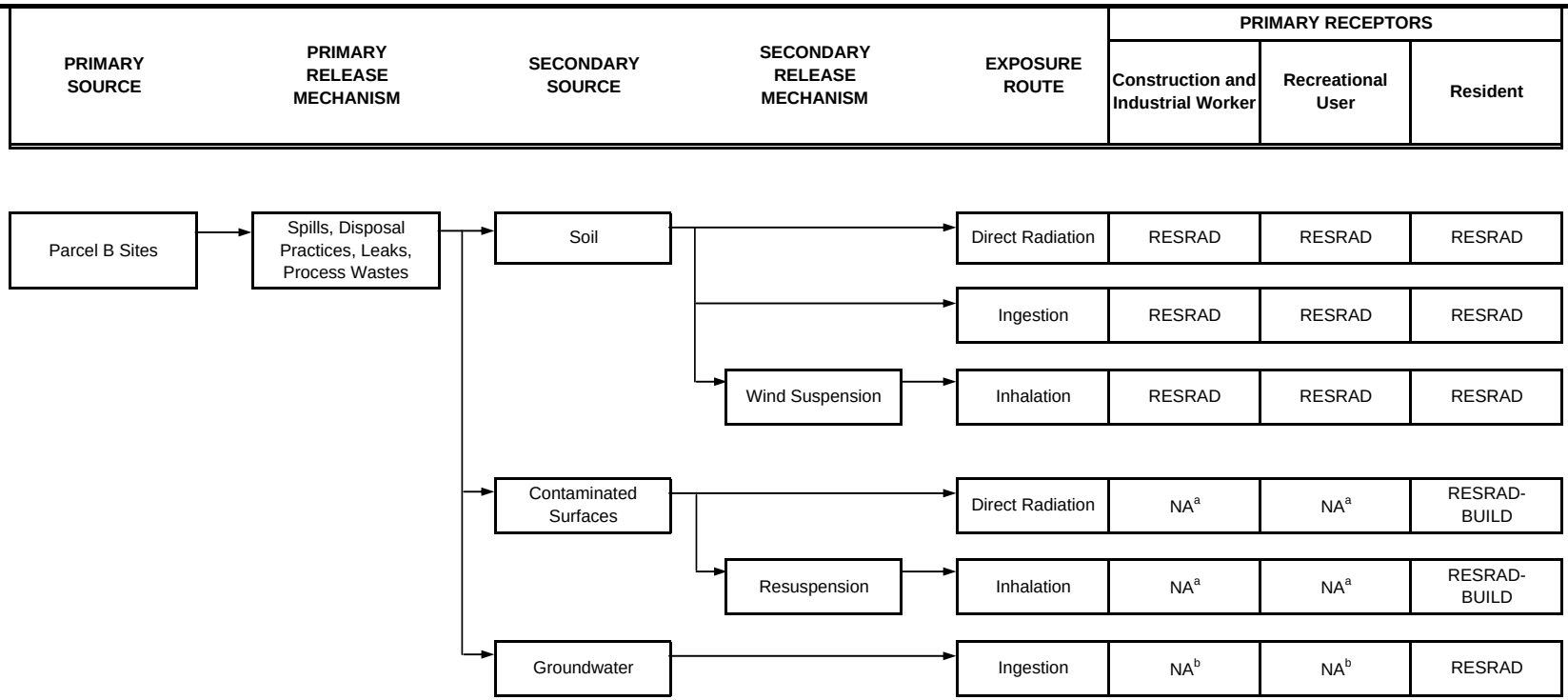
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-1

HUMAN HEALTH CONCEPTUAL SITE MODEL

(NONRADIOACTIVE CHEMICALS)

Amended ROD for Parcel B



Notes:

a Resident scenario bounds the worker and recreational user scenarios.

b Groundwater pathway analyzed only for resident scenario.

NA Not applicable

RESRAD Computer code model to estimate risk/dose from residual radiological materials.
RESRAD-BUILD estimates risk/dose resulting from human activities at radiologically impacted buildings.

Exposure pathway is potentially complete for all receptors where RESRAD or RESRAD-BUILD is listed.

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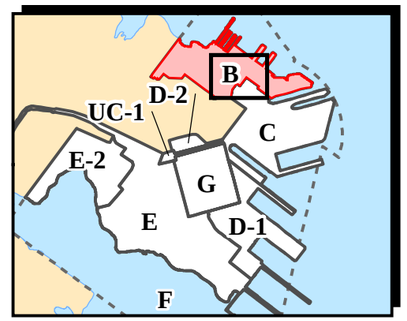
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-2
HUMAN HEALTH CONCEPTUAL SITE MODEL
(RADIOACTIVE CHEMICALS)
Amended ROD for Parcel B

PA24MW01A
IR46MW46A
IR46MW39A2
IR46MW39A3
IR46MW39A
PA50MW01A
SAN FRANCISCO BAY
IR46MW47A
IR10MW31A1
IR10MW31A2
IR10MW31A1D
PA24MW02A
IR10MW32A
IR10MW64A
IR10MW33A
IR10BHG07
IR10MW62A
IR10P13AA
IR46MW48A
IR10MW78A
IR10BHG08
IR10P13A
IR46MW40A2
IR46MW40A3
IR10BHG06
IR10MW13A1
IR46MW40A
IR24-
IR61MW05A
IR-61
IR10BHG05
IR10MW13A2
IR10MW80A
IR24MW07A
PA24MW03AD
IR10BHG04
IR10MW63A
IR46MW38A
IR46P38AB
IR61MW04A
IR10MW75A
IR10MW61A
PA24MW03AD1
IR24MW05A
IR10MW12A
IR46P38AA
IR10MW60A
IR10MW79A
IR24MW06A
IR-23
IR10MW29A2
IR10MW74A
IR24MW04A
IR10MW76A
IR10MW29A1
IR10MW59A
IR62MW07A
IR10BHG02
IR10MW70A
IR10MW77A
IR10MW71A
IR10BHG01
IR10MW14A
IR10MW66A
IR46MW37A
IR10BHG03
IR10MW28A
IR10BHG09
IR10BHG10
IR10MW65A
IR10MW72A
IR10MW69A
IR20MW06A
IR10MW73A
IR10MW68A
IR25MW61A1
IR10MW67A
IR25MW61A2
IR20MW17A
LOCKWOOD ST.
IR62MW08A
IR-10
IR10P15A
IR10MW15A
IR20MW01A
IR20MW11A
IR06MW46A
IR-20
SI-31
IR-42
Parcel C

159 125 128 131 121 122 130 116 115 123 120 156 113 134 113A 109



Location Map

- Monitoring Well
- Road
- 2004 Chromium VI Plume
- 2004 Volatile Organic Compound Plume
- Parcel B Boundary
- IR-10A Risk Plume
- IR-10B Risk Plume
- IR-25 Risk Plume
- IR or SI Site
- Other Parcel Boundary
- 128 Building
- San Francisco Bay
- Non-Navy Property

Notes:

IR Installation Restoration
SI Site Inspection

See Figure 5-1 for location of current mercury plume; no risk plume was identified for mercury.

0 100 200
Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-3
COMPARISON OF THE 2004 GROUNDWATER PLUMES AND RISK PLUMES
Amended ROD for Parcel B

07/09/2008 O:\Hunters_Point\Projects\Parcel_B\ROD\projects\Fig7-3_Plume_Comparison.mxd TtEMI-DN Kurt.Cholak

SAN FRANCISCO BAY

SAN FRANCISCO BAY

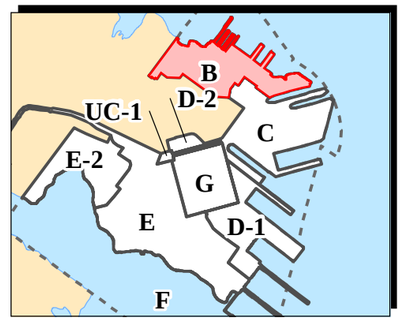
ROBINSON ST.

LOCKWOOD ST

FISHER AVE.

VAN KEUREN AVE.

Blk 1
Blk 2
Blk 3
Blk 4
Blk 5
Blk 6
Blk 7
Blk 8
Blk 9
Blk 12
Blk 15
Blk 16
Blk BOS-1
Blk BOS-2
Blk BOS-3



Location Map

- Residential Lead Concentration > 155 mg/kg
- Recreational Lead Concentration > 155 mg/kg
- Road
- Residential Cancer Risk > 1E-06
- Recreational Cancer Risk > 1E-06
- Residential and Recreational Cancer Risk ≤ 1E-06
- Highest Segregated Hazard Index > 1
- No Data
- Parcel Boundary
- Research and Development
- Mixed Use
- Open Space
- Educational/Cultural
- Building
- Non-Navy Property
- San Francisco Bay

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use and Research and Development planned reuses.
2. A 150-foot by 150-foot exposure area (industrial grid) is used to evaluate risks associated with Open Space, and Educational/Cultural planned reuses.
3. Risks are based on nonradiological chemicals.

Blk Block
ft bgs Feet below ground surface
mg/kg Milligram per kilogram

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-4
INCREMENTAL RISK - SURFACE SOIL (0 TO 2 FT BGS)
BASED ON PLANNED REUSE
Amended ROD for Parcel B

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SAN FRANCISCO BAY

SAN FRANCISCO BAY

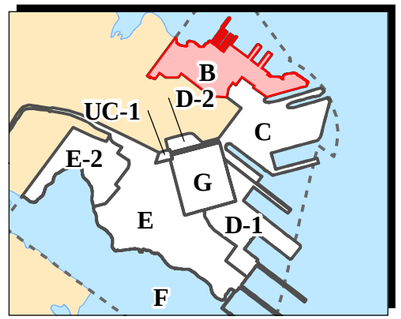
Blk 1
Blk 2
Blk 3
Blk 4
Blk 5
Blk 6
Blk 7
Blk 8
Blk 9
Blk 12
Blk 15
Blk 16
Blk BOS-1
Blk BOS-2
Blk BOS-3

LOCKWOOD ST.

ROBINSON ST.

FISHER AVE.

VAN KEUREN AVE.



Location Map

- Residential Lead Concentration > 155 mg/kg
- Industrial Cancer Risk > 1E-06
- Residential Cancer Risk > 1E-06
- Residential Cancer Risk ≤ 1E-06
- Highest Segregated Hazard Index > 1
- Data Available; Recreational Scenario Not Evaluated for Subsurface Soil
- No Data
- Parcel Boundary
- Research and Development
- Mixed Use
- Open Space
- Educational/Cultural
- Road
- 128 Building
- Non-Navy Property
- San Francisco Bay

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use and Research and Development planned reuses.
2. A 150-foot by 150-foot exposure area (industrial grid) is used to evaluate risks associated with Open Space, and Educational/Cultural planned reuses.
3. Risks are based on nonradiological chemicals.

Blk Block
ft bgs Feet below ground surface
mg/kg Milligram per kilogram

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-5
INCREMENTAL RISK - SUBSURFACE SOIL (0 TO 10 FT BGS)
BASED ON PLANNED REUSE
Amended ROD for Parcel B

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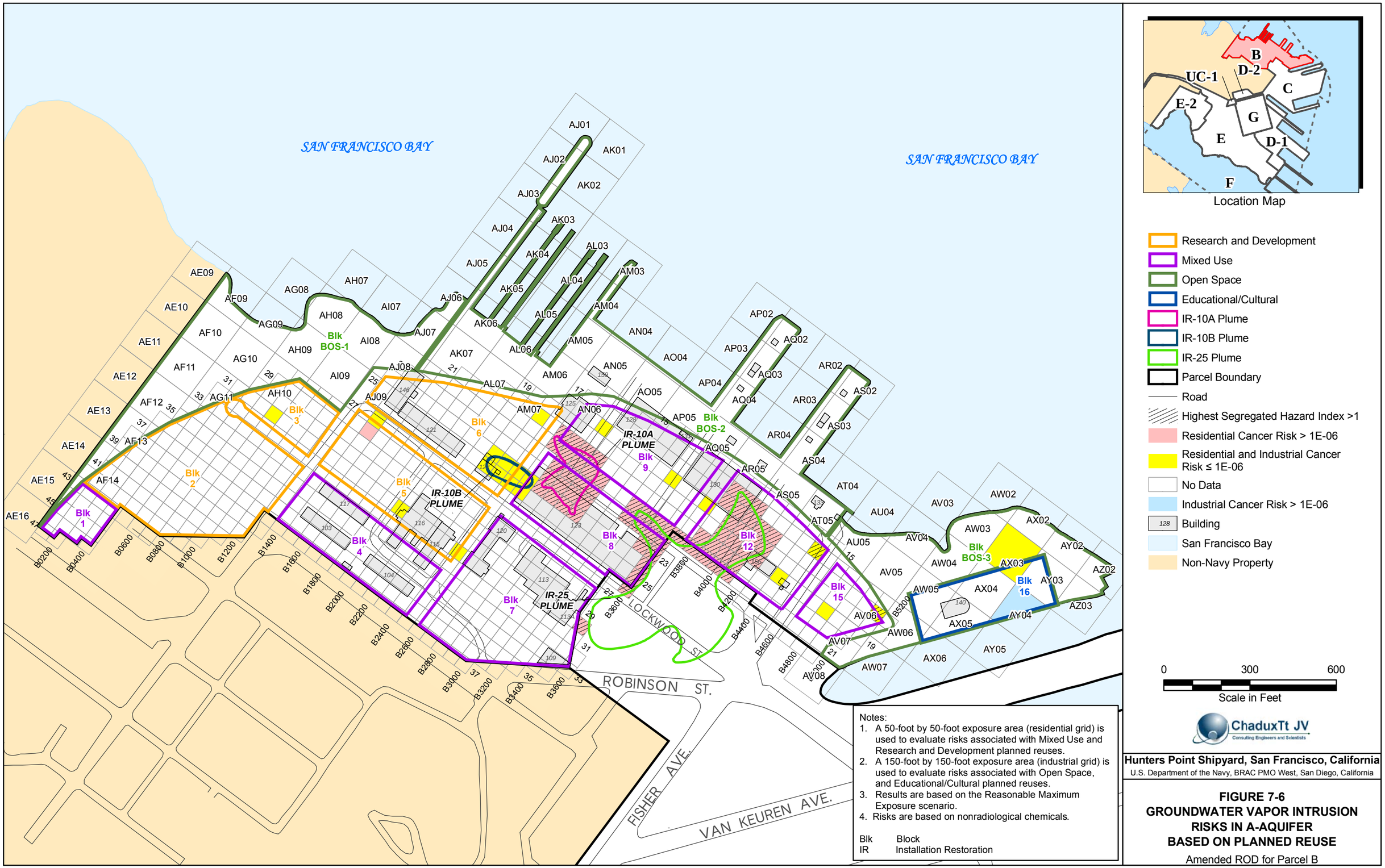

Location Map

- Research and Development
- Mixed Use
- Open Space
- Educational/Cultural
- IR-10A Plume
- IR-10B Plume
- IR-25 Plume
- Parcel Boundary
- Road
- Highest Segregated Hazard Index >1
- Residential Cancer Risk > 1E-06
- Residential and Industrial Cancer Risk ≤ 1E-06
- No Data
- Industrial Cancer Risk > 1E-06
- 128 Building
- San Francisco Bay
- Non-Navy Property

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use and Research and Development planned reuses.
2. A 150-foot by 150-foot exposure area (industrial grid) is used to evaluate risks associated with Open Space, and Educational/Cultural planned reuses.
3. Results are based on the Reasonable Maximum Exposure scenario.
4. Risks are based on nonradiological chemicals.

Blk Block
IR Installation Restoration

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-6
GROUNDWATER VAPOR INTRUSION RISKS IN A-AQUIFER BASED ON PLANNED REUSE
Amended ROD for Parcel B

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SAN FRANCISCO BAY

SAN FRANCISCO BAY

Risk estimates for B-aquifer with potential hydraulic communication between the A- and B-aquifers

IR-10A PLUME

IR-10B PLUME

IR-25 PLUME

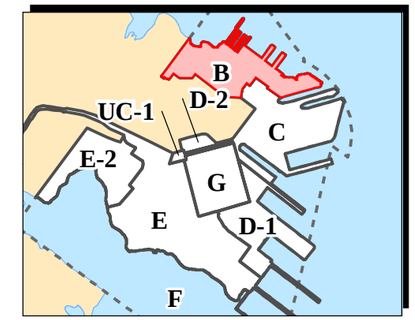
LOCKWOOD ST.

ROBINSON ST.

FISHER AVE.

VAN KEUREN AVE.

Parcel C



Location Map

- IR-10A Plume
- IR-10B Plume
- IR-25 Plume
- Parcel Boundary
- Highest Segregated Hazard Index > 1
- Residential Cancer Risk > 1E-06
- Residential Cancer Risk ≤ 1E-06
- Road
- Building
- San Francisco Bay
- Non-Navy Property

Notes:

1. Results are based on the reasonable maximum exposure scenario.
2. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with residential exposures.
3. Risks are based on nonradiological chemicals.

IR Installation Restoration

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California

U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-7
GROUNDWATER DOMESTIC USE RISKS IN B-AQUIFER, RESIDENTIAL EXPOSURE SCENARIO

Amended ROD for Parcel B

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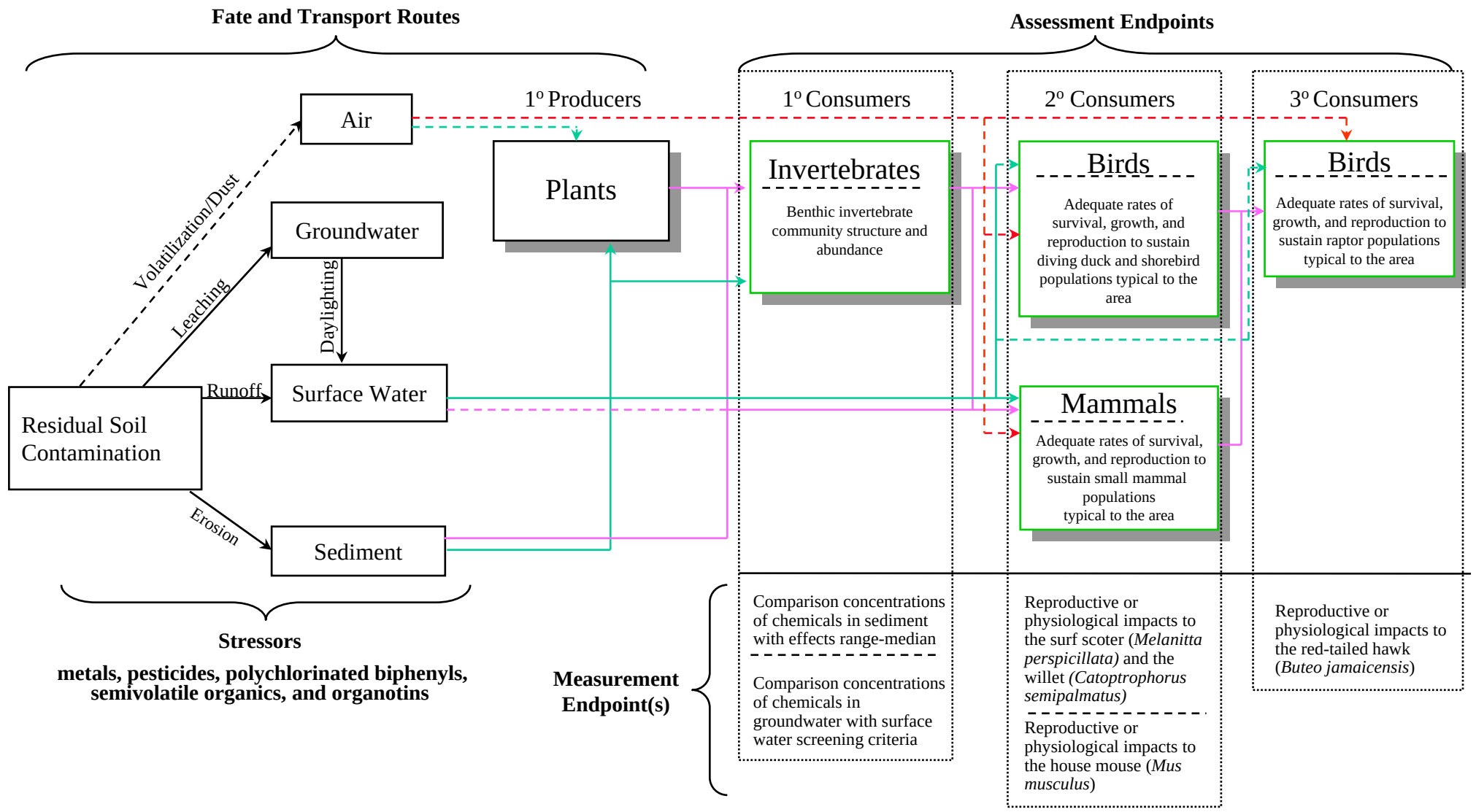


Legend

- INHALATION EXPOSURE PATHWAY
- INGESTION EXPOSURE PATHWAY
- DIRECT CONTACT EXPOSURE PATHWAY
- TRANSPORT ROUTE
- (All Colors) MINOR TRANSPORT ROUTES AND EXPOSURE PATHWAYS

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 7-8
ECOLOGICAL CONCEPTUAL SITE MODEL

Amended ROD for Parcel B

TABLES

TABLE 7-1: CANCER RISKS AND NONCANCER HAZARDS FROM SOIL

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Redevelopment Block	Exposure Scenario	Cancer Risk		Noncancer Hazard Index[a]
		Chemical[a]	Radiological[b]	
1	Residential	2×10^{-6}	1×10^{-5}	< 1
2	Residential	9×10^{-6}	1×10^{-5}	2
3	Residential	3×10^{-3}	1×10^{-5}	9
4	Residential	c	3×10^{-6}	c
5	Residential	4×10^{-6}	d	< 1
6	Residential	8×10^{-6}	3×10^{-6}	2
7	Residential	4×10^{-4}	3×10^{-6}	3
8	Residential	2×10^{-4}	d	2
9	Residential	6×10^{-6}	3×10^{-6}	3
12	Residential	2×10^{-5}	3×10^{-6}	4
15	Residential	4×10^{-5}	4×10^{-5}	2
16	Industrial	1×10^{-4}	2×10^{-5}	< 1
BOS-1	Recreational	8×10^{-6}	1×10^{-5}	< 1
BOS-2	Recreational	3×10^{-7}	d	< 1
BOS-3	Recreational	8×10^{-5}	4×10^{-6}	< 1

Notes:

a Listed risk value is maximum in each redevelopment block; risk values for non-radioactive chemicals are based on Tables A-19 and A-20 of the final TMSRA.

b Risk from radiological contaminants includes soil and structures; risk values for radiological contaminants are based on Table 3-6 of the final TMSRA radiological addendum.

c Not applicable; samples were not collected because no historical activities occurred there.

d Not applicable; no radiologically impacted areas or buildings were located in this block.

TMSRA Technical Memorandum in Support of a Record of Decision Amendment

Sources:

ChaduxTt. 2007. "Final Parcel B Technical Memorandum in Support of a Record of Decision Amendment, Hunters Point Shipyard, San Francisco, California." December 12.

Tetra Tech EC, Inc. 2008. "Final Parcel B Technical Memorandum in Support of a Record of Decision Amendment Radiological Addendum, Hunters Point Shipyard, San Francisco, California." March 14.

TABLE 7-2: CANCER RISKS AND NONCANCER HAZARDS FROM GROUNDWATER
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Redevelopment Block	Exposure Scenario	Cancer Risk	Noncancer Hazard Index
A-Aquifer. Risks based on Vapor Intrusion.			
1	Residential	a	a
2	Residential	b	b
3	Residential	$< 10^{-6}$	< 1
4	Residential	a	a
5	Residential	2×10^{-6}	< 1
6	Residential	$< 10^{-6}$	< 1
7	Residential	b	b
8	Residential	1×10^{-1}	331
9	Residential	6×10^{-3}	2
12	Residential	1×10^{-1}	331
15	Residential	c	1
16	Industrial	3×10^{-6}	< 1
BOS-1	Recreational	d	d
BOS-2	Recreational	d	d
BOS-3	Recreational	d	d
B-Aquifer. Risks based on Domestic Use.			
2	Residential	9×10^{-4}	< 1
BOS-1	Residential	1×10^{-3}	4

Notes:

B-aquifer is present only at Redevelopment Blocks 2 and BOS-1. Risks for B-aquifer include A-aquifer data to address potential hydraulic communication between aquifers.

a Not applicable; samples were not collected because no historical activities occurred there.

b Not applicable; volatile chemicals not detected in groundwater in this block.

c Not applicable; carcinogenic chemicals were not detected in groundwater in this block.

d Not applicable; recreational users are not assumed to be exposed to groundwater.

TABLE 7-3: RADIOLOGICAL RISK RESULTS

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

RESRAD-BUILD Results

Impacted Building	Radiological Risk[a,b]	Dose (millirem/year)
Building 103	1.48×10^{-6}	7.02
Building 113	1.48×10^{-6}	7.02
Building 113A	1.60×10^{-6}	1.45
Building 130	1.60×10^{-6}	1.45
Building 140	1.44×10^{-6}	5.43
Building 146	1.16×10^{-6}	1.20

Notes:

a Total risk and dose is equivalent to incremental risk and dose. Actual calculated dose and risk will be based on field measurements from the final status survey results.

b Total excess lifetime cancer risk

RESRAD Results

Total Dose and Risk[a]

Impacted Soil Area	Radiological Risk[b]	Dose (millirem/year)
Building 142 Site	6.39×10^{-5}	3.48
Building 157 Site	8.90×10^{-5}	4.86
IR-07	4.51×10^{-5}	3.27
IR-18	4.51×10^{-5}	3.27

Incremental Dose and Risk[a]

Impacted Soil Area	Radiological Risk[b]	Dose (millirem/year)
Building 142 Site	4.35×10^{-5}	2.39
Building 157 Site	5.97×10^{-5}	3.25
IR-07	3.02×10^{-5}	2.26
IR-18	3.02×10^{-5}	2.26

Notes:

a Actual calculated dose and risk will be based on field measurements from the final status survey results.

b Total excess lifetime cancer risk

IR Installation Restoration
RESRAD Residual radioactive (model)
RESRAD-BUILD Residual radioactive–building (model)

8.0 AMENDED REMEDIAL ACTION OBJECTIVES

This section summarizes the amended RAOs identified for Parcel B based on the future site use and the results of the HHRA and SLERA. RAOs were amended to reflect changes in the COCs (for example, the addition of radionuclides), changes in exposure pathways (for example, domestic use of groundwater in the B-aquifer), and changes in receptors (such as ecological receptors) since the 1997 ROD. RAOs provide the foundation used to develop the remedial alternatives for a site. An RAO is a statement that contains an objective for the protection of one or more specific receptors from exposure to one or more specific chemicals in a specific medium (such as soil, groundwater, or air) at a site. Reasonably anticipated future use of the site is an important consideration in selecting the RAOs and, thus, the remedy selected for the site. Amended RAOs for Parcel B were selected based on the future reuses identified in the redevelopment plan (SFRA 1997). Changes to the future reuse plans may result in further changes to the RAOs and, potentially, to the remedy.

The following sections summarize the amended RAOs developed for soil and sediment, groundwater, and radiologically impacted soil and structures at Parcel B based on the identified COCs, potential receptors and exposure pathways, and ARARs. RAOs related to soil gas are incorporated into the discussions of soil and groundwater because COCs in soil gas are influenced by the concentrations of the COCs in both soil and groundwater.

8.1 SOIL AND SEDIMENT

Separate RAOs were developed for human and ecological receptors. Ecological RAOs were developed only for soil and sediment in shoreline areas. No ecological RAOs were developed for other soil at Parcel B because most of the land is paved and the parcel contains no identified terrestrial habitat.

The following RAOs apply to Parcel B soil and sediment:

1. Prevent exposure to organic and inorganic compounds in soil at concentrations above remediation goals developed in the HHRA (see Table 8-1) for the following exposure pathways:

   (a) Ingestion of, outdoor inhalation of, and dermal exposure to soil

   - From 0 to 10 feet bgs for residents in research and development and mixed-use reuse areas
   - From 0 to 10 feet bgs for industrial workers in the educational/cultural reuse area
   - From 0 to 2 feet bgs for recreational users in open space reuse areas
   - From 0 to 10 feet bgs for construction workers in all reuse areas

   (b) Ingestion of homegrown produce by residents in research and development and mixed-use reuse areas

2. Prevent exposure to VOCs in soil gas at concentrations that would pose unacceptable risk (that is, risk greater than 10^{-6}) via indoor inhalation of vapors.

3. Reduce presence of methane in soil gas such that at concentrations do not accumulate and become explosive in structures.

4. Prevent or minimize exposure of ecological receptors to organic and inorganic compounds in soil and sediment in shoreline areas at concentrations above remediation goals established for sediment (see Table 8-2).

8.2 GROUNDWATER

RAOs for groundwater were selected based on the various exposure scenarios indicating potential risk to human health and ecological receptors from groundwater. The RAOs for groundwater include:

1. Prevent exposure to VOCs and mercury in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater (see Table 8-3).

2. Prevent direct exposure to B-aquifer groundwater at concentrations above remediation goals (see Table 8-3) through the domestic use pathway (for example, drinking water or showering).

3. Prevent or minimize exposure of construction workers to metals, VOCs, and semivolatile organic compounds (SVOC) in the A-aquifer groundwater at concentrations above remediation goals from dermal exposure and inhalation of vapors from groundwater (see Table 8-3).

4. Prevent or minimize migration to the surface water of San Francisco Bay of chromium VI, copper, lead, and mercury in the A-aquifer groundwater that would result in concentrations of chromium VI above 50 µg/L, copper above 28.04 µg/L, lead above 14.44 µg/L, and mercury above 0.6 µg/L in the surface water of San Francisco Bay. This RAO is intended to protect the beneficial uses of the bay, including ecological receptors.

Remediation goals for soil, sediment, and groundwater were selected, by chemical, based on a comparison of (1) the concentration calculated in the risk assessment corresponding to a cancer risk of 10^{-6} or a noncancer hazard index of 1, (2) the laboratory practical quantitation limit (PQL), and (3) for metals only, the ambient level at Hunters Point Shipyard (the HPAL for soil and the HGAL for groundwater). The highest of the three values was selected as the remediation goal for each chemical. The same comparison was made for groundwater, with one additional constraint. If a legal requirement (see the discussion of ARARs in Section 13.0) applied to the chemical, the value specified in the legal requirement was selected.

8.3 RADIOLOGICALLY IMPACTED SOIL AND STRUCTURES

RAOs for radiologically impacted sites include:

1. Prevent ingestion, dermal contact, or inhalation of radionuclides of concern in concentrations that exceed remediation goals (see Table 8-4).
2. Ensure that the increased lifetime cancer risk does not exceed the risk range of 10^{-6} to 10^{-4} for future-use scenarios.

TABLES

TABLE 8-1: REMEDIATION GOALS FOR SOIL

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (mg/kg)	Basis for Goal
Residential	Antimony	10	RBC
	Aroclor-1254	0.093	RBC
	Aroclor-1260	0.21	RBC
	Arsenic	11.1	HPAL
	Benzo(a)anthracene	0.37	RBC
	Benzo(a)pyrene	0.33	PQL
	Benzo(b)fluoranthene	0.34	RBC
	Benzo(k)fluoranthene	0.34	RBC
	Beta-BHC	0.0066	RBC
	Bis(2-ethylhexyl)phthalate	1.1	RBC
	Cadmium	3.5	RBC
	Copper	159	RBC
	Dibenz(a,h)anthracene	0.33	PQL
	Dieldrin	0.0034	PQL
	Heptachlor epoxide	0.0017	PQL
	Indeno(1,2,3-cd) pyrene	0.35	RBC
	Iron	58,000	HPAL
	Lead	155	RBC
	Manganese	1,431	HPAL
	Mercury	2.3	HPAL
	Naphthalene	1.7	RBC
	Tetrachloroethene	0.48	RBC
	Trichloroethene	2.9	RBC
	Vanadium	117	HPAL
	Zinc	373	RBC
Recreational	Aroclor-1254	0.74	RBC
	Aroclor-1260	0.74	RBC
	Arsenic	11.1	HPAL
	Benzo(a)pyrene	0.33	PQL
	Lead	155	RBC
Industrial	Arsenic	11.1	HPAL
	Benzo(a)anthracene	1.8	RBC
	Benzo(a)pyrene	0.33	PQL
Construction Worker	Aroclor-1260	2.1	RBC
	Arsenic	11.1	HPAL
	Benzo(a)pyrene	0.65	RBC
	Lead	800	RBC
	Trichloroethene	151	RBC

Notes:

HPAL Hunters Point ambient level
mg/kg Milligram per kilogram
PQL Practical quantitation limit
RBC Risk-based concentration

TABLE 8-2: REMEDIATION GOALS FOR SEDIMENT
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (mg/kg)	Basis for Goal
Ecological Receptor	Aluminum	3,400	RBC
	Copper	270	RBC
	Dibenz(a,h)anthracene	0.33	PQL
	Dieldrin	0.008	RBC
	Lead	218	RBC
	Methoxychlor	0.4	RBC
	Total Aroclors	0.18	RBC
	Total DDT	0.046	RBC
	Zinc	410	RBC

Notes:

mg/kg Milligram per kilogram
PQL Practical quantitation limit
RBC Risk-based concentration

TABLE 8-3: REMEDIATION GOALS FOR GROUNDWATER
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (µg/L)	Basis for Goal
A-Aquifer Groundwater			
Residential Vapor Intrusion	1,2,4-Trichlorobenzene	66	RBC
	1,2,4-Trimethylbenzene	25	RBC
	1,2-Dichlorobenzene	2,561	RBC
	1,2-Dichloroethane	2.3	RBC
	1,2-Dichloroethene (total)	209	RBC
	1,2-Dichloropropane	1.1	RBC
	1,3,5-Trimethylbenzene	19	RBC
	1,4-Dichlorobenzene	2.1	RBC
	2-Methylnaphthalene	707	RBC
	Benzene	0.5	PQL
	Bromodichloromethane	1	RBC
	Chlorobenzene	392	RBC
	Chloroethane	6.5	RBC
	Chloroform	1.0	PQL
	cis-1,2-Dichloroethene	209	RBC
	Dichlorodifluoromethane	14	RBC
	Mercury	0.68	RBC
	Methylene chloride	27	RBC
	Naphthalene	3.6	RBC
	Tetrachloroethene	1	PQL
	trans-1,2-Dichloroethene	182	RBC
	Trichloroethene	2.9	RBC
	Trichlorofluoromethane	176	RBC
	Vinyl chloride	0.5	PQL
Industrial Vapor Intrusion	Chloroform	1.2	RBC
Construction Worker Trench Exposure	1,2,4-Trichlorobenzene	55	RBC
	1,2,4-Trimethylbenzene	72	RBC
	1,2-Dichlorobenzene	2,215	RBC
	1,2-Dichloroethane	30	RBC
	1,2-Dichloroethene (total)	363	RBC
	1,2-Dichloropropane	40	RBC
	1,4-Dichlorobenzene	68	RBC
	2,4,6-Trichlorophenol	15	RBC
	2,4-Dimethylphenol	9,801	RBC
	2,4-Dinitrotoluene	179	RBC
	2-Methylnaphthalene	140	RBC
	4-Methylphenol	3,500	RBC

TABLE 8-3: REMEDIATION GOALS FOR GROUNDWATER (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Exposure Scenario	Chemical of Concern	Remediation Goal (µg/L)	Basis for Goal
A-Aquifer Groundwater (Continued)			
Construction Worker Trench Exposure (Continued)	Arsenic	40	RBC
	Benzene	22	RBC
	Benzo(a)anthracene	2	PQL
	Benzo(a)pyrene	2	PQL
	Bromodichloromethane	26	RBC
	Chlorobenzene	594	RBC
	Chloroform	36	RBC
	Chrysene	6.4	RBC
	cis-1,2-Dichloroethene	363	RBC
	Mercury	4.68	RBC
	Naphthalene	20	RBC
	Pentachlorophenol	25	PQL
	Tetrachloroethene	19	RBC
	trans-1,2-Dichloroethene	721	RBC
	Trichloroethene	374	RBC
	Vinyl chloride	7.2	RBC
B-Aquifer Groundwater			
Residential Domestic Use	1,4-Dichlorobenzene	7.5	ARAR
	Antimony	43.26	HGAL
	Arsenic	27.34	HGAL
	Benzene	5	ARAR
	Chloroethane	4.6	RBC
	Manganese	8,140	HGAL
	Pentachlorophenol	25	PQL
	Thallium	12.97	HGAL
	Trichloroethene	5	ARAR

Notes:

µg/L Microgram per liter
ARAR Applicable or relevant and appropriate requirement
HGAL Hunters Point groundwater ambient level
PQL Practical quantitation limit
RBC Risk-based concentration

TABLE 8-4: REMEDIATION GOALS FOR RADIOLOGICALLY IMPACTED SOIL, STRUCTURES, AND GROUNDWATER

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Remediation Goals for Radionuclides					
	Surfaces (dpm/100cm^2)		Soil[c] (pCi/g)		Water[e] (pCi/L)
Radionuclide	Equipment, Waste[a]	Structures[b]	Construction Worker	Residential	Equipment, Waste[a]
Cesium-137	5,000	5,000	0.113	0.113	119
Cobalt-60	5,000	5,000	0.0602	0.0361	100
Plutonium-239	100	100	14.0	2.59	15
Radium-226	100	100	1.0[d]	1.0[d]	5.0[f]
Strontium-90	1,000	1,000	10.8	0.331	8.0

Notes:

a Based on "AEC Regulatory Guide 1.86" (1974). Goals for removable surface activity are 20 percent of these values

b Goals are based on 25 millirem per year (EPA does not believe this NRC regulation is protective of human health and the environment, and the HPS cleanup goals are more protective. This regulation is an ARAR only for radiologically impacted sites that are undergoing TCRAs and any additional remedial action required for those sites. It is not an ARAR for radiologically impacted portions of IR Sites 7 and 18 and Building 140 that will be transferred with engineering and institutional controls for radiological contaminants.)

c EPA PRGs for two future use scenarios

d Goal is 1 pCi/g above background per agreement with EPA

e Release criteria for water were derived from "Radionuclides Notice of Data Availability Technical Document" (EPA 2000) by comparing the limits from two criteria and using the most conservative value.

f Goal is for total radium concentration

AEC	Atomic Energy Commission	IR	Installation Restoration
ARAR	Applicable or relevant and appropriate requirement	NRC	Nuclear Regulatory Commission
cm^2	square centimeter	pCi/g	picocurie per gram
dpm	disintegration per minute	pCi/L	picocurie per liter
EPA	U.S. Environmental Protection Agency	PRG	Preliminary remediation goal
HPS	Hunters Point Shipyard	TCRA	Time-critical removal action

Source of goals:

Navy. 2006. "Revised Final Basewide Radiological Removal Action, Action Memorandum, Hunters Point Shipyard, San Francisco, California." February 14, 2006 as cited in

Tetra Tech EC Inc. 2008. "Final Parcel B Technical Memorandum in Support of a Record of Decision Amendment Radiological Addendum, Hunters Point Shipyard, San Francisco, California." March 14.

9.0 DESCRIPTION OF AMENDED REMEDIAL ALTERNATIVES

Amended remedial alternatives for soil, groundwater, and radiologically impacted sites at Parcel B were developed in accordance with the requirements identified in CERCLA, as amended by SARA, 42 U.S.C. § 9601, et seq. and the NCP. Five alternatives were developed for soil, three alternatives were developed for groundwater and three alternatives were developed for radiologically impacted soil and structures. These amended alternatives, including the evaluation of technologies and screening process that led to the development of these alternatives, were presented in the TMSRA (ChaduxTt 2007). The amended remedial alternatives are also compared with the original 1997 ROD alternatives in the TMSRA.

The amended remedial alternatives are listed below and discussed in the following sections.

9.1 AMENDED REMEDIAL ALTERNATIVES FOR SOIL

The following remedial alternatives were identified for soil at Parcel B:

- Alternative S-1 – No Action
- Alternative S-2 – Institutional Controls, Maintained Landscaping, and Shoreline Revetment
- Alternative S-3 – Excavation, Methane and Mercury Source Removal, Disposal, Maintained Landscaping, Institutional Controls, and Shoreline Revetment
- Alternative S-4 – Covers, Methane and Mercury Source Removal, Institutional Controls, and Shoreline Revetment
- Alternative S-5 – Excavation, Methane and Mercury Source Removal, Disposal, Covers, SVE, Institutional Controls, and Shoreline Revetment

Each of these alternatives is discussed below.

9.1.1 Alternative S-1 – No Action

Under Alternative S-1, remedial actions would not be performed. Soil would be left in place without implementing any response actions. The no-action response is retained as required by the NCP to provide a baseline for comparison with other alternatives. No cost is associated with this alternative.

9.1.2 Alternative S-2 – Institutional Controls, Maintained Landscaping, and Shoreline Revetment

Alternative S-2 uses a combination of institutional controls, maintained landscaping, and constructing a shoreline revetment that, together, would meet the RAOs. Institutional controls would be implemented parcel-wide for all of the redevelopment blocks to prevent exposure to potential unacceptable risks posed by COCs in soil. Institutional controls including land use and activity restrictions would be incorporated into legal instruments (restrictive covenants) that would be enforceable against future transferees. Section 12.2.1.5 describes institutional controls in detail. Institutional and engineering controls are the primary components for preventing exposure to COCs under this alternative.

Maintained landscaping would be required as an engineering control for areas that have been disturbed by excavation or construction and have not been restored with a cover (for example, clean imported soil, asphalt, or concrete). The maintained landscaping would prevent potential exposure to asbestos (that may be present in surface soil and transported by wind erosion) that would not be addressed by institutional controls alone. The RD would include specifications for the maintained landscaping (for example, plant types and cover density) as well as inspection and monitoring requirements.

The shoreline revetment would be constructed to protect the entire shoreline for Redevelopment Blocks BOS-1 and BOS-3, where the revetment was deemed necessary based on the results of the SLERA. The shoreline revetment would be constructed to eliminate exposure to contaminated shoreline sediment and to prevent migration of contaminated soil from inland locations to the bay. The revetments would cover the shoreline and could consist of layers of riprap overlying geofabric filters designed to prevent erosion and migration of fine material. Approximately 2,500 feet of shoreline would need revetment.

The 1,300-ft^2 wetland at Redevelopment Block BOS-1 would be filled and the Navy would mitigate the loss of the wetland through either compensatory mitigation, mitigation banking, or an in-lieu fee arrangement. Details of the shoreline revetment, including the plan for wetland mitigation, will be further refined during the RD. Institutional controls would be implemented to maintain the integrity of the shoreline revetment at Parcel B.

The shoreline revetment is a common element among Alternatives S-2, S-3, S-4, and S-5. The revetment is estimated to cost $2.9 million (capital cost only) and take about 6 months to build. The revetment will use proven shoreline stabilization techniques and the long-term effectiveness of the revetment is expected to be very good.

Engineering controls and institutional controls are estimated to cost $500,000 (capital only) and require a minimal amount of time (1 to 2 months) to implement. The effectiveness of this remaining portion of Alternative S-2 (that is, without the revetment) depends on the reliability of the engineering controls (fences, barriers, signs, and maintained landscaping) and the degree of enforcement of institutional controls. The estimated overall cost of Alternative S-2 is $5.5 million, which includes capital, the present value of 30 years of recurring periodic costs (such as operation and maintenance [O&M], inspections, and reporting), and contingency costs.

9.1.3 Alternative S-3 – Excavation, Methane and Mercury Source Removal, Disposal, Maintained Landscaping, Institutional Controls, and Shoreline Revetment

Alternative S-3 consists of soil excavation and off-site disposal in additional to the institutional controls, maintained landscaping, and shoreline revetment discussed in Alternative S-2. Areas where organic chemicals (including the methane source), mercury, and lead are COCs would be excavated to remediate these COCs to remediation goals. The engineering and institutional controls under this alternative would be the same as for Alternative S-2 and would be used to prevent exposure to potential unacceptable risk posed by other COCs in soil (that is, the ubiquitous metals at concentrations above remediation goals).

Soil would be excavated in specific areas within selected areas at Parcel B, as described below:

- Soil contaminated with organic chemicals and lead at concentrations that exceed remediation goals based on the planned reuse (SFRA 1997) would be excavated. Excavation would occur to a maximum depth of 10 feet bgs at risk grid B3416 (for lead in Redevelopment Block 9; see Figure 9-1), B3426 (for lead in Redevelopment Block 8; see Figure 9-2) and B4716 (for organic chemicals in Redevelopment Block 15; see Figure 9-3). The combined volume of soil for all three excavations is estimated to be less than 250 cubic yards.

- Soil and debris from the methane source area at Redevelopment Block 3 would be excavated (see Figure 9-4). Soil would be excavated to a depth of 20 feet bgs over an area of 50 feet by 150 feet (for an estimated volume of 5,600 cubic yards). Post-excavation monitoring of soil gas concentrations would be conducted to confirm methane levels meet the RAO. If methane source removal is not feasible based on site conditions (for example, if methane is produced from organic material in the native sediments instead of from identifiable construction debris), methane venting may be added as a contingency to mitigate potential risk from methane.

- Soil from the mercury source area at former Excavation EE-05 would be excavated (see Figure 9-5). The vertical extent of the mercury concentrations that exceed the remediation goal would be delineated to identify the mercury source material. Horizontal delineation can be estimated from the previous remedial action. Contaminated soil will be excavated from within the area of former Excavation EE-05 from 10 feet bgs to a depth of 15 feet bgs (the estimated depth of bedrock in the area) over an area of 60 feet by 250 feet (for an estimated volume of about 2,800 cubic yards).

- The need to excavate and remove soil or sediment for construction of the shoreline revetment would be evaluated during the RD; the cost estimate for the shoreline revetment included disposal of 6,000 cubic yards of sediment to establish appropriate grades and to allow placement of erosion control materials at appropriate elevations relative to sea level.

- The open excavations would be backfilled with clean soil, and the excavated soil that contains COCs would be removed from the site and transported to an appropriate disposal facility.

- Areas of soil that have been disturbed by excavation or construction and have not been restored with a cover would be covered by maintained landscaping as described in Alternative S-2.

- All other areas that present potential unacceptable incremental risk from potential exposure to COCs in soil (see Figure 9-6) would be left in place and addressed through institutional controls. The following bullets provide specific examples.
  - Excavation would not be proposed for any areas at Redevelopment Blocks 2, 3, and BOS-1 based on the presence of debris fill in those areas and the known difficulties of attempting removals in debris fill areas.
  - Excavation would not be proposed beneath existing buildings; building slabs and foundations act as adequate covers (grid B1626 and grids at Redevelopment Block 8).
  - Excavation would not be proposed to remove contaminants present at 10 feet bgs (except as discussed above for the mercury source area at Excavation EE-05); the overlying soil would act as an adequate cover (grids B4017, B4520, AX04, and AY03).

The Navy decided to address some of the newly identified sources (that is, methane and mercury sources) using TCRAs. Although these TCRAs may not be completed by the time the amended ROD is signed, the Navy anticipates that the TCRAs will meet the RAOs described in this amended ROD.

The methane and mercury source removals are also common elements among Alternatives S-3, S-4, and S-5. The methane source removal is estimated to cost $2.7 million (capital cost only) and to take about 6 months to complete. The mercury source removal is estimated to cost $1.3 million (capital cost only) and also take about 6 months to complete. These excavation and disposal components would provide excellent long-term effectiveness.

Excavation and off-site disposal are significant elements of this alternative; however, institutional controls are still a major component for preventing exposure to potential unacceptable risk posed by the soil left in place. Institutional controls are described in detail in Section 12.2.1.5.

The estimated overall cost of Alternative S-3 is $11.2 million.

9.1.4 Alternative S-4 – Covers, Methane and Mercury Source Removal, Institutional Controls, and Shoreline Revetment

Alternative S-4 consists of covers to ensure the exposure pathway to contaminants in soil remains blocked and institutional controls to maintain the integrity of the covers. Alternative S-4 also contains the same methane and mercury source removal components that are described in Alternative S-3 and the shoreline revetment component included in Alternatives S-2 and S-3. Alternative S-4 provides physical barriers to cut off the exposure pathways to soil at Parcel B. Covers would be required at all redevelopment blocks to prevent human exposure to ubiquitous metals in soil that may pose an unacceptable risk. The institutional controls are discussed in Section 12.2.1.5.

Redevelopment blocks with soil that contains metals (including lead) and organic chemicals that pose a potential unacceptable risk would be covered to allow for currently planned land uses. Covers would be applied to an entire redevelopment block if any grid within the block requires a cover based on ease and efficiency of implementation, consistency in long-term enforcement, and effectiveness of long-term maintenance.

Covers would be achieved in two ways:

- **Use of Existing Covers:** Existing asphalt and concrete surfaces and buildings would be considered existing covers. These may include existing building footprints, roads, and parking lots. These existing covers may require rehabilitation, such as sealing or repairing cracks.

- **New Covers:** Where covers are needed, areas would be covered with a durable material that will not break, erode, or deteriorate such that the underlying soil becomes exposed. Standard construction practices for roads, sidewalks, and buildings would likely be adequate to meet this performance standard. Other examples of covers could include a minimum 4 inches of asphalt or a minimum 2 feet of clean imported soil. All covers must achieve a full cover over the entire redevelopment block. The exact nature and specifications for covers can vary from block to block, but all covers must meet the performance standard of preventing exposure to soil and durability. Backfill for soil covers would be tested and confirmed to not contain contaminants at concentrations exceeding remediation goals and to contain less than 0.25 percent asbestos. The soil cover may overlay existing grades. Appropriate covers for the open space reuse blocks would depend on the details of redevelopment.

It is estimated from aerial photographs of Parcel B that approximately 16 acres would be covered with soil, 3 acres would be covered by the shoreline revetment, and 40 acres of existing asphalt and concrete surfaces (including buildings) would be used and repaired, as necessary (see Figure 9-7). The actual extent of cover types would be identified in the RD.

Covers, and the institutional controls to maintain their integrity, are the primary component of Alternative S-4. Alternative S-4 also includes the common elements of methane and mercury source removal and shoreline revetment discussed in Alternatives S-2 and S-3. The estimated overall cost of Alternative S-3 is $12.4 million.

9.1.5 Alternative S-5 – Excavation, Methane and Mercury Source Removal, Disposal, Covers, SVE, Institutional Controls, and Shoreline Revetment

Alternative S-5 consists of a combination of soil excavation (including methane and mercury source removal) and off-site disposal, covers, SVE for VOCs, institutional controls, and shoreline revetment. This alternative was developed as a combined alternative to (1) remove and dispose of organic COCs, mercury, and lead, as described in Alternative S-3, (2) implement and maintain block-wide covers, as described in Alternative S-4, (3) remove and treat VOCs in soil using SVE, and (4) implement the institutional controls and construct the shoreline revetment, as described in Alternative S-2.

Alternative S-5 would include expansion and continued operation of the pilot-scale SVE system that was operated at Redevelopment Block 8 (Building 123) (ITSI 2006). SVE would be implemented as a source reduction measure, and the other actions associated with Alternative S-5 would provide overall protectiveness to meet the RAOs. Institutional controls to address vapor intrusion would likely be a necessary component of the remedy, but specific areas requiring institutional controls (ARIC) would be selected after remediation was complete. The results of a site-specific soil gas survey would be the basis for the ARICs. The soil gas survey would address both soil and groundwater areas where vapor intrusion is a concern. The ARICs may be modified by the FFA signatories as the soil contamination areas and groundwater plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas originally included in the ARICs do not pose unacceptable potential exposure risk to VOC vapors.

Alternative S-5 also combines components of Alternatives S-2, S-3, and S-4 to provide the maximum amount of treatment for COCs in soil. The estimated overall cost of Alternative S-5 is $13.0 million.

9.2 AMENDED REMEDIAL ALTERNATIVES FOR GROUNDWATER

The following remedial alternatives were identified for groundwater at Parcel B:

- Alternative GW-1 – No Action
- Alternative GW-2 – Long-Term Groundwater Monitoring and Institutional Controls
- Alternatives GW-3A and GW-3B – In Situ Treatment, Groundwater Monitoring, and Institutional Controls

Each of these alternatives is discussed below.

9.2.1 Alternative GW-1 – No Action

Under Alternative GW-1, remedial actions would not be performed. Groundwater would be left in place without implementing any response actions. The no-action response is retained as required by the NCP to provide a baseline for comparison with other alternatives. No cost is associated with this alternative.

9.2.2 Alternative GW-2 – Long-Term Groundwater Monitoring and Institutional Controls

Alternative GW-2 consists of groundwater monitoring and institutional controls. The groundwater monitoring addresses all of the COCs identified in Section 7.0 whether they were derived from the HHRA, the SLERA, or the surface water quality screening evaluation. Groundwater in the A-aquifer would be monitored where metals and VOCs are detected at concentrations above remediation goals. Details of groundwater monitoring (such as wells to be monitored, the analytical suite, laboratory analytical methods, sample collection procedures, and quality control requirements) would be included in the RD. Additionally, the Navy is implementing an adaptable strategy for groundwater monitoring based on the Triad approach to allow flexibility to optimize monitoring. Results of groundwater monitoring would be used during 5-year reviews to assess the monitoring program, adjust the data collection and analysis requirements, and evaluate the need for other response actions. Groundwater monitoring would continue until remediation goals are met.

The overall objectives for groundwater monitoring include:

- Monitor the potential migration of COCs into previously uncontaminated areas and potential migration toward San Francisco Bay
- Monitor the changes in concentrations within a plume, including the effects of remedial actions and previous treatability studies
- Monitor concentrations in and near individual wells where the HHRA indicated potential risk

Institutional controls are part of Alternative GW-2 and are described in detail in Section 12.2.1.5. Institutional controls include parcel-wide prohibitions against installation of wells and use of groundwater without approval as well as specific restrictions related to VOC vapors. Institutional controls would be in place to prohibit use of buildings or other enclosures where there is potential unacceptable risk from the vapor intrusion pathway and would require engineering controls on all new buildings occupied in areas where groundwater plumes may present potential unacceptable risk from the vapor intrusion pathway. Institutional controls to address vapor intrusion would likely be a necessary component of the remedy, but specific ARICs would be selected after remediation was complete. The results of a site-specific soil gas

survey would be the basis for the ARICs. The soil gas survey would address both soil and groundwater areas where vapor intrusion is a concern. The ARICs may be modified by the FFA signatories as the soil contamination areas and groundwater plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas originally included in the ARICs do not pose unacceptable potential exposure risk to VOC vapors.

Alternative GW-2 relies on monitoring and institutional controls without active treatment. Institutional controls are the primary component for preventing exposure to COCs under this alternative. Installation of additional groundwater monitoring wells and establishment of institutional controls are estimated to cost $150,000 (capital only) and require a minimal amount of time (1 to 2 months) to implement. The effectiveness of Alternative GW-2 depends on the degree of enforcement of institutional controls. The estimated overall cost of Alternative GW-2 is $2.0 million.

9.2.3 Alternatives GW-3A and GW-3B – In Situ Treatment, Groundwater Monitoring, and Institutional Controls

Alternatives GW-3A and GW-3B consists of three elements: (1) in situ treatment of groundwater, (2) reduced groundwater monitoring compared with the monitoring-only alternative (Alternative GW-2), and (3) institutional controls. The analysis of Alternatives GW-3A and GW-3B was based on in situ injection treatments. The only difference between Alternatives GW-3A and GW-3B is the type of material used to treat the groundwater. The groundwater treatment materials evaluated in the TMSRA were a substrate for biodegradation (Alternative GW-3A) or a slurry of ZVI for chemical reduction (Alternative GW-3B). Details of in situ treatment options would be further refined during the RD. The major components of Alternatives GW-3A and GW-3B are described below.

9.2.3.1 Treatment for VOCs

In situ treatment would use either a biodegradation substrate (Alternative GW-3A) or ZVI (Alternative GW-3B) to actively mitigate contaminants where concentrations are highest in the IR-10A groundwater plume. This treatment is based on the 2004 groundwater plume as presented on Figure 7-3. Plume conditions may continue to change over time as a result of the continued effects of treatability studies. The RD would use current information on plume extent and concentration to select the actual injection parameters. The assumed process involves a single injection of the treatment compound into groundwater to reduce the contaminant concentrations to or near remediation goals. The treatment process also assumes that a successful injection can be implemented, as demonstrated during the pilot study at Parcel B, where 130,500 pounds of ZVI was injected in 2003 (ERRG and URS 2004).

Relatively low concentrations of the COCs in the groundwater at Parcel B are observed compared with other remedial sites where injection treatments have been successful; therefore, using either biodegradation substrate or ZVI as the injection material has a high probability of success with one inoculation. However, these materials affect the COCs differently.

The assumed biodegradation substrate (glycerol polylactate) creates reducing conditions in the aquifer by forming lactic acid and hydrogen, which microbes use to degrade VOCs. This biodegradation substrate treatment is a timed-release compound that will continue to react for up to several years, depending on the dose of the treatment. This timed-release reaction is beneficial in low-permeability aquifers such as the A-aquifer at Parcel B because the slow release allows more time for dispersion of the substrate and more time for the substrate to come in contact with the COCs and treat them.

The ZVI treatment injects a slurry of carrier fluid with fine particles of ZVI. The ZVI reacts in groundwater to produce intermediate products such as hydrogen, which react with VOCs to degrade them. This reaction occurs quickly and is beneficial for high or low concentrations of dissolved COCs.

9.2.3.2 Treatment for Metals

In situ treatment for metals (chromium VI, copper, lead, and mercury), if necessary, would use an organo-sulfur compound that causes anaerobic bioactivity to immobilize metal contaminants. Using the injected material, the microbes produce a metal-organo-sulfur complex that strongly sorbs to the aquifer matrix. Removal of the mercury source as part of the soil remedy is expected to mitigate mercury in groundwater so that in situ treatment is not necessary. The need to treat chromium VI, copper, and lead would be based on further analysis of groundwater data against trigger levels that would occur during the RD.

9.2.3.3 Groundwater Monitoring and Institutional Controls

Groundwater would be monitored quarterly for Alternatives GW-3A and GW-3B for the first year while the treatment is being implemented. The monitoring frequency would be reduced to semiannual events for years 2, 3, and 4, and then monitoring would occur annually thereafter (starting in year 5). Monitoring would be quarterly for a 1-year "proof period" to demonstrate attainment of remediation goals near the end of the monitoring period for Alternatives GW-3A and GW-3B (assumed to occur in year 15). Groundwater monitoring in the IR-10A plume area would cease after year 15 but would continue at other locations outside the plume. The actual monitoring period could be shorter or longer, depending on data collected during the RD and remedial action.

The current locations of the VOC plumes at IR-25 in Parcel C do not extend into Parcel B (see Figure 7-3), and active groundwater treatment is not proposed at Parcel B for any of the plume area used in the risk assessment that was shown in Parcel B. The VOC plumes at IR-25 will be addressed in the Parcel C FS and ROD. However, monitoring of selected wells at Parcel B would be included as part of the groundwater monitoring component; these wells would be selected in the RD.

The institutional controls for this alternative would be the same as were described in Alternative GW-2.

Alternatives GW-3A and GW-3B rely on active treatment and, to a lesser degree, on institutional controls for preventing exposure to COCs. Treatment using the biological substrate is estimated to cost $75,000 (capital only) and treatment using ZVI is estimated to cost $411,000; both treatments would require less than 1 year to implement. The effectiveness of Alternatives GW-3A and GW-3B depends on the effectiveness of the injected chemicals and the degree they are distributed within the contaminated groundwater. The estimated overall cost of Alternative GW-3A is $2.7 million; the estimated overall cost of Alternative GW-3B is $3.1 million.

9.3 REMEDIAL ALTERNATIVES FOR RADIOLOGICALLY IMPACTED SOIL AND STRUCTURES

The following remedial alternatives were identified for radiologically impacted soil and structures at Parcel B:

- Alternative R-1 – No Action
- Alternative R-2 – Survey, Decontamination, Disposal, Release, and Institutional Controls
- Alternative R-3 – Survey, Decontamination, Disposal, Release, Close In Place, and Institutional Controls

Each of these alternatives is discussed below.

9.3.1 Alternative R-1 – No Action

Under Alternative R-1, remedial actions would not be taken for radiologically impacted sites. The no-action response is retained as required by the NCP to provide a baseline for comparison with other alternatives. No cost is associated with this alternative.

9.3.2 Alternative R-2 – Survey, Decontamination, Disposal, Release, and Institutional Controls

Alternative R-2 includes (1) surveying structures, former building sites, and radiologically impacted areas; (2) decontaminating (and demolishing if necessary) buildings and former building sites; (3) excavating radiologically impacted storm drain and sanitary sewer lines; (4) screening, separating, and disposing of radioactive anomalies and contaminated excavated soil at an off-site low-level radioactive waste facility, and (5) implementing ICs. Alternative R-2 also includes a surface scan at IR-07 and IR-18, and removal of any radiological anomalies to a depth of 1 foot (the maximum effective depth of the surface scan). Although there is a potential, however unlikely, for radiological contamination to exist beyond the depth of 1 foot, the soil cover would be effective in preventing any unacceptable exposure, and additional investigation beyond 1 foot is not proposed. A demarcation layer would be installed on the surveyed soil surface before covers were constructed at IR-07 and IR-18 to mark the boundary between the existing surface and a new 2-foot-thick soil cover. Groundwater at IR-07 and IR-18 would be

monitored for radionuclides of concern. The above-grade portions of Building 140, the discharge tunnel, and the first 10 feet of the Building 140 pump shaft would be surveyed to verify that no residual radioactivity is present above remediation goals. The pump shaft below Building 140 would be abandoned. ICs would be implemented to minimize inadvertent contact with radiologically impacted media.

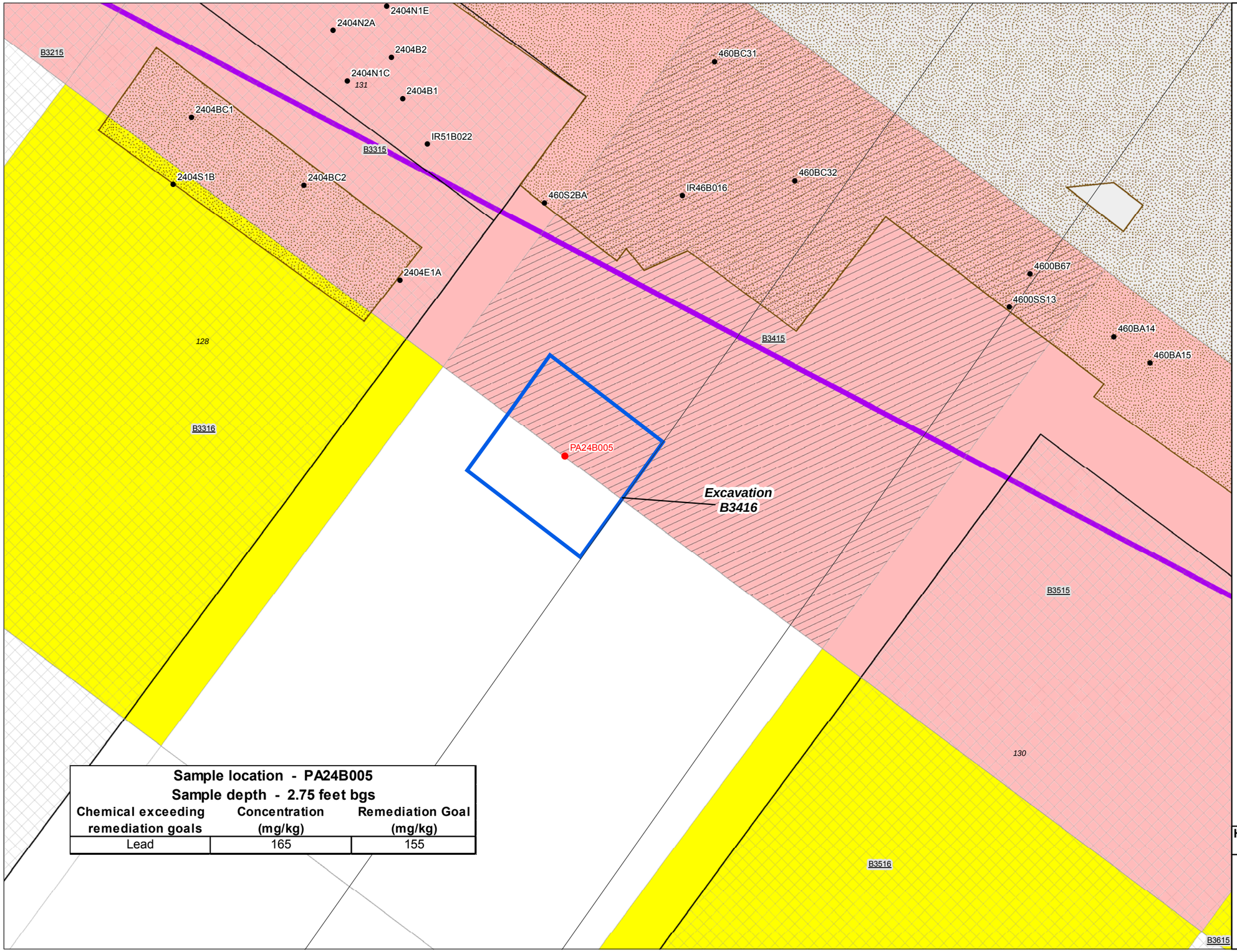
The storm drain and sanitary sewer removal components of this alternative are in progress as TCRAs. The use of TCRAs allows the Navy to get an early start on cleanup at these newly identified source areas. However, these TCRAs will not be completed before the amended ROD is signed. Consequently, components of the cleanup alternatives that are addressed as TCRAs remain in the amended ROD as parts of the remedial action.

Alternative R-2 relies on surveys, decontamination, and removals to address radioactive COCs in soil and structures. The estimated overall cost of Alternative R-2 is $28.9 million.

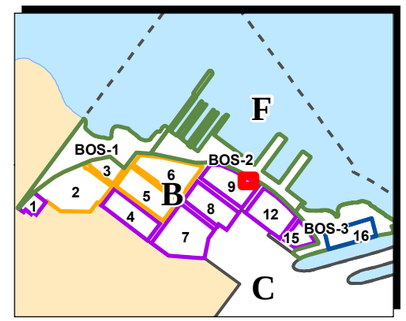
9.3.3 Alternative R-3 – Survey, Decontamination, Disposal, Release, Close in Place, and Institutional Controls

Alternative R-3 is identical to R-2 except that Alternative R-3 adds closure of the pump shaft and connecting piping beneath Building 140 using backfilled stone and a concrete cap. The estimated overall cost of Alternative R-3 is $29.6 million.

FIGURES



Sample location - PA24B005 Sample depth - 2.75 feet bgs		
Chemical exceeding remediation goals	**Concentration (mg/kg)**	**Remediation Goal (mg/kg)**
Lead	165	155



Location Map

- HHRA Risk Driver Sample Location
- HHRA Sample Location
- Road
- Excavation B3416
- Residential Cancer Risk > 1E-06
- Residential Cancer Risk ≤ 1E-06
- Highest Segregated Hazard Index > 1
- No Data
- Redevelopment Block 9
- Previous Excavation
- Building

Notes:

1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use planned reuse.
2. Risks are based on nonradiological chemicals.

bgs Below ground surface
HHRA Human health risk assessment
mg/kg Milligram per kilogram

N

0 10 20

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 9-1
PROPOSED EXCAVATION
B3416 AREA

Amended ROD for Parcel B

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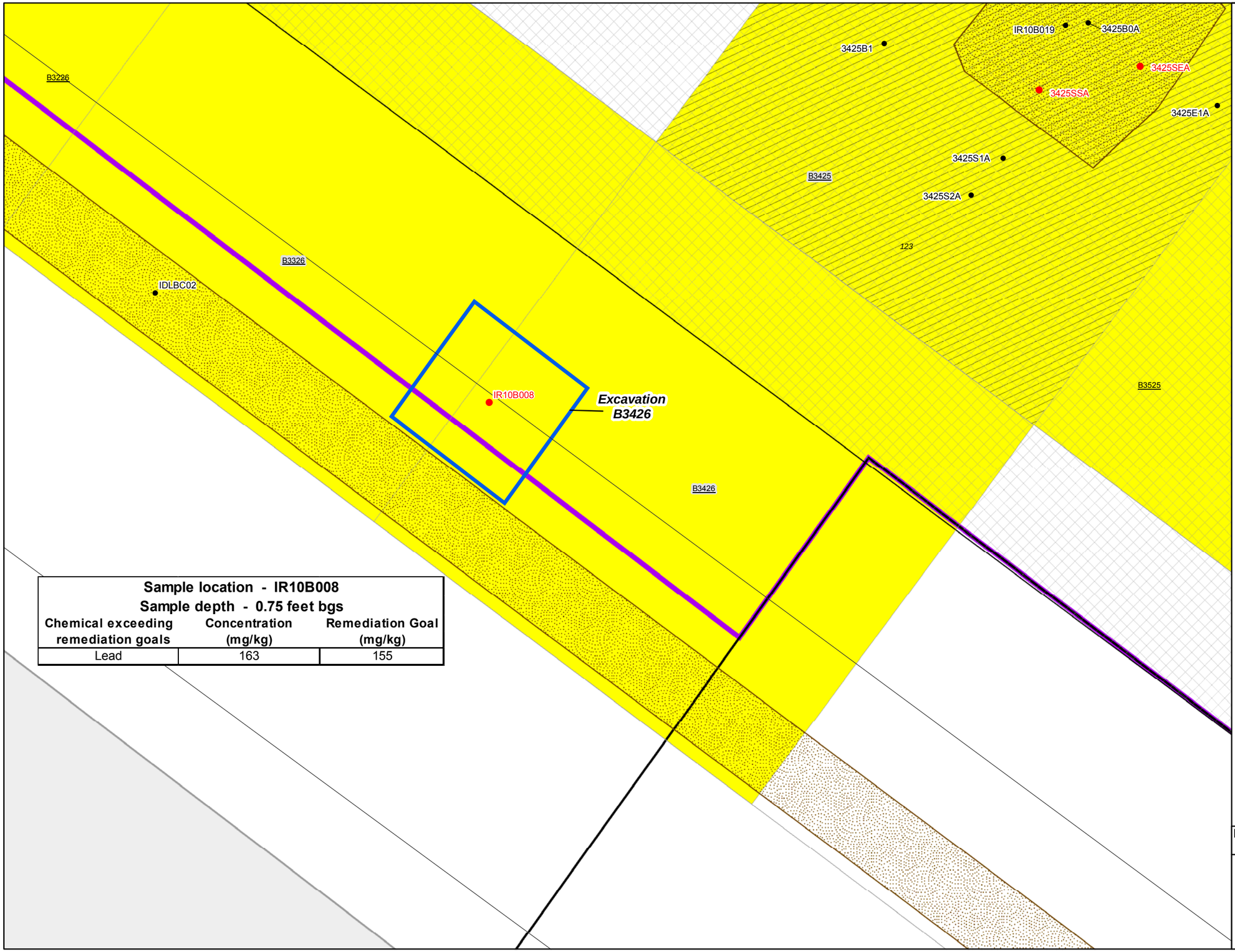
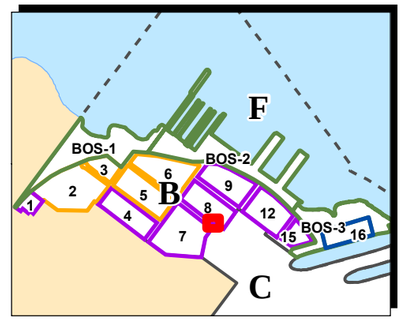


Sample location - IR10B008 Sample depth - 0.75 feet bgs		
Chemical exceeding remediation goals	**Concentration (mg/kg)**	**Remediation Goal (mg/kg)**
Lead	163	155



Location Map

- HHRA Risk Driver Sample Location
- HHRA Sample Location
- Road
- Excavation B3426
- Residential Cancer Risk ≤ 1E-06
- Highest Segregated Hazard Index > 1
- No Data
- Redevelopment Block 8
- Previous Excavation
- Other Redevelopment Block
- Parcel Boundary
- 123 Building

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use planned reuse.
2. Risks are based on nonradiological chemicals.

bgs Below ground surface
HHRA Human health risk assessment
mg/kg Milligram per kilogram

N

0 10 20

Scale in Feet

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FIGURE 9-2
PROPOSED EXCAVATION
B3426 AREA

Amended ROD for Parcel B

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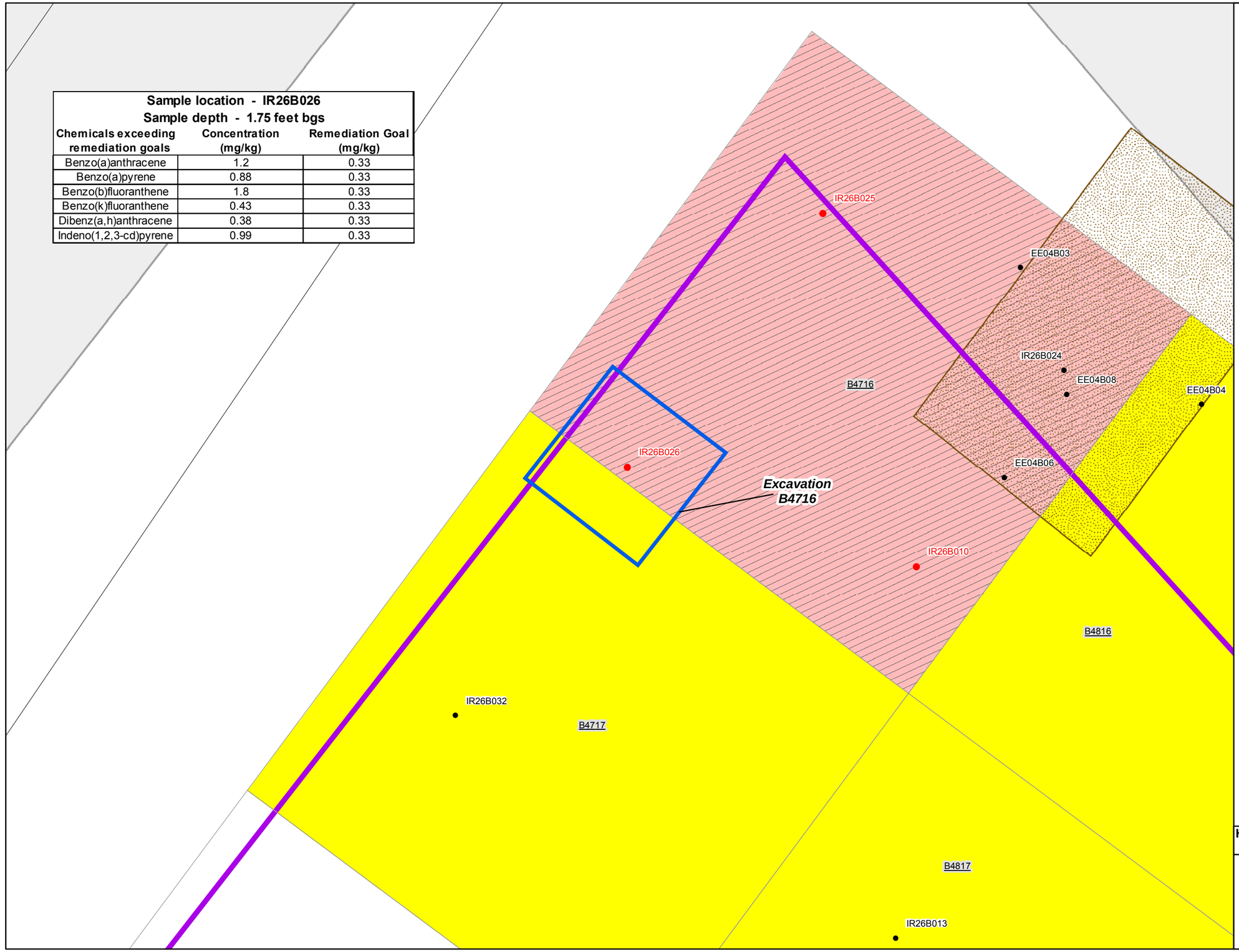
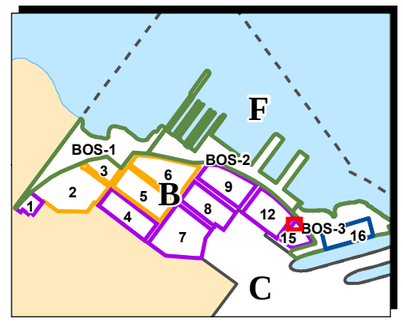
Sample location - IR26B026 Sample depth - 1.75 feet bgs		
Chemicals exceeding remediation goals	**Concentration (mg/kg)**	**Remediation Goal (mg/kg)**
Benzo(a)anthracene	1.2	0.33
Benzo(a)pyrene	0.88	0.33
Benzo(b)fluoranthene	1.8	0.33
Benzo(k)fluoranthene	0.43	0.33
Dibenz(a,h)anthracene	0.38	0.33
Indeno(1,2,3-cd)pyrene	0.99	0.33





Location Map

- HHRA Risk Driver Sample Location
- HHRA Sample Location
- Road
- Excavation B4716
- Residential Cancer Risk > 1E-06
- Highest Segregated Hazard Index > 1
- Residential Cancer Risk ≤ 1E-06
- Redevelopment Block 15
- Previous Excavation
- 157 Building
- Other Redevelopment Block

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use planned reuse.
2. Risks are based on nonradiological chemicals.

bgs Below ground surface
HHRA Human health risk assessment
mg/kg Milligram per kilogram

N

0 10 20
Scale in Feet

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U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 9-3
PROPOSED EXCAVATION
B4716 AREA

Amended ROD for Parcel B

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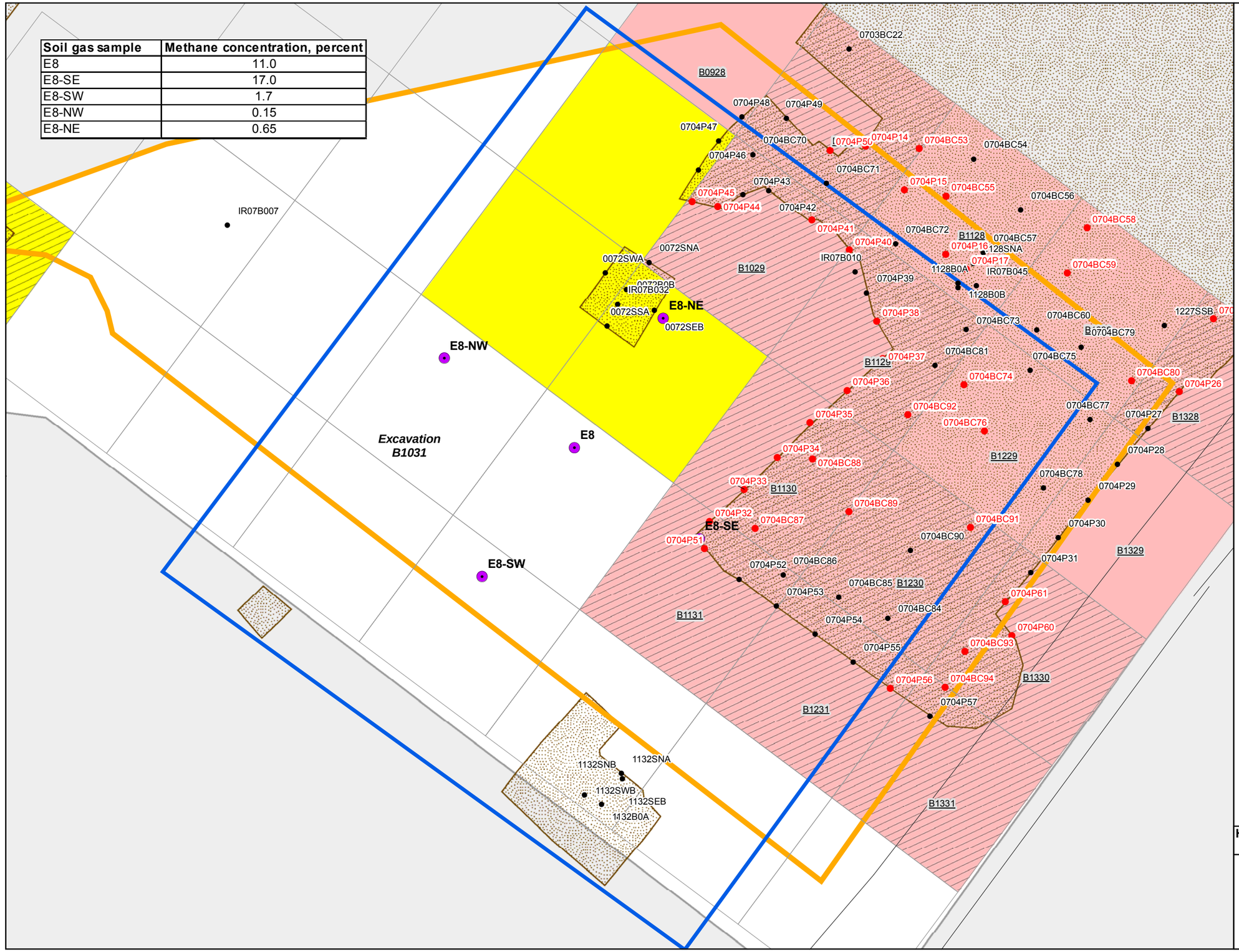
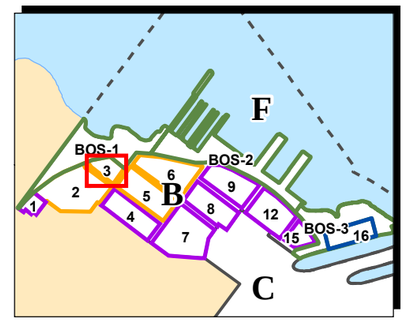
Soil gas sample	Methane concentration, percent
E8	11.0
E8-SE	17.0
E8-SW	1.7
E8-NW	0.15
E8-NE	0.65





Location Map

- Soil Gas Sample Location
- HHRA Risk Driver Sample Location
- HHRA Sample Location
- Road
- Excavation B1031
- Residential Cancer Risk > 1E-06
- Highest Segregated Hazard Index > 1
- Residential Cancer Risk ≤ 1E-06
- Redevelopment Block 3
- Previous Excavation
- Other Redevelopment Block

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use planned reuse.
2. Risks are based on nonradiological chemicals.

HHRA Human health risk assessment

N

0 30 60

Scale in Feet

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FIGURE 9-4
PROPOSED EXCAVATION B1031 AREA FOR METHANE SOURCE REMOVAL

Amended ROD for Parcel B

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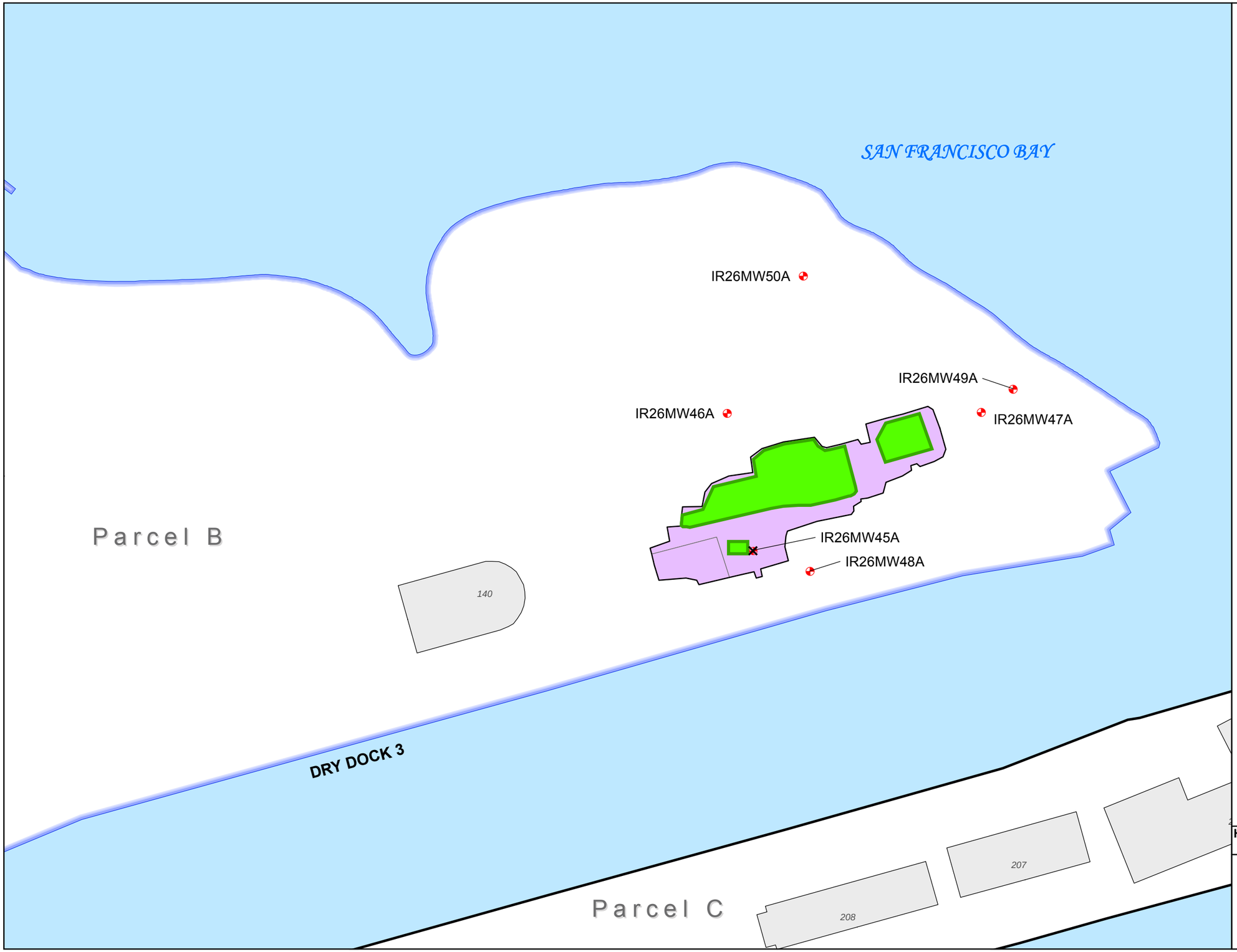

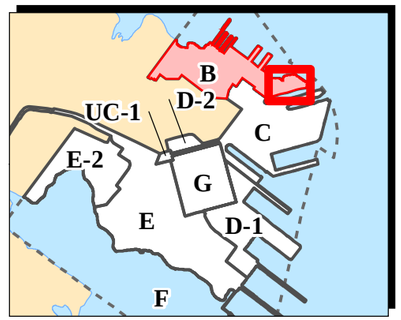

Location Map

RAMP Monitoring Well

Decommissioned RAMP Monitoring Well

Proposed Excavation Area

Former Excavation EE-05

Parcel B Boundary

Other Parcel Boundary

128 Building

San Francisco Bay

Notes:

1. Excavation planned to extend from base of previous excavation (7 or 10 feet) to bedrock (about 15 feet below ground surface).
2. Depth to groundwater in this area is about 6.5 to 8.0 feet below ground surface.

RAMP Remedial action monitoring program

0 75 150

Scale in Feet

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FIGURE 9-5
PROPOSED EXCAVATION EE-05 AREA FOR MERCURY SOURCE REMOVAL

Amended ROD for Parcel B

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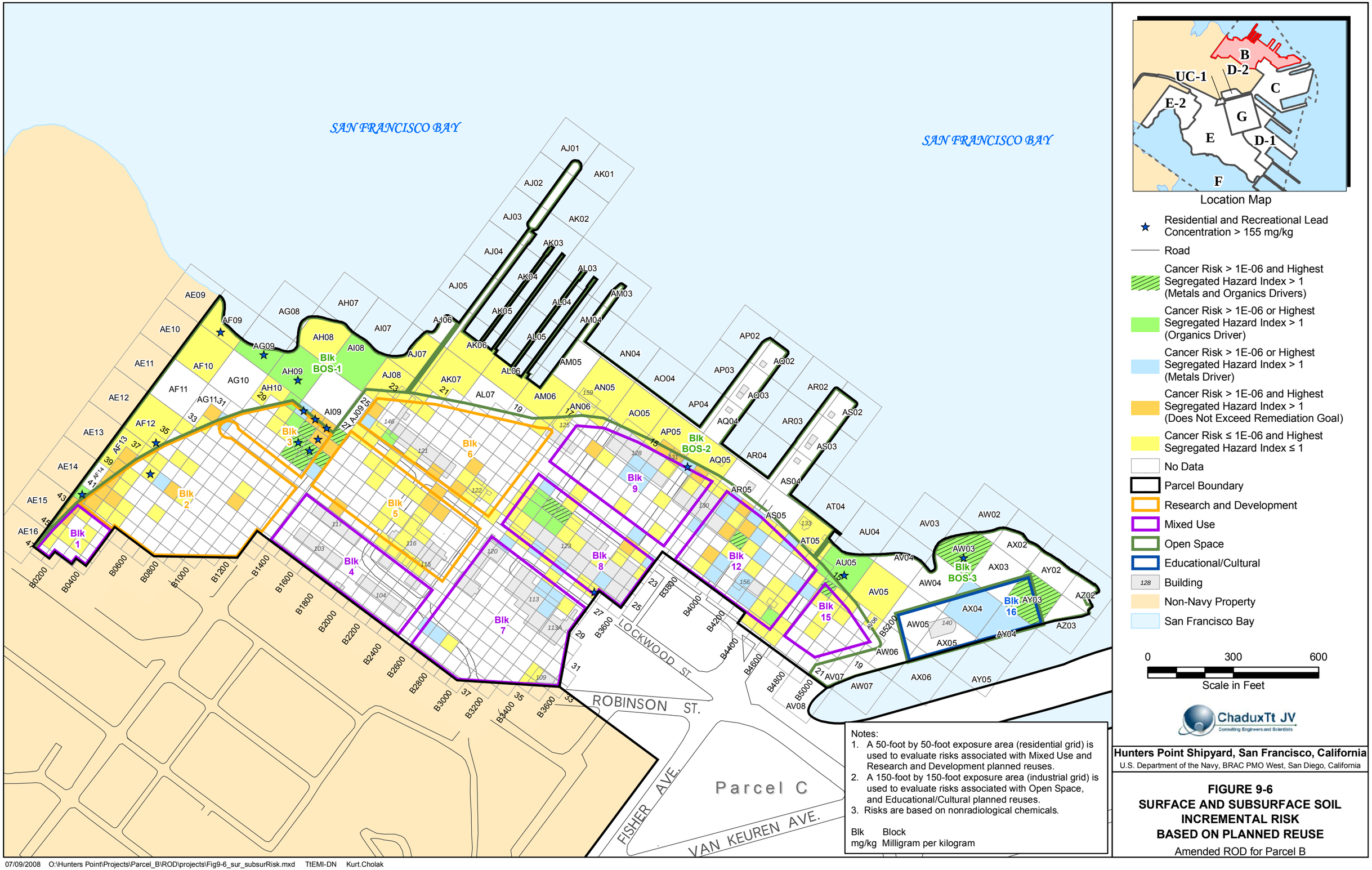

Notes:
1. A 50-foot by 50-foot exposure area (residential grid) is used to evaluate risks associated with Mixed Use and Research and Development planned reuses.
2. A 150-foot by 150-foot exposure area (industrial grid) is used to evaluate risks associated with Open Space, and Educational/Cultural planned reuses.
3. Risks are based on nonradiological chemicals.

Blk Block
mg/kg Milligram per kilogram

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FIGURE 9-6
SURFACE AND SUBSURFACE SOIL INCREMENTAL RISK BASED ON PLANNED REUSE
Amended ROD for Parcel B

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SAN FRANCISCO BAY

BREAKWATER

DRY DOCK 7

DRY DOCK 6

DRY DOCK 5

DRY DOCK 3

DRY DOCK 2

BOS-1

BOS-2

BOS-3

1 2 3 4 5 6 7 8 9 12 15 16

103 104 109 113 113A 115 116 117 120 121 122 123 125 128 130 140 144 145 146 156

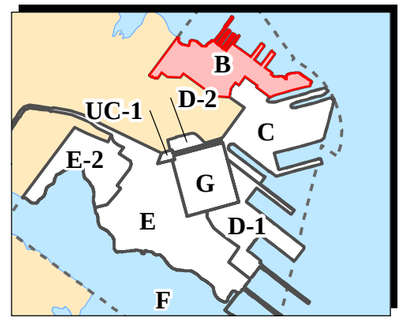
LOCKWOOD ST.

ROBINSON ST.

FISHER AVE.

VAN KEUREN AVE.

Parcel C



Proposed Cover Type

- Existing Asphalt (Repaired)
- New Shoreline Revetment
- New Soil
- Pier Area (Parcel F)

Land Use Designation

- Research and Development
- Mixed Use
- Open Space
- Educational/Cultural
- 128 Building
- Parcel B Boundary
- Other Parcel Boundary
- Road
- San Francisco Bay
- Non-Navy Property

0 300 600

Scale in Feet

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Note:

Minor areas of maintained landscaping occur within existing asphalt cover areas. These areas are not shown because of their limited extent.

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FIGURE 9-7
PROPOSED COVER TYPES

Amended ROD for Parcel B

07/09/2008 O:\Hunters_Point\Projects\Parcel_B\ROD\projects\Fig9-7ProposedCover.mxd TtEMI-DN Kurt.Cholak

10.0 COMPARATIVE ANALYSIS OF AMENDED REMEDIAL ALTERNATIVES

This section summarizes the comparative analysis that was conducted to evaluate the relative performance of each amended remedial alternative for soil, groundwater, and structures at Parcel B in relation to the nine criteria outlined in CERCLA § 121 (b), as amended. The purpose of the comparative analysis was to identify the relative advantages and disadvantages of each alternative. The evaluation criteria are based on requirements promulgated in the NCP. As stated in the NCP (40 CFR 300.430[f]), the evaluation criteria were arranged in a hierarchical manner that was used to select a amended remedy for Parcel B based on the following categories:

- Threshold criteria
  - Overall protection of human health and the environment
  - Compliance with ARARs
- Primary balancing criteria
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost-effectiveness
- Modifying criteria
  - State acceptance
  - Community acceptance

10.1 COMPARISON OF AMENDED REMEDIAL ALTERNATIVES FOR SOIL

This section summarizes the comparative analysis of the amended remedial alternatives for soil at Parcel B. Table 10-1 summarizes the results of the comparative analysis using the primary balancing criteria, and Table 10-2 summarizes the costs for each alternative.

10.1.1 Overall Protection of Human Health and the Environment

COCs at Parcel B pose unacceptable risks to human health under the proposed planned reuse for several redevelopment blocks. Alternative S-1 does not address these risks; therefore, Alternative S-1 would not be protective of human health and the environment. Alternatives S-2 through S-5 protect human health and the environment under the anticipated future land use of the site.

10.1.2 Compliance with ARARs

There is no need to identify ARARs for the no-action alternative (S-1) because ARARs apply to "any removal or remedial action conducted entirely on-site" and "no action" is not a removal or remedial action. CERCLA § 121 (42 U.S.C. § 9621) cleanup standards for selection of a Superfund remedy, including the requirement to meet ARARs, are not triggered by the no-action alternative (EPA 1991). Alternatives S-2 through S-5 comply with all pertinent ARARs. (Refer to Section 6.1 of the TMSRA for details.)

10.1.3 Balancing Criteria

The comparative analysis of soil alternatives using the five balancing criteria — long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness, implementability, and cost — is summarized in Table 10-1.

10.1.4 State Acceptance

The State of California's acceptance of the Navy's selected amended remedial alternative (Alternative S-5) will be evaluated in responses to comments on the draft amended ROD.

10.1.5 Community Acceptance

The amended proposed plan for Parcel B was presented to the community and discussed during a public meeting on July 8, 2008. Comments were also gathered during the public comment period from June 28 through July 28, 2008. Attachment C, the responsiveness summary, of this amended ROD addresses the public's comments and concerns about the selected remedial alternative for soil at Parcel B.

10.1.6 Conclusion

Alternative S-5, Excavation, Methane and Mercury Source Removal, Disposal, Covers, SVE, ICs, and Shoreline Revetment, was selected as the preferred amended remedial alternative for soil at Parcel B based on the following:

- Protects human health and the environment and fully complies with ARARs
- Provides best long-term effectiveness by permanently removing the greatest volume of contamination (by excavation), and preventing exposure to remaining contamination (by covers)
- Includes the largest amount of treatment to destroy contaminants (using SVE)
- Contains the most active remediation components and involves the least reliance on ICs to prevent exposure

10.2 ANALYSIS OF AMENDED REMEDIAL ALTERNATIVES FOR GROUNDWATER

This section summarizes the comparative analysis of amended remedial alternatives for groundwater at Parcel B. Table 10-2 summarizes the costs for each alternative using the primary balancing criteria, and Table 10-3 summarizes the results of the comparative analysis.

10.2.1 Overall Protection of Human Health and the Environment

COCs at Parcel B pose unacceptable risks to human health under the proposed planned reuse for several redevelopment blocks. Alternative GW-1 does not address these risks; therefore, Alternative GW-1 would not be protective of human health and the environment. Alternatives GW-2, GW-3A, and GW-3B protect human health and the environment under the anticipated future land use of the site.

10.2.2 Compliance with ARARs

There is no need to identify ARARs for the no-action alternative (GW-1) because ARARs apply to "any removal or remedial action conducted entirely on-site" and "no action" is not a removal or remedial action. CERCLA § 121 (42 U.S.C. § 9621) cleanup standards for selection of a Superfund remedy, including the requirement to meet ARARs, are not triggered by the no-action alternative (EPA 1991). Alternatives GW-2, GW-3A, and GW-3B comply with all pertinent ARARs. (Refer to Section 6.2 of the TMSRA for details.)

10.2.3 Balancing Criteria

The comparative analysis of groundwater alternatives using the five balancing criteria — long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness, implementability, and cost — is summarized in Table 10-3.

10.2.4 State Acceptance

The State of California's acceptance of the Navy's selected amended remedial alternative (Alternative GW-3A) will be evaluated in responses to comments on the draft amended ROD.

10.2.5 Community Acceptance

The amended proposed plan for Parcel B was presented to the community and discussed during a public meeting on July 8, 2008. Comments were also gathered during the public comment period from June 28 through July 28, 2008. Attachment C, the responsiveness summary, of this amended ROD addresses the public's comments and concerns about the selected remedial alternative for groundwater at Parcel B.

10.2.6 Conclusion

Alternative GW-3A, In Situ Treatment using Biological Substrate, Groundwater Monitoring, and ICs, was selected as the preferred amended remedial alternative for groundwater at Parcel B based on the following:

- Protects human health and the environment and fully complies with ARARs
- Provides long-term protection by reducing concentrations of VOCs and their associated risk
- Reduces the toxicity, mobility, and volume of VOCs by implementing an expedient and aggressive treatment strategy
- Is potentially more effective because the injected biological substrate can flow with groundwater and remediate a larger volume than ZVI that remains in place after injection
- Is slightly less expensive than the other alternative that includes active treatment

10.3 Comparison of Remedial Alternatives for Radiologically Impacted Soil and Structures

This section summarizes the comparative analysis of the remedial alternatives for radiologically impacted soil and structures at Parcel B. Table 10-4 summarizes the results of the comparative analysis using the primary balancing criteria, and Table 10-2 summarizes the costs for each alternative.

10.3.1 Overall Protection of Human Health and the Environment

COCs at Parcel B pose unacceptable risks to human health under the proposed planned reuse for several redevelopment blocks. Alternative R-1 does not address these risks; therefore, Alternative R-1 would not be protective of human health and the environment. Alternatives R-2 and R-3 protect human health and the environment under the anticipated future land use of the site.

10.3.2 Compliance with ARARs

There is no need to identify ARARs for the no-action alternative (R-1) because ARARs apply to "any removal or remedial action conducted entirely on-site" and "no action" is not a removal or remedial action. CERCLA § 121 (42 U.S.C. § 9621) cleanup standards for selection of a Superfund remedy, including the requirement to meet ARARs, are not triggered by the no-action alternative (EPA 1991). Alternatives R-2 and R-3 comply with all pertinent ARARs. (Refer to Section 6.5 of the TMSRA radiological addendum for details.)

10.3.3 Balancing Criteria

The comparative analysis of radiological alternatives using the five balancing criteria — long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness, implementability, and cost — is summarized in Table 10-4.

10.3.4 State Acceptance

The State of California's acceptance of the Navy's selected remedial alternative (Alternative R-3) will be evaluated in responses to comments on the draft amended ROD.

10.3.5 Community Acceptance

The amended proposed plan for Parcel B was presented to the community and discussed during a public meeting on July 8, 2008. Comments were also gathered during the public comment period from June 28 through July 28, 2008. Attachment C, the responsiveness summary, of this amended ROD addresses the public's comments and concerns about the selected remedial alternative for radiologically impacted soil and structures at Parcel B.

10.3.6 Conclusion

Alternative R-3, Survey, Decontamination, Disposal, Release, Close In Place, and ICs, was selected as the preferred remedial alternative for radiologically impacted soil and structures at Parcel B based on the following:

- Protects human health and the environment and fully complies with ARARs
- Provides best long-term effectiveness by removing contaminants from radiologically impacted buildings and former building sites, removing the radiologically impacted sanitary and storm sewers, permanently closing the pump shaft beneath Building 140, and removing radiological anomalies from the surface of IR-07 and IR-18 followed by application of a cover

TABLES

TABLE 10-1: COMPARATIVE ANALYSIS OF REVISED SOIL REMEDIAL ALTERNATIVES BY BALANCING CRITERIA
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Alternative	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost
	Parameters considered: • Residual risk at completion • Long-term management of remaining contaminants • Reliability of ICs • Need to replace components • Continuing repair/maintenance needs	Parameters considered: • Treatment processes • Amount of hazardous material • Degree of reduction in toxicity, mobility, or volume • Degree of irreversibility • Treatment residuals	Parameters considered: • Short-term risks to community • Effects on workers • Effects on the environment • Duration of remediation	Parameters considered: • Technical feasibility • Operational reliability • Future alternative remedial options • Ability to monitor effectiveness • Ability to obtain governmental approvals • Availability of services and materials	
Alternative S-1 – No Action	**Not evaluated – see Section 10.0 for discussion of comparative analysis**	**Not Evaluated**	**Not evaluated**	**Not evaluated**	$0
Alternative S-2 – Institutional Controls, Maintained Landscaping, and Shoreline Revetment	**Good**	**Poor**	**Very Good**	**Very Good**	$5.5 million
	ICs would be the primary component used to prevent exposure. Maintained landscaping would prevent exposure to windblown asbestos. The long-term effectiveness of ICs and engineering controls would depend upon continued enforcement. The long-term effectiveness of maintained landscaping would depend on regular maintenance and inspection.	This alternative does not include treatment that would result in the destruction or transformation of contaminants, or irreversible reduction in mobility of contaminants.	Alternative S-2 involves little construction (beyond the shoreline revetment that is common to Alternatives S-2 through S-5) and so is expected to be effective in the short term because risks to the community and site workers should be minimal.	Conventional technologies would be used to construct components of this alternative. This alternative would be straightforward to implement.	Least expensive alternative.
Alternative S-3 – Excavation, Methane and Mercury Source Removal, Disposal, Maintained Landscaping, Institutional Controls, and Shoreline Revetment	**Very Good**	**Poor**	**Good**	**Very Good**	$11.2 million
	Excavation would remove organic compounds (including the methane source), mercury, and lead; long-term effectiveness in the removal areas would be excellent. Like Alternative S-2, ICs for remaining COCs and maintained landscaping for windblown asbestos would still be major components to prevent exposure.	This alternative does not include treatment that would result in the destruction or transformation of contaminants, or irreversible reduction in mobility of contaminants.	Adverse effects to site workers, the surrounding community, and the environment associated with implementation of Alternative S-3 could be created by dust from excavation and transportation of excavated soil through the community. These potential effects would be minimized through proper planning and engineering controls.	Conventional technologies would be used to construct components of this alternative. This alternative would be straightforward to implement.	Least expensive of the alternatives that include excavation (S-3, S-4, and S-5). However, the cost range among Alternatives S-3, S-4, and S-5 is small (only about 15 percent).
Alternative S-4 – Covers, Methane and Mercury Source Removal, Institutional Controls, and Shoreline Revetment	**Very Good**	**Poor**	**Good**	**Very Good**	$12.4 million
	Covers across Parcel B, and the ICs to maintain their integrity, are the primary components. Like Alternative S-3, some COCs would be excavated and covers would prevent exposure to remaining COCs. Covers would replace the need for maintained landscaping used in Alternatives S-2 and S-3 and some of the access restrictions required by S-2 and S-3 would not be needed. Long-term effectiveness depends on inspection and maintenance of the covers. ICs would still be relied on to prevent inhalation exposure to VOCs in soil.	This alternative does not include treatment that would result in the destruction or transformation of contaminants, or irreversible reduction in mobility of contaminants.	Like Alternative S-3, adverse effects to site workers, the surrounding community, and the environment associated with implementation could be created by dust from excavation, transportation of excavated soil through the community, and construction of soil covers. These potential effects would be minimized through proper planning and engineering controls.	Conventional technologies would be used to construct components of this alternative. This alternative would be straightforward to implement.	Middle cost of the alternatives that include excavation (S-3, S-4, and S-5). However, the cost range among Alternatives S-3, S-4, and S-5 is small (only about 15 percent).

TABLE 10-1: COMPARATIVE ANALYSIS OF REVISED SOIL REMEDIAL ALTERNATIVES BY BALANCING CRITERIA (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Alternative	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost
Alternative S-5 – Excavation, Methane and Mercury Source Removal, Disposal, Covers, SVE, Institutional Controls, and Shoreline Revetment	**Excellent**	**Good**	**Good**	**Very Good**	$13.0 million
	Alternative S-5 combines the excavation component of S-3 and the covers of S-4 and adds SVE for removal and treatment of VOCs in soil. This alternative provides the largest amount of removal of COCs and is expected to have the best long-term effectiveness. Long-term effectiveness depends on inspection and maintenance of the covers. ICs would be necessary to protect the integrity of the covers. ICs may not be needed, or may be needed over smaller areas, to address inhalation of VOCs, depending on the effectiveness of SVE.	Alternative S-5 is the only alternative that has a treatment component. Alternative S-5 includes removal and treatment of VOCs in soil at IR Site 10 (Redevelopment Block 8) using SVE. SVE will reduce the volume of VOCs in soil.	Like Alternatives S-3 and S-4, adverse effects to site workers, the surrounding community, and the environment associated with implementation could be created by dust from excavation, transportation of excavated soil through the community, and construction of soil covers. These potential effects would be minimized through proper planning and engineering controls.	Conventional technologies would be used to construct components of this alternative. This alternative would be straightforward to implement.	Most expensive of the alternatives that include excavation (S-3, S-4, and S-5). However, the cost range among Alternatives S-3, S-4, and S-5 is small (only about 15 percent).

Notes:

COC	Chemical of concern
IC	Institutional control
IR	Installation Restoration
SVE	Soil vapor extraction
VOC	Volatile organic compound

TABLE 10-2: COST COMPARISON OF REVISED REMEDIAL ALTERNATIVES
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Remedial Alternative	Estimated Cost
Soil	
Alternative S-1 – No Action	0
Alternative S-2 – Institutional Controls, Maintained Landscaping, and Shoreline Revetment	$5.5 million
Alternative S-3 – Excavation, Methane and Mercury Source Removal, Disposal, Maintained Landscaping, Institutional Controls, and Shoreline Revetment	$11.2 million
Alternative S-4 – Covers, Methane and Mercury Source Removal, Institutional Controls, and Shoreline Revetment	$12.4 million
Alternative S-5 – Excavation, Methane and Mercury Source Removal, Disposal, Covers, SVE, Institutional Controls, and Shoreline Revetment	$13.0 million
Groundwater	
Alternative GW-1 – No Action	0
Alternative GW-2 – Long-Term Monitoring and Institutional Controls	$2.0 million
Alternative GW-3A – In Situ Groundwater Treatment with Biological Substrate Injection, Groundwater Monitoring, and Institutional Controls	$2.7 million
Alternative GW-3B – In Situ Groundwater Treatment with ZVI Injection, Groundwater Monitoring, and Institutional Controls	$3.1 million
Radiologically Impacted Soil and Structures	
Alternative R-1 – No Action	0
Alternative R-2 – Survey, Decontamination, Disposal, Release, and Institutional Controls	$28.9 million
Alternative R-3 – Survey, Decontamination, Disposal, Release, Close in Place, and Institutional Controls	$29.6 million

Notes:

SVE Soil vapor extraction
ZVI Zero-valent iron

TABLE 10-3: COMPARATIVE ANALYSIS OF REVISED GROUNDWATER REMEDIAL ALTERNATIVES BY BALANCING CRITERIA
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Alternative	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost
	Parameters considered: • Residual risk at completion • Long-term management of remaining contaminants • Reliability of ICs • Need to replace components • Continuing repair/maintenance needs	Parameters considered: • Treatment processes • Amount of hazardous material • Degree of reduction in toxicity, mobility, or volume • Degree of irreversibility • Treatment residuals	Parameters considered: • Short-term risks to community • Effects on workers • Effects on the environment • Duration of remediation	Parameters considered: • Technical feasibility • Operational reliability • Future alternative remedial options • Ability to monitor effectiveness • Ability to obtain governmental approvals • Availability of services and materials	
Alternative GW-1 – No Action	**Not evaluated – see Section 10.0 for discussion of comparative analysis**	**Not Evaluated**	**Not evaluated**	**Not evaluated**	$0
Alternative GW-2 – Long-Term Monitoring and Institutional Controls	**Good** ICs would be the primary component used to prevent exposure. The long-term effectiveness of ICs would depend on continued enforcement.	**Poor** This alternative does not include treatment that would result in the destruction or transformation of contaminants, or irreversible reduction in mobility of contaminants.	**Excellent** Alternative GW-2 involves little activity beyond groundwater monitoring and so is expected to be effective in the short term because risks to the community and site workers should be minimal.	**Excellent** Conventional technologies would be used for groundwater monitoring. This alternative would be the easiest to implement.	$2.0 million Least expensive alternative.
Alternative GW-3A – In Situ Groundwater Treatment with Biological Substrate Injection, Groundwater Monitoring, and Institutional Controls	**Excellent** Treatability studies at Parcel B using other injected chemicals showed in situ treatment is effective. Biological substrate has the potential for increased effectiveness over ZVI because the substrate can flow with groundwater and remediate a larger volume (while ZVI remains in place).	**Excellent** This alternative includes treatment that will destroy VOCs in groundwater and leave nontoxic residuals.	**Very Good** This alternative includes active remediation and, therefore, some risk to site workers. However, in situ treatment involves minimal risk to site workers and the community because the treatment additives are not toxic. Potential effects would be minimized through proper planning and engineering controls. Groundwater monitoring is likely to continue for the same duration as Alternative GW-2, although the number of wells monitored would decrease based on the effectiveness of treatment.	**Very Good** Treatability studies at Parcel B showed in situ treatment is implementable and effective. This alternative would be straightforward to implement.	$2.7 million Least expensive of the alternatives that include treatment. However, the cost difference between Alternatives GW-3A and GW-3B is small (only about 15 percent).
Alternative GW-3B – In Situ Groundwater Treatment with ZVI Injection, Groundwater Monitoring, and Institutional Controls	**Very Good** Treatability studies using ZVI injection at Parcel B have shown permanent reductions in VOC concentrations in groundwater.	**Excellent** This alternative includes treatment that will destroy VOCs in groundwater and leave nontoxic residuals.	**Very Good** This alternative includes active remediation and, therefore, some risk to site workers. However, in situ treatment involves minimal risk to site workers and the community because the treatment additives are not toxic. Potential effects would be minimized through proper planning and engineering controls. Groundwater monitoring is likely to continue for the same duration as Alternative GW-2, although the number of wells monitored would decrease based on the effectiveness of treatment.	**Very Good** Treatability studies at Parcel B showed in situ treatment is implementable and effective. This alternative would be straightforward to implement.	$3.1 million Most expensive of the alternatives that include treatment. However, the cost difference between Alternatives GW-3A and GW-3B is small (only about 15 percent).

Notes:

IC	Institutional control
VOC	Volatile organic compound
ZVI	Zero-valent iron

TABLE 10-4: COMPARATIVE ANALYSIS OF RADIOLOGICAL REMEDIAL ALTERNATIVES BY BALANCING CRITERIA
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Alternative	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost
	Parameters considered: • Residual risk at completion • Long-term management of remaining contaminants • Reliability of ICs • Need to replace components • Continuing repair/maintenance needs	Parameters considered: • Treatment processes • Amount of hazardous material • Degree of reduction in toxicity, mobility, or volume • Degree of irreversibility • Treatment residuals	Parameters considered: • Short-term risks to community • Effects on workers • Effects on the environment • Duration of remediation	Parameters considered: • Technical feasibility • Operational reliability • Future alternative remedial options • Ability to monitor effectiveness • Ability to obtain governmental approvals • Availability of services and materials	
Alternative R-1 – No Action	**Not evaluated – see Section 10.0 for discussion of comparative analysis**	**Not Evaluated**	**Not evaluated**	**Not evaluated**	$0
Alternative R-2 – Survey, Decontamination, Disposal, Release, and Institutional Controls	**Good**	**Poor**	**Very Good**	**Very Good**	$28.9 million
	Identical to Alternative R-3, except for closure in place of the pump shaft beneath Building 140. Alternative R-2 includes only abandonment of the pump shaft without backfilling.	This alternative does not include treatment that would result in the destruction or transformation of contaminants, or irreversible reduction in mobility of contaminants.	Alternatives R-2 and R-3 would have nearly identical short-term effectiveness. The duration of remediation for Alternative R-3 would be slightly longer to account for the closure in place of the pump shaft beneath Building 140; however, the difference in duration is not considered significant.	Conventional technologies would be used for this alternative. This alternative would be straightforward to implement.	Least expensive alternative.
Alternative R-3 – Survey, Decontamination, Disposal, Release, Close in Place, and Institutional Controls	**Very Good**	**Poor**	**Very Good**	**Very Good**	$29.6 million
	Identical to Alternative R-2, except for closure in place of the pump shaft beneath Building 140. Alternative R-3 provides the best long-term effectiveness because this alternative includes closing the shaft below 10 feet and connecting piping in place with backfilled stone and a concrete cap.	This alternative does not include treatment that would result in the destruction or transformation of contaminants, or irreversible reduction in mobility of contaminants.	Alternatives R-2 and R-3 would have nearly identical short-term effectiveness. The duration of remediation for Alternative R-3 would be slightly longer to account for the closure in place of the pump shaft beneath Building 140; however, the difference in duration is not considered significant.	Conventional technologies would be used for this alternative. This alternative would be straightforward to implement.	Most expensive alternative. However, the cost difference between Alternatives R-2 and R-3 is small (only about 2 percent).

Notes:

IC Institutional control

11.0 PRINCIPAL THREAT WASTE

Principal threat wastes are hazardous or highly toxic source materials that result in ongoing contamination to surrounding media, generally cannot be reliably contained, or present a significant risk to human health or the environment should exposure occur. Contaminated groundwater is not generally considered to be source material unless nonaqueous-phase liquids are present (EPA 1999b). The nonradioactive COCs in soil are not considered source materials. Likewise, no nonaqueous-phase liquids have been identified at Parcel B, and the contaminated groundwater is not considered to be a source material.

Radionuclides in soil and structures are considered the only principal threat wastes at Parcel B. The Navy has encountered only low-level radioactive waste at levels slightly above background during the radiological TCRA removals conducted to date at Parcel B. Radioactive material encountered during the TCRA was removed and disposed of off-site at a low-level radioactive waste disposal facility.

12.0 AMENDED SELECTED REMEDY

Based on the results of the RI report (PRC and others 1996), FS report (PRC 1996b), the TMSRA (ChaduxTt 2007), and other documents provided in the administrative record for Parcel B (see Attachment A), as well as an evaluation of all comments on the amended Proposed Plan (Navy 2008) submitted by interested parties during the public comment period, the Navy has selected Alternative S-5 as the amended remedy for soil, Alternative GW-3A as the amended remedy for groundwater, and Alternative R-3 as the remedy for radiologically impacted soil and structures at Parcel B. The components of the selected alternatives are summarized below.

- Alternative S-5

  - Excavate soil in select areas where concentrations of COCs exceed remediation goals. Screen and separate radioactive anomalies from the excavated soil. Transport the excavated contaminated soil and materials off site to an appropriate disposal facility. Transport radioactive anomalies and contaminated soil off site to an appropriate low-level radioactive waste disposal facility. Backfill excavated areas with clean fill material.
  - Install durable soil covers over the entire parcel to prevent contact with any COCs that are not excavated. Covers would be maintained to laterally contain the soil at the shoreline.
  - Install a revetment along the shoreline of Redevelopment Blocks BOS-1 (at IR-07) and BOS-3 (at IR-26).
  - Install an SVE system at IR-10 (Redevelopment Block 8) to remove VOCs from soil.
  - Conduct a soil gas survey following the remedial actions. The results of the survey will be used to provide data to establish risk-based numeric goals for VOCs in soil gas based on cumulative risk at a 10^{-6} risk level and to evaluate potential vapor intrusion risks. The results of the survey will be used to evaluate the need for additional remedial action and to identify where the initial ARICs for VOCs described in Section 12.2.1.5 shall be retained and areas where they shall be released. In some areas, site-specific pre-remediation soil gas surveys may be necessary to support the RD. Monitoring for methane that will follow removal of the methane source will be used to identify whether contingencies such as additional engineering controls (for example, methane venting or vapor barriers) or additional ICs will be necessary.
  - Implement ICs, including controls to maintain the integrity of the covers (as well as where the covers meet the shoreline). Legal instruments known as restrictive covenants in Quitclaim Deed(s) between the Navy and the property recipient and in "Covenant(s) to Restrict Use of Property" between DTSC and the Navy will be implemented to establish land use restrictions to limit exposure to contaminated soil and groundwater. An RMP will be prepared by the City and County of San Francisco and will specify soil and groundwater management procedures for implementation of the ICs. Section 12.2.1.5 contains more details on ICs.

- Alternative GW-3A

  - Treat groundwater by injecting a biological amendment in the plume near IR-10 (Redevelopment Blocks 8 and 9) to break down VOCs where concentrations exceed remediation goals.
  - Treat groundwater, if necessary, by injecting an organo-sulfur compound to immobilize metal COCs (chromium VI, copper, lead, and mercury). The need to treat these metals will be based on the further analysis of groundwater data against trigger levels that will occur during the RD.
  - Implement a groundwater monitoring program to verify treatment effectiveness during and after treatment. The monitoring program will be flexible to allow modifications as data are collected.
  - Implement ICs (see Section 12.2.1.5).

- Alternative R-3

  - Decontaminate radiologically impacted structures and dismantle them if necessary. Remove radiologically impacted storm drain and sanitary sewer lines throughout Parcel B. Survey former building sites and the discharge tunnel from Building 140. Screen removed materials and transport contaminated material off site to an appropriate disposal facility.
  - Conduct a surface scan for radioactive materials at IR-07 and IR-18. Remove all radiological anomalies to a depth of 1 foot. Install a demarcation layer on the surveyed soil surface before a new 2-foot-thick soil cover is installed. Transport radioactive anomalies and contaminated soil off site to an appropriate low-level radioactive waste facility. Monitor groundwater at IR-07 and IR-18 for radionuclides of concern.
  - Close the pump shaft beneath Building 140 in place using backfilled stone and a concrete cap.
  - Implement ICs (see Section 12.2.1.5).

12.1 SUMMARY OF THE RATIONALE FOR THE AMENDED SELECTED REMEDY

The following sections present the rationale for the amended selected remedy for soil, groundwater, and radiologically impacted soil and structures.

12.1.1 Soil

The amended selected remedy for soil at Parcel B includes a variety of components that will together meet the RAOs and satisfy ARARs. The selected remedy provides the best balance of tradeoffs with respect to the nine evaluation criteria.

Soil will be excavated in selected areas where COCs exceed remediation goals. These areas include the methane and mercury sources areas as well as other, smaller areas where metals (lead) or organic chemicals exceed remediation goals. Excavation of contaminated soil from these areas will eliminate the exposure pathway to the COCs, remove the source of methane gas at IR-07, and remove the source of mercury to the groundwater at IR-26 (Redevelopment Blocks 16 and BOS-3). The amended selected remedy for soil will provide the best long-term effectiveness by removing the greatest volume of contamination.

However, excavation to remove all COCs in soil was shown to be ineffective during the initial remedial action. Potential unacceptable risk from exposure to soil across the rest of Parcel B will remain even after these excavations are completed based on the widespread presence of ubiquitous metals. Therefore, durable covers will be installed over the entire parcel to prevent contact with any COCs that are not excavated. Similarly, a shoreline revetment will be constructed along the shoreline of Redevelopment Blocks BOS-1 (at IR-07) and BOS-3 (at IR-26) to prevent contact between ecological receptors and COCs in shoreline sediment. The inland soil covers will be designed and maintained to laterally contain the soil where the covers meet the seawalls or the shoreline revetment.

The amended selected remedy also includes an SVE component to address VOCs in soil at IR-10 (Redevelopment Block 8). SVE for the soil, in combination with treatment of the VOCs in the underlying groundwater, will reduce the concentrations of VOCs that may cause risk from vapor intrusion. A soil gas survey will be conducted after soil and groundwater remediation is complete. Results from the soil gas survey will be used to provide data to establish risk-based numeric goals for VOCs in soil gas based on cumulative risk at a 10^{-6} risk level and to evaluate potential vapor intrusion risk. The results of the survey will be used to evaluate the need for additional remedial action and to identify where the initial ARICs for VOCs described in Section 12.2.1.5 shall be retained and areas where they shall be released. In some areas, site-specific pre-remediation soil gas surveys may be necessary to support the RD. Monitoring for methane that will follow removal of the methane source would be used to identify whether contingencies such as additional engineering controls (for example, methane venting or vapor barriers) or additional ICs would be necessary. The selected remedy is the only alternative that provides treatment for VOCs; all other alternatives for soil addressed this potential exposure through ICs.

The amended selected remedy contains the most active remediation components of all the alternatives and has the least reliance on ICs to prevent exposure. The amended selected remedy offers (1) the best long-term effectiveness and reduction of contaminant toxicity, mobility, or volume through treatment (2) equal (or nearly so) short-term effectiveness and implementability, and (3) only slighter greater cost than Alternatives S-3 and S-4.

12.1.2 Groundwater

The amended selected remedy for groundwater at Parcel B includes a variety of components that will together meet the RAOs and satisfy ARARs. The amended selected remedy provides the best balance of tradeoffs with respect to the nine evaluation criteria.

Groundwater poses a potential unacceptable risk to human health, especially through the vapor intrusion pathway. Therefore, groundwater will be treated by injecting a biological amendment to break down VOCs where concentrations exceed remediation goals. This active, in situ treatment will reduce the toxicity, mobility, and volume of VOCs. The selected remedy (using a biological amendment) is potentially more effective than the other in situ treatment alternative (using ZVI) because the injected biological substrate can flow with the groundwater and remediate a larger volume. The selected remedy has equivalent short-term effectiveness and implementability and a slightly lower cost than the other alternative that involves active treatment.

Groundwater also poses a potential unacceptable risk to saltwater aquatic organisms based the potential discharge of groundwater into San Francisco Bay. Groundwater will be treated, if necessary, by injecting an organo-sulfur compound to immobilize metal COCs. The need to treat metal COCs in groundwater will be based on further analysis of groundwater data against trigger levels that will occur during the RD.

The amended selected remedy includes implementing a flexible groundwater monitoring program to verify effectiveness during and after treatment.

12.1.3 Radiologically Impacted Soil and Structures

The selected remedy for radiologically impacted soil and structures at Parcel B includes components that will together meet the RAOs and satisfy ARARs. The selected remedy provides the best balance of tradeoffs with respect to the nine evaluation criteria.

Radioactive COCs pose a potential unacceptable risk to human health. Alternatives R-2 and R-3 both contain the following components to address this risk: (1) surveying structures, former building sites, and radiologically impacted areas; (2) decontaminating (and demolishing if necessary) buildings; (3) excavating storm drain and sanitary sewer lines; (4) screening, separating, and disposing of radioactive anomalies and contaminated excavated soil at an off-site low-level radioactive waste facility and (5) implementing ICs. The large, radiologically impacted area at IR-07 and IR-18 will be addressed based on its unique features. Both alternatives for this area include conducting a surface scan at IR-07 and IR-18, and removing any radiological anomalies to a depth of 1 foot (the maximum effective depth of the surface scan). A demarcation layer would be installed on the surveyed soil surface before covers were constructed to mark the boundary between the existing surface and the new 2-foot-thick soil cover.

Building 140 and its associated pump shaft and drainage tunnel are also radiologically impacted. The selected remedy (Alternative R-3) provides the best long-term effectiveness because this alternative also includes closing the pump shaft below 10 feet (and connecting piping) in place with backfilled stone and a concrete cap (versus abandonment). The selected remedy is equivalent to the other active treatment alternative on all other balancing criteria, except it is slightly (about 2 percent) more expensive.

12.2 DESCRIPTION OF THE AMENDED SELECTED REMEDY

The following sections provide a description of the amended selected remedy.

12.2.1 Soil

The amended selected remedy for soil at Parcel B is Alternative S-5. Alternative S-5 consists of a combination of soil excavation (including methane and mercury source removal) and off-site disposal, covers, SVE for VOCs, shoreline revetment, and institutional controls.

12.2.1.1 Excavation

The amended selected remedy includes excavation of contaminated soil, excavation of soil and debris in the methane and mercury source areas, and off-site disposal of known and potentially contaminated soil and debris.

Soil would be excavated in specific areas within selected areas at Parcel B, as described below:

- Soil contaminated with organic chemicals and lead at concentrations that exceed remediation goals based on the planned reuse will be excavated. Excavation will occur to a maximum depth of 10 feet bgs at risk grid B3416 (for lead in Redevelopment Block 9; see Figure 9-1), B3426 (for lead in Redevelopment Block 8; see Figure 9-2) and B4716 (for organic chemicals in Redevelopment Block 15; see Figure 9-3).

- Soil and debris from the methane source area at Redevelopment Block 3 will be excavated (see Figure 9-4). Post-excavation monitoring of soil gas concentrations will be conducted to confirm methane levels meet the RAO. If methane source removal is not feasible based on site conditions (for example, if methane is produced from organic material in the native sediments instead of from identifiable construction debris), methane venting may be added as a contingency to mitigate potential risk from methane.

- Soil from the mercury source area at former Excavation EE-05 will be excavated (see Figure 9-5). The vertical extent of the mercury concentrations that exceed the remediation goal will be delineated to identify the mercury source material. Horizontal delineation can be estimated from the previous remedial action.

- The need for excavation and removal of soil or sediment for construction of the shoreline revetment will be evaluated during the RD. Excavation of soil or sediment may be necessary to establish appropriate grades and to allow placement of erosion control materials at appropriate elevations relative to sea level.

- The open excavations will be backfilled with clean soil. The excavated soil that contains COCs will be removed from the site and transported to an appropriate disposal facility.

- All other areas that present potential unacceptable incremental risk from potential exposure to COCs in soil (see Figure 9-6) will be left in place and addressed through covers and institutional controls.

The methane and mercury source removal components of this alternative are in progress as TCRAs. However, these TCRAs will not be completed before the amended ROD is signed. Consequently, components of the preferred cleanup alternative that are addressed as TCRAs remain in the amended ROD as parts of the remedy.

12.2.1.2 Covers

The amended selected remedy includes the installation of durable soil covers to prevent contact with any COCs that are not excavated. Covers will be required at all redevelopment blocks to prevent human exposure to ubiquitous metals in soil that may pose an unacceptable risk.

Existing covers, such as buildings and asphalt parking lots, are considered adequate for this alternative. New covers are considered for construction only in areas where there are no existing covers or existing covers have been destroyed in the process of redevelopment. The need for upgrades or repairs to the existing covers will be assessed in the RD and implemented for this alternative as necessary.

Covers will be built in two ways:

- **Use of Existing Covers:** Existing asphalt and concrete surfaces and buildings will be considered existing covers and may include existing building footprints, roads, and parking lots. These existing covers may require rehabilitation, such as sealing or repairing cracks.

- **New Covers:** Where covers are needed, areas would be covered with a durable material that will not break, erode, or deteriorate such that the underlying soil becomes exposed. Standard construction practices for roads, sidewalks, and buildings would likely be adequate to meet this performance standard. Other examples of covers could include a minimum 4 inches of asphalt or a minimum 2 feet of clean imported soil. All covers must achieve a full cover over the entire redevelopment block. The exact nature and specifications for covers can vary from block to block, but all covers must meet the performance standard of preventing exposure to soil and durability. Backfill for soil covers would be tested and confirmed to not contain contaminants at concentrations exceeding remediation goals and to contain less than 0.25 percent asbestos. The soil cover may overlay existing grades. Appropriate covers for the open space reuse blocks would depend on the details of redevelopment.

It is estimated from aerial photographs of Parcel B that approximately 16 acres will be covered with soil, 3 acres will be covered by the shoreline revetment, and 40 acres of existing asphalt and concrete surfaces (including buildings) will be used and repaired, as necessary (see Figure 9-7). The actual extent of cover types will be identified in the RD.

12.2.1.3 SVE

The amended selected remedy includes the expansion and continued operation of the pilot-scale SVE system that was operated at IR-10 (Building 123 at Redevelopment Block 8). SVE will be implemented as a source reduction measure, and the other actions associated with the remedy will provide overall protectiveness to meet the RAOs. Institutional controls to address vapor intrusion will likely be a necessary component of the remedy, but specific ARICs will be selected after remediation is complete. The results of a site-specific soil gas survey will be the basis for the ARICs. The soil gas survey will address both soil and groundwater areas where vapor intrusion is a concern. The ARICs may be modified by the FFA signatories as the soil contamination areas and groundwater plumes that are producing unacceptable vapor inhalation risks are reduced over time. They also may be modified in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas originally included in the ARICs do not pose unacceptable potential exposure risk to VOC vapors.

12.2.1.4 Shoreline Revetment

The amended selected remedy includes a shoreline revetment to eliminate exposure to contaminated shoreline sediment and to prevent migration of contaminated soil from inland locations to the bay. The shoreline revetment will be constructed to protect the entire shoreline for Redevelopment Blocks BOS-1 (at IR-07) and BOS-3 (at IR-26), where the revetment was deemed necessary based on the results of the SLERA. The 1,300-ft^2 wetland at Redevelopment Block BOS-1 will be filled, and the Navy will mitigate the loss of the wetland using either compensatory mitigation, mitigation banking, or an in-lieu fee arrangement. The revetments will cover the shoreline and consist of layers of riprap overlying geofabric filters designed to prevent erosion and migration of fine material. The revetments will extend from below the low tide line to above the high tide line with an allowance for wave "run-up." Approximately 2,500 feet of shoreline will need revetment. Details of the shoreline revetment, including the plan for wetland mitigation, will be further refined during the RD. The RD will use current information on shoreline conditions to select the actual engineering design parameters. Institutional controls will be implemented to maintain the integrity of the shoreline revetment at Parcel B.

12.2.1.5 Institutional Controls

The amended selected remedy includes institutional controls to limit exposure by restricting specified land uses and activities on the parcel. This section discusses institutional controls related to all the components of the selected remedy (soil, groundwater, and radiologically impacted soil and structures) to provide a single source location within this amended ROD.

Institutional Controls in General

Institutional controls are legal and administrative mechanisms used to implement land use restrictions that are used to limit the exposure of future landowner(s) or user(s) of the property to hazardous substances present on the property, and to ensure the integrity of the remedial action. Institutional controls are required on a property where the selected remedial clean-up levels result in contamination remaining at the property above levels that allow for unlimited use and unrestricted exposure. Institutional controls will remain in place unless the remedial action taken will allow for unlimited use of the property and unrestricted exposure. Implementation of institutional controls includes requirements for monitoring and inspections, and reporting to ensure compliance with land use or activity restrictions.

The Navy has determined that it will rely upon proprietary controls in the form of environmental restrictive covenants as provided in the "Memorandum of Agreement Between the United States Department of the Navy and the California Department of Toxic Substances Control" and attached covenant models (Navy and DTSC 2000) (hereinafter referred to as the "Navy/DTSC MOA").

More specifically, land use and activity restrictions will be incorporated into two separate legal instruments as provided in the Navy/DTSC MOA:

1. Restrictive covenants included in one or more Quitclaim Deeds from the Navy to the property recipient.

2. Restrictive covenants included in one or more "Covenant to Restrict Use of Property" entered into by the Navy and DTSC as provided in the Navy/DTSC MOA and consistent with the substantive provisions of California Code of Regulations (Cal. Code Regs.) tit. 22 § 67391.1.

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

The activity restrictions in the "Covenant(s) to Restrict Use of Property" and Deed(s) shall be implemented through the Parcel B Risk Management Plan ("Parcel B RMP") to be prepared by the City and County of San Francisco and approved by the Navy and FFA Signatories. The Parcel B RMP shall be attached to and incorporated by reference into the Covenant(s) to Restrict Use of Property and Deed(s) as an enforceable part thereof. It shall specify soil and groundwater management procedures for compliance with the remedy selected in the Parcel B amended ROD. The Parcel B RMP shall identify the roles of local, state, and federal government in administering the Parcel B RMP and shall include, but not be limited to, procedures for any necessary sampling and analysis requirements, worker health and safety requirements, and any necessary site-specific construction and/or use approvals that may be required.

In addition to being set forth in the "Covenant(s) to Restrict Use of Property" and Quitclaim Deed(s) as described above, restrictions applied to specified portions of the property will be described in findings of suitability for transfer and findings of suitability for early transfer.

Access

The Deed and Covenant shall provide that the Navy and FFA signatories and their authorized agents, employees, contractors and subcontractors shall have the right to enter upon HPS Parcel B to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary under the cleanup program, including but not limited to monitoring wells, pumping wells, treatment facilities, and cap/containment systems.

Implementation

The Navy shall address and describe institutional control implementation and maintenance actions including periodic inspections and reporting requirements in the preliminary and final RD reports to be developed and submitted to the FFA signatories for review pursuant to the FFA (see "Navy Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions" attached to January 16, 2004 Department of Defense memorandum titled "Comprehensive Environmental Response, Compensation and Liability Act [CERCLA] Record of Decision [ROD] and Post-ROD Policy"). The preliminary and final RD reports are primary documents as provided in Section 7.3 of the FFA.

Activity Restrictions that Apply Throughout Parcel B

The following sections describe the institutional control objectives to be achieved through activity restrictions throughout Parcel B in order to ensure that any necessary measures to protect human health and the environment and the integrity of the remedy have been undertaken.

Restricted Activities

The following restricted activities throughout HPS Parcel B must be conducted in accordance with the "Covenant(s) to Restrict Use of Property", Quitclaim Deed(s), the Parcel B RMP, and if required, any other workplan or document approved in accordance with these referenced documents:

a. "Land disturbing activity" which includes but is not limited to: (1) excavation of soil, (2) construction of roads, utilities, facilities, structures, and appurtenances of any kind, (3) demolition or removal of "hardscape" (for example, concrete roadways, parking lots, foundations, and sidewalks), (4) any activity that involves movement of soil to the surface from below the surface of the land, and (5) any other activity that causes or facilitates the movement of known contaminated groundwater.

b. Alteration, disturbance, or removal of any component of a response or cleanup action (including but not limited to pump-and-treat facilities, revetment walls and shoreline protection, and soil cap/containment systems); groundwater extraction, injection, and monitoring wells and associated piping and equipment; or associated utilities.

c. Extraction of groundwater and installation of new groundwater wells.

d. Removal of or damage to security features (for example, locks on monitoring wells, survey monuments, fencing, signs, or monitoring equipment and associated pipelines and appurtenances).

Prohibited Activities

The following activities are prohibited throughout HPS Parcel B:

a. Growing vegetables or fruits in native soil for human consumption.

b. Use of groundwater.

Activity Restrictions Relating to VOC Vapors at Specific Locations within Parcel B

Any proposed construction of enclosed structures must be approved in accordance with the "Covenant to Restrict Use of the Property," Quitclaim Deed, and Parcel B RMP prior to the conduct of such activity within the area requiring institutional controls (ARIC) for VOC vapors in order to ensure that the risks of potential exposures to VOC vapors are reduced to acceptable levels that are adequately protective of human health. Initially, the ARIC will include all of Parcel B except Redevelopment Block 4 (see Figure 12-1). This can be achieved through engineering controls or other design alternatives that meet the specifications set forth in the amended ROD, RD reports, land use control remedial design (LUC RD) report, and Parcel B RMP. The ARIC may be modified by the FFA signatories as the soil contamination areas and groundwater contaminant plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC do not pose an unacceptable potential exposure risk to VOC vapors.

Additional Land Use Restrictions for IR Sites 7 and 18

The following restricted land uses for property in IR Sites 7 and 18 must be reviewed and approved by the FFA Signatories in accordance with the "Covenant(s) to Restrict Use of the Property," Quitclaim Deed(s), and Parcel B RMP prior to use of the property for any of the restricted uses:

a. A residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation,

b. A hospital for humans,

c. A school for persons under 21 years of age, or

d. A day care facility for children.

Additional Land Use Restrictions Related to Radionuclides at IR Sites 7 and 18 and the Pump Shaft beneath Building 140

The following activity restriction requirements shall apply in the ARIC for potential radionuclides located on IR Sites 7 and 18 and the deep pump shaft under Building 140 in addition to those generally applicable land use restrictions specified above. At the time of transfer, the areas that require this restriction will be surveyed to define the legal metes and bounds for inclusion in the property transfer documents.

The Parcel B RMP shall address any necessary additional soil and radiological management issues within the ARIC for potential radionuclides designated in Figure 12-1 and defined in the property transfer documents.

For excavations at IR Sites 7 and 18 that are solely in clean fill, that is the fill that is placed above the physical or visual barrier which will be placed directly on top of the soils as a demarcation layer as detailed in the RD or other appropriate documents, the Parcel B RMP will list the procedures to be followed to be sure that the barrier is not disturbed or breeched.

For any excavation into the IR Sites 7 and 18 soils beneath the barrier, the proposed excavation will be required to be described in a work plan that will include but not be limited to a radiological work plan, soil sampling and analysis requirements, and a plan for off-site disposal of any excavated radionuclides by the transferee in accordance with federal and state law. This work plan must be submitted to and approved by the Navy and environmental regulators in accordance with procedures (including dispute resolution procedures) and timeframes that will be set forth in the RMP. The integrity of the cover/cap must be restored upon completion of excavation as provided in the Parcel B RMP. A completion report describing the details of the implementation of the work plan, the sampling and analysis, the off-site disposal, and the restoration of the integrity of the cover/cap must be submitted to and approved in writing by the Navy and environmental regulators in accordance with procedures (including dispute resolution procedures) and timeframes that will be set forth in the RMP.

12.2.2 Groundwater

The amended selected remedy for groundwater at Parcel B is Alternative GW-3A. Alternative GW-3A consists of three elements: (1) in situ treatment of groundwater, (2) groundwater monitoring, and (3) ICs.

12.2.2.1 Treatment for VOCs

In situ treatment uses a biodegradation substrate to actively mitigate contaminants where concentrations are highest in the IR-10A groundwater plume at Redevelopment Blocks 8 and 9. This treatment is based on the groundwater plume as presented on Figure 7-3. Plume conditions may continue to change over time as a result of the continued effects of treatability studies. The RD will use current information on plume extent and concentration to select the actual injection

parameters. The assumed process involves a single injection of the treatment compound into groundwater to reduce the contaminant concentrations to or near remediation goals.

The biodegradation substrate is assumed to be a glycerol polylactate, which creates reducing conditions in the aquifer by forming lactic acid and hydrogen. This biodegradation substrate treatment is a timed-release compound that will continue to react for up to several years, depending on the dose of the treatment. This timed-release reaction is beneficial in low-permeability aquifers such as the A-aquifer at Parcel B because the slow release allows more time for dispersion of the substrate and more time for the substrate to come in contact with the COCs and immobilize or mineralize them. The RD will use current information on plume extent and concentration to select the actual injection parameters, including the actual biodegradation substrate material.

12.2.2.2 Treatment for Metals

In situ treatment for metals (chromium VI, copper, lead, and mercury), if necessary, will use an organo-sulfur compound that causes anaerobic bioactivity to immobilize metal contaminants. Using the injected material, the microbes produce a metal-organo-sulfur complex that strongly sorbs to the aquifer matrix. Removal of the mercury source as part of the soil remedy is expected to mitigate mercury in groundwater so that in situ treatment is not necessary. The need to treat chromium VI, copper, and lead will be based on the further analysis of groundwater data against trigger levels that will occur during the RD.

12.2.2.3 Groundwater Monitoring

Groundwater will be monitored quarterly for the first year while the treatment is being implemented. The monitoring frequency will be reduced to semiannual events for years 2, 3, and 4, and then monitoring will occur annually thereafter (starting in year 5). Monitoring will be quarterly for a 1-year "proof period" to demonstrate attainment of remediation goals near the end of the monitoring period (assumed to occur in year 15). A 1-year of proof period will be required to demonstrate that the RAOs associated with the IR-10A groundwater plume at Redevelopment Blocks 8 and 9 have been achieved. Groundwater monitoring in the IR-10A plume area will cease after year 15, but will continue at other locations outside the plume.

The 15-year period for groundwater monitoring was assumed to develop the cost estimate for the amended selected remedy. However, the actual monitoring period could be shorter or longer, depending on data collected during the RD and remedial action.

The current locations of the VOC plumes at IR-25 in Parcel C do not extend into Parcel B (see Figure 7-3), and active groundwater treatment is not proposed at Parcel B for any of the plume area used in the risk assessment that was shown in Parcel B. The VOC plumes at IR-25 will be addressed in the Parcel C FS and ROD. However, monitoring of selected wells would be included as part of the groundwater monitoring component; these wells would be selected in the RD.

12.2.2.4 Institutional Controls

Institutional controls are discussed in detail in Section 12.2.1.5.

12.2.3 Radiologically Impacted Soil and Structures

The selected remedy for radiologically impacted soil and structures at Parcel B is Alternative R-3. Alternative R-3 includes (1) surveying structures, former building sites, and radiologically impacted areas; (2) decontaminating (and demolishing if necessary) buildings; (3) excavating storm drain and sanitary sewer lines; (4) screening, separating, and disposing of radioactive anomalies and contaminated excavated soil at an off-site low-level radioactive waste facility, and (5) implementing ICs. Alternative R-3 also includes a surface scan at IR-07 and IR-18, and removal of any radiological anomalies to a depth of 1 foot (the maximum effective depth of the surface scan). A demarcation layer would be installed on the surveyed soil surface before covers were constructed at IR-07 and IR-18 to mark the boundary between the existing surface and a new 2-foot-thick soil cover. Groundwater at IR-07 and IR-18 would be monitored for radionuclides of concern. The above-grade portions of Building 140, the discharge tunnel, and the first 10 feet of the Building 140 pump shaft would be surveyed to verify that no residual radioactivity is present above remediation goals. The pump shaft and connecting piping below Building 140 would be closed using backfilled stone and a concrete cap. ICs would be implemented to minimize inadvertent contact with radiologically impacted media. Institutional controls are discussed in detail in Section 12.2.1.5.

The storm drain and sanitary sewer removal components of this alternative are in progress as TCRAs. However, these TCRAs will not be completed before the amended ROD is signed. Consequently, components of the preferred cleanup alternative that are addressed as TCRAs remain in the amended ROD as parts of the remedy.

12.3 ESTIMATED COSTS OF THE AMENDED SELECTED REMEDY

The estimated costs for the amended selected remedy include:

- Alternative S-5 — $12,972,000
- Alternative GW-3A — $2,687,000
- Alternative R-3 — $29,603,000

These costs are based on the best available information regarding the anticipated scope of the remedy, including capital, periodic, and operation and maintenance costs, and are based on present value costs. Table 12-1a, Table 12-2a, and Table 12-3 summarize the estimated costs for Alternatives S-5, GW-3A, and R-3. Detailed cost estimates are presented in the TMSRA (ChaduxTt 2007) for Alternatives S-5 and GW-3A and the TMSRA radiological addendum (TtEC 2008) for Alternative R-3.

These engineering cost estimates are expected to be within +50 to -30 percent of the actual project cost for remedial design and remedial action phase of site cleanup. Costs may change as a result of new information and data collected during implementation of the selected remedy. Significant changes may be documented in a memorandum to the administrative record, explanation of significant differences, or as a further amendment to the ROD for Parcel B.

12.4 EXPECTED OUTCOMES OF THE AMENDED SELECTED REMEDY

The amended selected remedy for soil, groundwater, and radiologically impacted soil and structures at Parcel B provides for cleanup to be protective of the current use and planned future reuse of the site and to allow for transfer of the site. However, the amended selected remedy will not provide for unlimited use or unrestricted exposure. The following sections discuss the expected outcomes of each major component of the amended selected remedy.

12.4.1 Soil

Excavation and off-site disposal of contaminated soil will reduce potential risks for future exposure. However, soil covers and the shoreline revetment are central components of the amended selected remedy for soil. Continued maintenance of the covers and the revetment and sustained enforcement of ICs related to their disturbance will be necessary to prevent future exposure. Similarly, although operation of the SVE system may reduce concentrations of VOCs in soil vapor to acceptable levels, it is likely that ARICs for vapor intrusion will be needed at some locations at Parcel B. Institutional or engineering controls in those areas may be needed to prevent exposure by vapor intrusion.

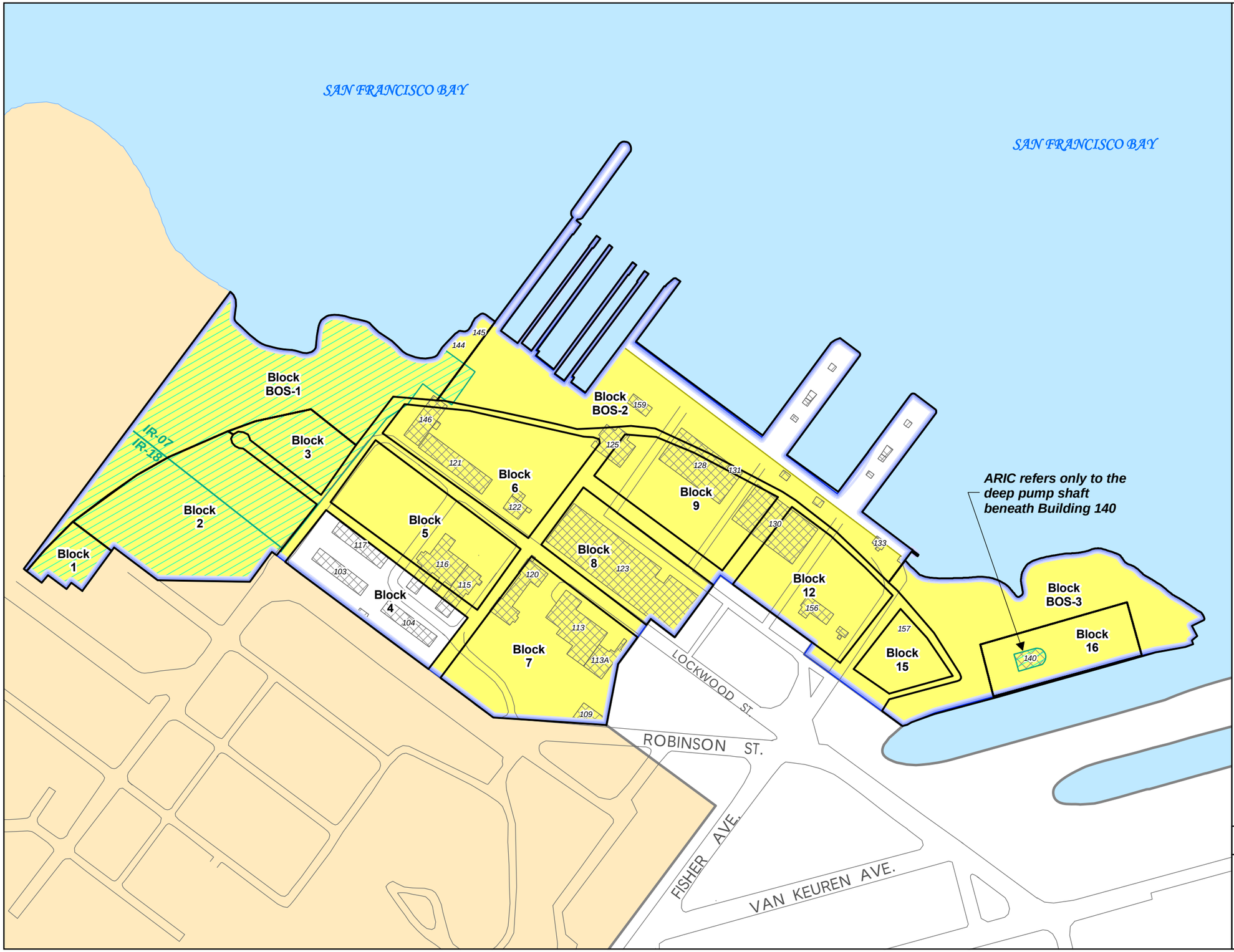
12.4.2 Groundwater

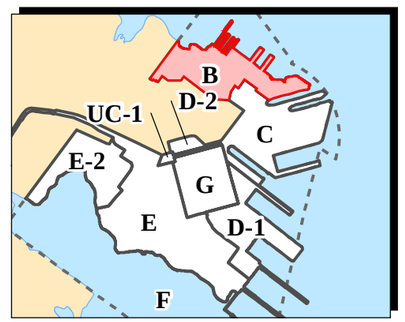
Treatment will reduce concentrations of COCs in groundwater and reduce the potential risks created by exposure. Although treatment of groundwater is expected to reduce VOC vapors released from groundwater, it is likely that ARICs for vapor intrusion will be needed at some locations at Parcel B. Furthermore, the Navy intends to permanently prohibit use of groundwater at Parcel B through ICs.

12.4.3 Radiologically Impacted Soil and Structures

The remedy components including surveys, decontamination, excavation, and off-site disposal will reduce the potential risks of exposure to radionuclides. However, the selected remedy for radiologically impacted soil and structures relies on a soil cover at IR-07 and IR-18 and a concrete cap over the pump shaft at Building 140. Continued maintenance of the covers and the cap and sustained enforcement of institutional controls related to their disturbance will be necessary to prevent future exposure.

FIGURE





Location Map

- Road
- Restrictions Related to Radionuclides
- Restrictions Related to VOC Vapors
- Redevelopment Block
- Parcel B Boundary
- Other Parcel Boundary
- Building (128)
- San Francisco Bay
- Non-Navy Property

Notes:

Other activity restrictions apply throughout Parcel B; refer to Section 12.2.1.5 of the text for these restrictions.

ARIC	Area requiring institutional controls
IR	Installation Restoration
VOC	Volatile organic compound

0 300 600

Scale in Feet

ChaduxTt JV
Consulting Engineers and Scientists

Hunters Point Shipyard, San Francisco, California

U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 12-1
PARCEL B
AREAS REQUIRING
INSTITUTIONAL CONTROLS

Amended ROD for Parcel B

TABLES

TABLE 12-1A: COST ESTIMATE SUMMARY FOR SOIL ALTERNATIVE S-5

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Description	Capital Cost	Periodic Cost[a]	Total Cost
Capital Costs			
Remedial design	$1,001,740		$1,001,740
Excavations B3416, B3426, and B4716	$122,520		$122,520
Methane source removal	$2,655,370		$2,655,370
Mercury source removal	$1,274,450		$1,274,450
Covers	$819,840		$819,840
SVE system	$231,190		$231,190
Shoreline revetment	$2,925,120		$2,925,120
Institutional controls	$88,620		$88,620
Site-wide distributive costs	$775,600		$775,600
		Total capital costs:	**$9,894,450**
Periodic Costs			
Cover maintenance[b]		$379,380	
Annual inspection and covenant enforcement		$13,400	
5-year review		$90,980	
10-year shoreline revetment inspection and maintenance[c]		$56,470	
Present value of 30 years of periodic costs[d] (see Table 12-1B):			**$915,890**
		Subtotal:	**$10,810,340**
		Contingency (20%)	$2,162,070
		TOTAL COST:	**$12,972,000**

Notes:

This estimate has been prepared without equipment specifications, layout, design, or engineering calculations. Expected level of accuracy is +50 to -30 percent. Actual construction costs will vary from this estimate based on market conditions, actual costs of purchased materials, quantity variations, regulatory requirements, final design details, and other project-specific factors existing at the time of construction.

a Cost per event

b Cover maintenance includes asphalt seal coat every 10 years.

c Revetment maintenance includes replacement of 5 percent of riprap every 10 years.

d A duration of 30 years assumed for costing; actual duration could extend beyond this assumed time period

SVE Soil vapor extraction

TABLE 12-1B: PRESENT VALUE COST ESTIMATE, ALTERNATIVE S-5

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Annual Discount Factors at: 3.10 %

Year	Annual Discount Factor	Future Value of O&M and Periodic Cost for Alternative S-5[1]	Present Value Cost for Alternative S-5	Description of Cost
1	0.970	$13,400	$12,997	Annual Drive-by Inspection
2	0.941	$13,400	$12,606	Annual Drive-by Inspection
3	0.912	$13,400	$12,227	Annual Drive-by Inspection
4	0.885	$13,400	$11,860	Annual Drive-by Inspection
5	0.858	$90,973	$78,094	5-Year Review
6	0.833	$13,400	$11,157	Annual Drive-by Inspection
7	0.808	$13,400	$10,822	Annual Drive-by Inspection
8	0.783	$13,400	$10,496	Annual Drive-by Inspection
9	0.760	$13,400	$10,181	Annual Drive-by Inspection
10	0.737	$526,827	$388,223	5-Year Review, 10-Year Shoreline Inspection and Asphalt Maintenance
11	0.715	$13,400	$9,578	Annual Drive-by Inspection
12	0.693	$13,400	$9,290	Annual Drive-by Inspection
13	0.672	$13,400	$9,010	Annual Drive-by Inspection
14	0.652	$13,400	$8,739	Annual Drive-by Inspection
15	0.633	$90,973	$57,548	5-Year Review
16	0.614	$13,400	$8,222	Annual Drive-by Inspection
17	0.595	$13,400	$7,975	Annual Drive-by Inspection
18	0.577	$13,400	$7,735	Annual Drive-by Inspection
19	0.560	$13,400	$7,502	Annual Drive-by Inspection
20	0.543	$147,445	$80,068	5-Year Review, 10-Year Shoreline Inspection and Asphalt Maintenance
21	0.527	$13,400	$7,058	Annual Drive-by Inspection
22	0.511	$13,400	$6,846	Annual Drive-by Inspection
23	0.496	$13,400	$6,640	Annual Drive-by Inspection
24	0.481	$13,400	$6,440	Annual Drive-by Inspection
25	0.466	$90,973	$42,408	5-Year Review
26	0.452	$13,400	$6,059	Annual Drive-by Inspection
27	0.439	$13,400	$5,877	Annual Drive-by Inspection
28	0.425	$13,400	$5,700	Annual Drive-by Inspection
29	0.413	$13,400	$5,528	Annual Drive-by Inspection
30	0.400	$147,445	$59,002	5-Year Review, 10-Year Shoreline Inspection and Asphalt Maintenance
		Total Present Value Cost Over 30 Years	**$915,887**	

Notes: Annual discount factor = $1/(1+i)^t$, where i=0.031 and t=year (that is, the present value of $1 paid in year t at 3.1%).

1 Costs are for operation, maintenance, and 5-year reviews for 30 years

O&M Operation and maintenance

TABLE 12-2A: COST ESTIMATE SUMMARY FOR GROUNDWATER ALTERNATIVE GW-3A
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Description	Capital Cost	Periodic Cost[a]	Total Cost
Capital Costs			
Remedial design	$12,320		$12,320
Groundwater monitoring well installation	$1,710		$1,710
Lactate injection	$15,620		$15,620
Waste handling and disposal	$5,640		$5,640
Institutional controls	$135,675		$135,675
Site-wide staff support	$38,620		$38,620
		Total Capital Costs:	**$209,580**
Periodic Costs			
Groundwater monitoring event[b]		$43,390	
Bioremediation monitoring event[c]		$13,890	
Site-wide staff support		$3,440	
Annual inspection and covenant enforcement		$13,400	
5-year review		$77,570	
Closeout (well decommissioning and report)		$53,560	
Present value of 30 years of periodic costs[d] (see Table 12-2B):			**$2,029,880**
		Subtotal:	**$2,239,460**
		Contingency (20%)	$447,890
		TOTAL COST:	**$2,687,000**

Notes:

This estimate has been prepared without equipment specifications, layout, design, or engineering calculations. Expected level of accuracy is +50 to -30 percent. Actual construction costs will vary from this estimate based on market conditions, actual costs of purchased materials, quantity variations, regulatory requirements, final design details, and other project-specific factors existing at the time of construction.

a Cost per event

b For nonradioactive COCs: 31 wells sampled quarterly in year 1, semiannually years 2 through 4, annually to year 15; quarterly in year 15, then annually through year 30. For radioactive COCs: 26 wells sampled quarterly in year 1 then annually through year 30.

c For bioremediation monitoring: five wells sampled quarterly in year 1, semiannually years 2 through 4, annually to year 15; quarterly in year 15.

d A duration of 30 years assumed for costing; actual duration could extend beyond this assumed time period

COC Chemical of concern

TABLE 12-2B: PRESENT VALUE COST ESTIMATE, ALTERNATIVE GW-3A

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Annual Discount Factors at 3.10%

Year	Annual Discount Factor	Future Value of O&M and Periodic Cost for Alternative GW-3A[1]	Description of Cost	Present Value Cost for Alternative GW-3A
1	0.970	$215,090	Quarterly Groundwater and Bioremediation Monitoring, and Institutional Controls	$208,622
2	0.941	$115,965	Semiannual Groundwater and Bioremediation Monitoring, and Institutional Controls	$109,096
3	0.912	$115,965	Semiannual Groundwater and Bioremediation Monitoring, and Institutional Controls	$105,816
4	0.885	$115,965	Semiannual Groundwater and Bioremediation Monitoring, and Institutional Controls	$102,634
5	0.858	$143,975	Groundwater and Bioremediation Monitoring, 5-Year Review, and Institutional Controls	$123,593
6	0.833	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$55,288
7	0.808	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$53,626
8	0.783	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$52,013
9	0.760	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$50,449
10	0.737	$143,975	Groundwater and Bioremediation Monitoring, 5-Year Review, and Institutional Controls	$106,097
11	0.715	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$47,461
12	0.693	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$46,034
13	0.672	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$44,650
14	0.652	$66,402	Annual Groundwater and Bioremediation Monitoring, Inspections, and Project Maintenance	$43,307
15	0.633	$292,663	Quarterly Groundwater and Bioremediation Monitoring, 5-Year Review, and Institutional Controls	$185,134
16	0.614	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$32,218
17	0.595	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$31,250
18	0.577	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$30,310
19	0.560	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$29,399
20	0.543	$130,083	5-Year Review and Institutional Controls	$70,640
21	0.527	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$27,657
22	0.511	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$26,826
23	0.496	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$26,019
24	0.481	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$25,237
25	0.466	$130,083	5-Year Review and Institutional Controls	$60,639
26	0.452	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$23,742
27	0.439	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$23,028
28	0.425	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$22,336
29	0.413	$52,510	Annual Groundwater Monitoring, Inspections, and Project Maintenance	$21,664
30	0.400	$183,646	5-Year Review, Institutional Controls, and Closeout	$73,489
			Total Present Value Cost Over 30 Years (nonradiological)	**$1,858,276**
			Total Present Value Cost Over 30 Years (radiological)	**$171,600**
			Total Present Value Cost Over 30 Years (all)	**$2,029,876**

Notes: Annual discount factor = $1/(1+i)^t$, where i=0.031 and t=year (that is, the present value of $1 paid in year t at 3.1%).

1 Costs are for operation, maintenance, and 5-year reviews for 30 years

O&M Operation and maintenance

TABLE 12-3: COST ESTIMATE SUMMARY FOR RADIOLOGICAL ALTERNATIVE R-3
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Description	Capital Cost	Periodic Cost	Total Cost
Capital Costs			
Sewer and storm drain removal and disposal	$22,342,320		$22,342,320
IR-07 and IR-18 soil survey and disposal	$472,260		$472,260
Radiological soil screening and waste disposal for building and building sites	$118,210		$118,210
Impacted buildings survey and release (except Building 140)	$1,144,000		$1,144,000
Backfill of Building 140 shaft below 10 feet with stone and concrete cap	$592,450		$592,450
		Total capital costs:	**$24,669,240**
Periodic Costs			
Periodic costs included in Alternatives S-5 and GW-3A (see Tables 12-1 and 12-2)		$0	
		Present value of 30 years of periodic costs:	**$0**
		Subtotal:	**$24,669,240**
		Contingency (20%)	$4,933,850
		TOTAL COST:	**$29,603,000**

Notes:

This estimate has been prepared without equipment specifications, layout, design, or engineering calculations. Expected level of accuracy is +50 to -30 percent. Actual construction costs will vary from this estimate based on market conditions, actual costs of purchased materials, quantity variations, regulatory requirements, final design details, and other project-specific factors existing at the time of construction.

IR Installation Restoration

13.0 STATUTORY DETERMINATIONS

Section 121 of CERCLA established five principal requirements for the selection of remedies. Remedies must: (1) protect human health and the environment; (2) comply with ARARs unless a waiver is justified; (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy a preference for treatment as a principal element. The following sections discuss how the amended selected remedy meets these statutory requirements and preferences. Complete discussions are found in the TMSRA (ChaduxTt 2007) and the radiological addendum to the TMSRA (TtEC 2008).

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The amended selected remedy for Parcel B is designed to protect human health and the environment. The amended selected remedy for soil will protect human health by preventing exposure using a combination of components including excavation, covers, treatment, and institutional controls. The soil remedy will protect the environment by preventing exposure using a shoreline revetment and institutional controls.

The amended selected remedy for groundwater will protect human health by monitoring and treating groundwater and implementing institutional controls to prevent exposure; the groundwater remedy will protect the environment by monitoring concentrations of metal COCs and treating the groundwater, if necessary.

The selected remedy for radiologically impacted soil and structures will protect human health using several components including surveys, decontamination, excavation, covers, and institutional controls.

No short-term risks are associated with implementing the amended selected remedy that cannot be readily controlled. In addition, no adverse cross-media effects are expected from the remedy.

13.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CERCLA § 121(d)(1) states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. The remedial alternatives selected by the Navy and described in Section 12.0 would attain and comply with the substantive provisions of all statutes and promulgated regulations identified as ARARs.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence

when objectively compared to the conditions at the site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than federal ARARs.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations similar to the circumstances of the proposed response action and are well suited to the conditions of the site (EPA 1988). A requirement must be determined to be both relevant and appropriate to be considered an ARAR.

The criteria for determining relevance and appropriateness are listed in 40 CFR § 300.400(g)(2) and include the following:

- The purpose of the requirement and the purpose of the CERCLA action.
- The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site.
- The substances regulated by the requirement and the substances found at the CERCLA site.
- The actions or activities regulated by the requirement and the response action contemplated at the CERCLA site.
- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site.
- The type of place regulated and the type of place affected by the release or CERCLA action.
- The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action.
- Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resources at the CERCLA site.

According to CERCLA ARARs guidance (EPA 1988), a requirement may be "applicable" or "relevant and appropriate," but not both. Identification of ARARs must be done on a site-specific basis and involve a two-part analysis: first, a determination whether a given requirement is applicable; then, if it is not applicable, a determination whether it is nevertheless both relevant and appropriate. It is important to explain that some regulations may be applicable or, if not applicable, may still be relevant and appropriate. When the analysis determines that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable (EPA 1988).

Tables 13-1 through 13-3 present each potential ARAR with a determination of ARAR status (that is, applicable, relevant and appropriate, or not an ARAR). For the determination of relevance and appropriateness, the pertinent criteria were examined to determine whether the requirements addressed problems or situations sufficiently similar to the circumstances of the release or response action contemplated, and whether the requirement was well suited to the site. A negative determination of relevance and appropriateness indicates that the requirement did not meet the pertinent criteria. Negative determinations are discussed in the text only for specific cases.

As the lead federal agency, the Navy has primary responsibility for identifying federal ARARs at HPS. To qualify as a state ARAR under CERCLA and the NCP, a state requirement must be:

- A state law or regulation
- An environmental or facility siting law or regulation
- Promulgated (of general applicability and legally enforceable)
- Substantive (not procedural or administrative)
- More stringent than federal requirements
- Identified in a timely manner
- Consistently applied

To constitute an ARAR, a requirement must be substantive. Therefore, only the substantive provisions of requirements identified as ARARs in this analysis are considered to be ARARs. Permits are considered to be procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations that were determined to be procedural or non-environmental, including permit requirements, are not considered to be ARARs. CERCLA Section 121(e)(1), 42 U.S.C. § 9621(e)(1), states that "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section." The term *on-site* is defined for purposes of this ARARs discussion as "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action" (40 CFR § 300.5).

Nonpromulgated advisories or guidance issued by federal or state governments are not legally binding and do not have the status of ARARs. Such requirements may, however, be useful, and are "to be considered" (TBC). TBC (40 CFR § 300.400[g][3]) requirements complement ARARs but do not override them. They are useful for guiding decisions regarding cleanup levels or methodologies when regulatory standards are not available.

Pursuant to EPA guidance (EPA 1988), ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific requirements. This classification was developed to aid in the identification of ARARs; some ARARs do not fall precisely into one group or another. ARARs are identified on a site basis for remedial actions where CERCLA authority is the basis for cleanup.

Remedial action performed under CERCLA must comply with all ARARs. The selected remedy was found to comply with all ARARs, as presented in Tables 13-1 through 13-3. Compliance with chemical-specific, location-specific, and action-specific ARARs is described in the following subsections.

13.2.1 Chemical-Specific ARARs

This section summarizes the analysis of chemical-specific ARARs identified for Parcel B. Chemical-specific ARARs are health- or risk-based numerical values or methodologies 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. Chemical-specific ARARs for the selected alternatives are presented in detail in Table 13-1 and described in general below, by medium.

13.2.1.1 Soil

Federal

Excavation of soil will generate waste that the Navy will dispose of off site. The Navy has identified specific substantive provisions of the Resource Conservation and Recovery Act (RCRA) (Cal Code Regs. tit. 22 § 66261) as federal ARARs that require the characterization of waste for proper off-site disposal.

For PCB-contaminated soil, the Navy has identified specific substantive provisions of the Toxic Substances Control Act's PCB remediation waste requirements (40 CFR § 761) as federal ARARs.

For soil with residual radiological contamination that may be found following the TCRA, the Navy has identified specific substantive provisions of Nuclear Regulatory Commission standards (10 CFR § 20) and the Uranium Mill Tailings Radiation Control Act (40 CFR § 192) as federal ARARs.

State

The Navy has also identified specific substantive provisions of Cal. Code Regs. tit. 22 and 27 as state ARARs for characterization of waste for proper off-site disposal.

If the Navy determines that excavated soil meets the regulatory definition of any of the following regulated wastes — (1) RCRA hazardous waste, (2) designated waste, or (3) nonhazardous solid waste — the Navy will dispose of the waste off site in classified waste management units and will comply with all legally applicable requirements for proper off-site disposal, such as packaging, labeling, and placarding.

13.2.1.2 Groundwater

Federal

One of the significant issues in identifying ARARs for groundwater is whether the groundwater can be classified as a source of drinking water. The Navy evaluated the potential for groundwater at Parcel B to serve as a drinking water source under the federal classification criteria and further evaluated it based on eight site-specific factors developed in conjunction with EPA and the BCT (ChaduxTt 2007). These site-specific factors were: (1) aquifer thickness; (2) actual measured concentrations of total dissolved solids (TDS); (3) actual groundwater yield; (4) proximity to saltwater and the potential for saltwater intrusion; (5) quality of underlying water-bearing units; (6) existence of institutional controls on well construction or aquifer use; (7) information on current and historical use of the aquifer at HPS or in the community surrounding HPS; and (8) depth to groundwater. Based on this evaluation, the Navy determined that groundwater in the A-aquifer at Parcel B is unsuitable as a potential source of drinking water. The Navy has determined that drinking water standards, such as federal and state primary MCLs and non-zero MCL goals (MCLG), are not chemical-specific ARARs for the A-aquifer. However, the Navy has concluded that the B-aquifer is a potential source of drinking water.

Although it has a low potential for use as a source of drinking water, groundwater in the B-aquifer at Parcel B meets the definition of Class II groundwater and has a municipal or domestic supply designation in the Basin Plan. Therefore, the Navy has identified MCLs and non-zero MCLGs as ARARs for groundwater in the B-aquifer at Parcel B. The Navy has identified specific substantive provisions of the Safe Drinking Water Act (SDWA) (40 CFR § 141) as federal ARARs.

The table below lists the COCs identified for the B-aquifer, the federal MCL (if any), and the federal MCLG (if any). COCs for the B-aquifer were identified based on potential communication between the A- and the B-aquifers (discussed in more detail in Section 5.0). None of these COCs currently exceeds its MCL in the B-aquifer.

Chemical of Concern	Federal MCL	Citation	Federal MCLG	Citation
1,4-Dichlorobenzene	0.075 mg/L	40 CFR § 141.61(a)	0.075 mg/L	40 CFR § 141.50
Benzene	0.005 mg/L	40 CFR § 141.61(a)	Zero	40 CFR § 141.50
Chloroethane	No promulgated MCL	None	No promulgated MCLG	None
Pentachlorophenol	0.001 mg/L	40 CFR § 141.61(c)	Zero	40 CFR § 141.50
Trichloroethene	0.005 mg/L	40 CFR § 141.61(a)	Zero	40 CFR § 141.50
Antimony	0.006 mg/L	40 CFR § 141.62(b)	0.006 mg/L	40 CFR § 141.51
Arsenic	0.010 mg/L	40 CFR § 141.62(b)	Zero	40 CFR § 141.51
Manganese	No promulgated MCL	None	No promulgated MCLG	None
Thallium	0.002 mg/L	40 CFR § 141.62(b)	0.0005 mg/L	40 CFR § 141.51

Notes:

CFR *Code of Federal Regulations*
MCL Maximum contaminant level
MCLG Maximum contaminant level goal
mg/L Milligram per liter

Antimony and thallium are the only COCs for the B-aquifer that have been assigned nonzero MCLGs. The MCLG for antimony is set at a level equal to the MCL. The Navy has determined that the MCLG for antimony is not the relevant and appropriate requirement because it is not more stringent than the MCL. The MCLG for thallium is more stringent than the MCL. Therefore, the Navy determined that the MCLG, and not the MCL, is the relevant and appropriate requirement.

In addition, ambient background concentrations have been established for some inorganic chemicals that are referred to as HGALs. CERCLA and the State of California do not require cleanup to below background conditions. The Navy compared the MCLs for antimony and arsenic, the MCLG for thallium, and the risk-based concentration for manganese with the HGALs. If the HGAL was greater than the MCL, MCLG, or risk-based concentration, the Navy used the HGAL as the basis for the remediation goal for B-aquifer groundwater.

Although the point of compliance for MCLGs and MCLs under the SDWA is at the tap, EPA has determined that, for CERCLA remedies, nonzero MCLGs or MCLs that are selected as ARARs should be obtained throughout the contaminated plume or at and beyond the edge of the waste management area, when waste is left in place (55 Fed. Reg. 8666, 8753 [1990]).

The Navy identified the substantive provisions of the RCRA groundwater protection standards contained in Cal. Code Regs. tit. 22 § 66264.94 as federal, chemical-specific ARARs for groundwater in the A-and B-aquifers. These regulations are applicable to RCRA-regulated units. The CERCLA remedial action for groundwater at Parcel B is not for releases from a RCRA-regulated unit; however, the Navy has determined that these regulations are relevant and appropriate. Cal. Code Regs. tit. 22 § 66264.94(a)(1) and (3) state that for each COC and for each medium monitored, the owner or operator shall propose a concentration limit not to exceed the background concentration or a concentration limit greater than background established for a corrective action program.

Cal. Code Regs. tit. 22 § 66264.94(c) states that a concentration limit greater than the background value can be used only if it is technologically or economically infeasible to achieve the background value and the concentration limit greater than background will not pose a substantial present or potential hazard to human health or the environment. Cal. Code Regs. tit. 22 § 66264.94(d) lists factors to be considered in establishing a concentration limit that is greater than the background value. Cal. Code Regs. tit. 22 § 66264.94(e) states that in no event shall a concentration limit greater than background exceed other applicable statutes or regulations (for example, an MCL) or the lowest concentration demonstrated to be technologically and economically achievable. In general, economic feasibility is an objective balancing of the incremental benefit of attaining further reductions in the concentrations of chemicals of concern with the incremental cost of achieving those reductions. The lowest concentration limit greater than background that is technologically and economically achievable for the A-aquifer is based on unacceptable risk from the vapor intrusion pathway. The lowest concentration limit greater than background that is technologically and economically achievable for the B-aquifer is equivalent to the values that are also MCLs for the B-aquifer.

Installation of groundwater monitoring wells for the groundwater remedy will generate waste that the Navy will dispose of off site. The Navy has identified specific substantive provisions of RCRA (Cal. Code Regs. tit. 22 § 66261) as federal ARARs that require the characterization of waste for proper off-site disposal.

State

Comprehensive Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan)

The Navy accepts the substantive provisions for groundwater in Chapters 2 and 3 of the Basin Plan, including beneficial use, water quality objectives, and waste discharge requirements, as state chemical-specific ARARs. The beneficial uses designated for HPS Parcel B groundwater, except the municipal and domestic supply designation for the A-aquifer, are ARARs. The Navy accepts the substantive provisions of *California Water Code* §§ 13240, 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act as enabling legislation as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan and State Water Resources Control Board (SWRCB) Res. 88-63 as state chemical-specific ARARs, as discussed below.

The Navy has evaluated groundwater according to the state designations contained in Chapter 2 of the Basin Plan. Chapter 2 designates groundwater at HPS with the following existing or potential beneficial uses:

- Municipal or domestic supply
- Industrial process water supply
- Industrial service water supply
- Agricultural supply

There is no existing or potential beneficial use designation of freshwater replenishment to surface water for groundwater at HPS Parcel B. The Water Board has concurred in the Navy's determination that groundwater in the A-aquifer is not a potential source of drinking water (Water Board 2003).

SWRCB Resolution 88-63

The Navy has also identified the substantive provisions of SWRCB Res. 88-63 as state ARARs. Res. 88-63 provides that all groundwater within the State of California is considered suitable or potentially suitable for domestic or municipal freshwater supply except where any one of the following water quality and production criteria cannot be met:

- TDS exceed 3,000 milligrams per liter (mg/L) (or electrical conductivity is greater than 5,000 micromhos per centimeter) and the Water Board does not reasonably expect the groundwater to supply a public supply system.

- Groundwater is contaminated, either by natural processes or by human activity unrelated to a specific pollution incident, and cannot reasonably be treated for domestic use either by best management practices or best economically available treatment practices.

- Groundwater does not provide sufficient water to supply a single well capable of producing an average sustained yield of 200 gallons per day.

SWRCB Res. 88-63 has been incorporated by reference into the Basin Plan. The Navy has determined that the substantive provisions of this policy are applicable state ARARs. The Navy has determined that groundwater in the A-aquifer falls within these exceptions to potential sources of drinking water and cannot be a potential source of drinking water. The Navy considers the B-aquifer to be a potential source of drinking water.

Navy's Position Regarding SWRCB Resolutions 68-16 and 92-49

The Navy recognizes that the key substantive requirements of Cal. Code Regs. tit. 22 § 66264.94 (and the identical requirements of Cal. Code Regs tit. 23 § 2550.4 and § III.G of SWRCB Res. 92-49) require cleanup to background levels of constituents unless such restoration proves to be technologically or economically infeasible and an alternative cleanup level of constituents will not pose a substantial present or potential hazard to human health or the environment. In addition, the Navy recognizes that these provisions are more stringent than corresponding provisions of 40 CFR § 264.94. Although they are federally enforceable via the RCRA program authorization, they are also independently based on state law to the extent that they are more stringent than the federal regulations.

The Navy has determined that SWRCB Res. 68-16 is not a chemical-specific ARAR for determining response action goals. However, SWRCB Res. 68-16 is an action-specific state ARAR for regulating discharged treated groundwater back into the aquifer. The Navy has determined that further migration of already-contaminated groundwater is not a discharge governed by the language in SWRCB Res. 68-16. More specifically, the language of SWRCB Res. 68-16 indicates that it is prospective in intent, applying to new discharges to maintain existing high-quality waters. It is not intended to apply to restoration of waters that are already degraded.

The Navy's position is that SWRCB Res. 68-16 and 92-49 and Cal. Code Regs. tit. 23 § 2550.4 do not constitute chemical-specific ARARs for this response action because they are state requirements and are not more stringent than federal ARAR provisions of Cal. Code Regs. tit. 22 § 66264.94. The NCP set forth in 40 CFR § 300.400(g)(4) provides that only state standards more stringent than federal standards may be state ARARs (see also CERCLA § 121(d)(2)(A)(ii) [42 U.S.C. § 9621(d)(2)(A)(ii)]).

The substantive technical standard in the equivalent state requirements (Cal. Code Regs. tit. 23, Division [div.] 3, Chapter [ch.] 15 and SWRCB Res. 92-49 and 68-16) is identical to the substantive technical standard in Cal. Code Regs. tit. 22 § 66264.94. This section of Cal. Code Regs. tit. 22 will likely be applied in a manner consistent with equivalent provisions of other regulations, including SWRCB Res. 92-49 and 68-16.

State of California's Position Regarding SWRCB Resolutions 68-16 and 92-49

The State of California does not agree with the Navy's determination that SWRCB Res. 92-49 and 68-16 and certain provisions Cal. Code Regs. tit. 23, div. 3, ch. 15 are not ARARs for this response action. SWRCB has interpreted the term "discharges" in the *California Water Code* to include the movement of waste from soils to groundwater and from contaminated to uncontaminated water (SWRCB 1994). However, the state agrees that the proposed action would comply with SWRCB Res. 92-49 and 68-16, and compliance with the Cal. Code Regs. tit. 22 provisions should result in compliance with the Cal. Code Regs. tit. 23 provisions. The state does not intend to dispute the amended ROD, but reserves its rights if implementation of the provisions at Cal. Code Regs. tit. 22 is not as stringent as state implementation of the provisions at Cal. Code Regs. tit. 23. Because Cal. Code Regs. tit. 22 regulation is part of the state's authorized hazardous waste control program, it is also the state's position that Cal. Code Regs. tit. 22, § 66264.94 is a state ARAR and not a federal ARAR (*United States v. State of Colorado*, 990 F.2d 1565 [1993]).

Whereas the Navy and the State of California have not agreed on whether SWRCB Res. 92-49 and 68-16 and Cal. Code Regs. tit. 23 § 2550.4 are ARARs for this response action, this amended ROD documents each of the parties' positions on the resolutions but does not attempt to resolve the issue.

Waste Characterization

The Navy has also identified specific substantive provisions of Cal. Code Regs. tit. 22 and 27 as state ARARs for the characterization of waste (from construction of groundwater monitoring wells) for proper off-site disposal.

If the Navy determines that excavated soil meets the regulatory definition of any of the following regulated wastes — (1) RCRA hazardous waste, (2) designated waste, or (3) nonhazardous solid waste — the Navy will dispose of the waste off site in classified waste management units and will comply with all legally applicable requirements for proper off-site disposal, such as packaging, labeling, and placarding.

13.2.1.3 Surface Water

Federal

EPA promulgated a rule on May 18, 2000, to fill a gap in California water quality standards that was created in 1994 when a state court overturned the state's water quality control plans that contained water quality criteria for priority toxic pollutants. The rule is commonly called the California Toxics Rule (CTR). The rule is codified at 40 CFR § 131.38. These federal criteria are legally applicable in the State of California for inland surface waters and enclosed bays and estuaries for all purposes and programs under the Clean Water Act. The water quality standards at 40 CFR § 131.38 are applicable federal ARARs for the bay. The Navy has identified the substantive provisions of the CTR as ARARs because these standards are better suited to HPS Parcel B than are the national standards. The CTR standards will be applied at the interface of

the A-aquifer and the bay for those chemicals that do not have standards promulgated in Table 3-3 of the Basin Plan. In addition, ambient concentrations have been established as HGALs for some inorganic chemicals. CERCLA and the State of California do not require cleanup to below background conditions. The Navy will compare the CTR standards with these established HGALs, and if the HGAL is greater than the CTR standard, the Navy will meet the HGAL at the interface of the A-aquifer groundwater and the bay.

On December 22, 1992, EPA promulgated federal water quality standards under the authority of the federal Clean Water Act § 303(c)(2)(B), 33 U.S.C. ch. 26, § 1313(c)(2)(B), to establish water quality standards required by the Clean Water Act where the State of California and other states had failed to do so (57 Fed. Reg. 60848 [1992]). These standards have been amended over the years in the *Federal Register* including amendments of the National Toxics Rule (60 Fed. Reg. 22228 [1995]). These water quality standards, as amended, are codified at 40 CFR § 131.36**.** The Navy has determined that these are not ARARs for the bay because there are better-suited standards promulgated in Table 3-3 of the Basin Plan and the CTR. Additional and revised water quality standards for salinity for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary were codified at 40 CFR § 131.37.

For the B-aquifer groundwater, the Navy has identified federal MCLs as ARARs, as discussed above in Section 13.2.1.2. These ARARs also would be protective of the discharge of B-aquifer groundwater to the bay; therefore, CWA §§ 304 and 303 surface water criteria are not identified as ARARs for the interface of the B-aquifer groundwater and the bay.

State

Basin Plan

In Chapter 3, Table 3-3, of the Basin Plan, the Water Board established water quality objectives (WQO) for chemicals in surface water with salinities equal to or greater than 10 parts per thousand (ppt) 95 percent of the time, many of them based on the CTR. These WQOs apply to all marine waters within the region, except for the South Bay, south of the Dumbarton Bridge. These WQOs apply to the bay, which meets the salinity threshold. These WQOs were identified by the Water Board as applicable state ARARs. The Navy has accepted Table 3-3 of the Basin Plan as a state ARAR for the bay because it is a state promulgation for the specific pollutants and the water body (the bay) at HPS Parcel B. The Navy will meet the WQOs promulgated in Table 3-3 of the Basin Plan in the bay, at the interface of the A-aquifer and the bay unless that standard is lower than an established HGAL. If the WQOs promulgated in Table 3-3 of the Basin Plan are lower than an established HGAL, then, because CERCLA and the State of California do not require cleanup to below background conditions, the Navy will meet the HGAL. For chemicals that do not have a WQO promulgated in Table 3-3 of the Basin Plan, the Navy will comply with the standards promulgated in the CTR.

13.2.1.4 Air

Federal

The Navy identified specific substantive provisions of the Clean Air Act (40 CFR Part 61) as federal ARARs for air for the duration of active remediation to address airborne emissions and fugitive dust from radionuclides.

13.2.2 Location-Specific ARARs

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. Location-specific ARARs are presented in detail in Table 13-2 and are discussed, in general, below.

Federal

The substantive provisions of the following requirements are federal location-specific ARARs.

- Coastal Zone Management Act at 16 U.S.C. § 1456(c)(1)(A) and 15 CFR § 930 requiring activities that affect the coastal zone be conducted in a manner consistent with approved state management programs, including the San Francisco Bay Plan (Bay Plan)(see state location-specific ARARs below).

- Executive Order 11990, Protection of Wetlands at 40 CFR § 6.302(a) and 40 CFR Part 6, Appendix A § 6(a)(1), (3), and (5) (at the end of § 6.1007) requiring that federal agencies minimize the destruction, loss, or degradation of wetlands; preserve and enhance the natural and beneficial value of wetlands; and avoid support of new construction in wetlands if a practicable alternative exists.

- National Historic Preservation Act of 1966, as amended, at 16 U.S.C. § 470-470x-6, its implementing regulations at 36 CFR Part 800, and 40 CFR § 6.301(b) requiring the federal government to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.

The Coastal Zone Management Act (16 U.S.C. §§ 1451-1464) specifically excludes federal lands from the coastal zone (16 U.S.C. § 1453[1]). Therefore, the Coastal Zone Management Act is not applicable to HPS Parcel B. The Coastal Zone Management Act will be evaluated as a relevant and appropriate requirement. Section 1456(c)(1)(A) requires each federal agency activity within or outside the coastal zone that affects any land or water use or natural resource to conduct its activities in a manner that is consistent to the maximum extent practicable with enforceable policies of approved state management policies. A state coastal zone management program is developed under state law guided by the Coastal Zone Management Act and its accompanying implementing regulations in 15 CFR Part 930. A state program sets forth objectives, policies, and standards to guide public and private uses of lands and water in the coastal zone.

Executive Order 11990 is an ARAR because construction of the shoreline revetment will result in filling of a small wetland area (1,300 ft^2).

The National Historic Preservation Act is an ARAR because the Navy has concluded that Building 140 at Parcel B is eligible for inclusion on the National Register of Historic Places. The selected remedy will not adversely affect this building. Pursuant to §§ 106 and 110(f) of the National Historic Preservation Act (Title 16 USC §§ 470–470x-6, and its implementing regulations [36 CFR Part 800]), as amended, CERCLA remedial actions are required to take into account the effects of remedial activities on any historic properties included on or eligible for inclusion on the National Register of Historic Places (National Register). The National Register is a list of districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. Section 110(f) of the National Historic Preservation Act of 1966, as amended, requires that before approval of any federal undertaking that may directly and adversely affect any National Historic Landmark, the head of the responsible federal agency will, to the maximum extent possible, undertake planning and actions as may be necessary to minimize harm to the landmark, and will afford the advisory council a reasonable opportunity to comment on the undertaking.

The Navy is addressing and will continue to address these substantive requirements of 36 CFR Part 800 in the CERCLA process in lieu of the procedural requirements set forth in 36 CFR Part 800. More specifically, the Navy will focus the CERCLA process by actively seeking the expertise and comments of the State Historic Preservation Office (SHPO), Advisory Council on Historic Preservation (ACHP), and other interested parties to ensure the substantive requirements of the National Historic Preservation Act and 36 CFR Part 800 are being adequately addressed.

These entities were provided with the opportunity to review and comment on the Navy's findings on the Hunters Point Commercial Dry Docks Historical District and Building 140 in the Proposed Plan for Parcel B. No comments were received during the comment period. The Navy will also be available to meet and discuss alternatives, any adverse effects, and historic mitigation, with SHPO, ACHP, and stakeholders through open house presentations as well as through comments on this amended ROD.

State

The Navy has also identified specific substantive provisions of the McAteer-Petris Act (California Government Code §§ 66600 through 66661) authorizing the Bay Plan as state location-specific ARARs.

The San Francisco Bay Conservation and Development Commission (BCDC) administers the Coastal Zone Management Act within the bay. California's approved coastal management program includes the Bay Plan developed by the BCDC. The BCDC was formed under the authority of the McAteer-Petris Act, *California Government Code* § 66600 *et seq*., which authorizes the BCDC to regulate activities within San Francisco Bay and its shoreline (including 100 feet landward from the shoreline) in conformity with the policies of the Bay Plan. The McAteer-Petris Act and the Bay Plan were developed primarily to halt uncontrolled development and filling of the bay. Their broad goals include reducing bay fill and disposal of dredged

material in the bay, maintaining marshes and mudflats to the fullest extent possible to conserve wildlife and abate pollution, and protecting the beneficial uses of the bay. The federal Coastal Zone Management Act, which requires compliance with approved state coastal zone management program, is a federal ARAR. Therefore, the substantive provisions of the McAteer-Petris Act and the Bay Plan are state ARARs for Parcel B.

Nonfederal entities must obtain a BCDC permit before placing fill material in the bay. The permit requirements are not ARARs for the Navy, but the Navy needs to comply with the substantive provisions of the McAteer-Petris Act and the Bay Plan. For example, the McAteer-Petris Act states that filling of the bay should be authorized only when (1) public benefits from fill clearly exceed public detriment from the loss of the water areas, and (2) no alternative upland location is available. When fill is authorized, the water area to be filled should be the minimum necessary to achieve the purpose of the fill project, the fill should minimize harmful effects to the bay area, and the fill project must be constructed in accordance with sound safety standards.

All of the selected remedial alternatives can be implemented in a manner consistent with the goals and substantive requirements of the McAteer-Petris Act and the Bay Plan.

13.2.3 Action-Specific ARARs

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. Action-specific ARARs for components of the selected remedy are summarized below and discussed in detail in Table 13-3. No action-specific ARARs are associated with components of the remedy related to radiologically impacted soil and structures.

13.2.3.1 Soil Remedy

Excavation and Off-Site Disposal

The Navy has identified specific substantive provisions of RCRA (Cal. Code Regs. tit. 22 and 40 CFR § 264), the Clean Water Act (40 CFR § 122), and the Clean Air Act (Bay Area Air Quality Management District [BAAQMD] Regulation 6-302) as federal action-specific ARARs for excavation and off-site disposal.

Stormwater discharge requirements under the Clean Water Act require the use of best management practices to control or abate the discharge of pollutants when authorized under Clean Water Act § 402(p) to control storm water discharges. Under the Clean Water Act and its implementing regulations, individual National Pollutant Discharge Elimination System permits, or coverage under promulgated storm water general permits, are required for construction that disturbs at least 1 acre. The State of California has promulgated a storm water general permit as Order No. 99-08-DWQ. Under CERCLA § 121(e)(1), no federal, state, or local permit is required for any remedial action conducted entirely on site, where it is selected and carried out in compliance with CERCLA § 121. The Navy is therefore not required to obtain an individual storm water permit or submit a notice of intent to discharge under the state's general permit. The Navy will, however, use the substantive requirements of

the state's general permit for storm water discharges as to-be-considered standards for complying with the requirement to apply best management practices for storm water discharges promulgated at 40 CFR § 122.44(k)(2) and (4).

Any hazardous substance, pollutant, or contaminant that is shipped off site as a result of the implementation of this alternative will be shipped to a facility in compliance with 42 U.S.C. § 9621(d)(3) and EPA's off-site rule at 40 CFR § 300.440.

The Navy has identified specific substantive provisions of Cal. Code Regs. tit. 27 as state action-specific ARARs for excavation and off-site disposal.

In addition, specific substantive provisions of Cal. Code Regs. tit. 17, § 93105 are ARARs for control of airborne asbestos during construction, grading, and excavation. These regulations also require that when the project is complete, the disturbed surfaces in areas of naturally occurring asbestos must be stabilized using one or more of the following methods:

- A vegetative cover
- Placement of at least 3 inches of non-asbestos-containing material
- Paving
- Any other measure deemed sufficient to prevent wind speeds of 10 miles per hour or greater from causing visible dust emissions

The soil excavations will be covered with a non-asbestos-containing soil cover or paving that will comply with this ARAR.

Constructing the Shoreline Revetment and Covers for Soil

The Navy has identified specific substantive provisions of Cal. Code Regs. tit. 22, the Clean Water Act (40 CFR § 122), and the Clean Air Act (BAAQMD Regulation 6-302) as federal action-specific ARARs for construction of the shoreline revetment and for construction of a soil, asphalt, or concrete cover for the soil.

The Navy has identified specific substantive provisions of Cal. Code Regs. tit. 17 and 27 as state action-specific ARARs for construction of the shoreline revetment and for construction of a soil, asphalt, or concrete cover for the soil.

Construction of a Shoreline Revetment (Only)

The Navy has identified specific substantive provisions of RCRA temporary tank requirements (Cal. Code Regs. tit. 22, § 66264) as federal action-specific ARARs that apply only to construction of the shoreline revetment.

These requirements are applicable for dredged material that meets the definition of RCRA hazardous waste or non-RCRA, state regulated hazardous waste. The dredged material may meet the definition of a non-RCRA, state regulated hazardous waste if it contains a total threshold limit concentration wet weight of PCBs greater than or equal to 50 mg/kg as defined in Cal. Code Regs. tit. 22, § 66261.24(a)(2)(B). These requirements are relevant and appropriate requirements for dredged material that does not meet the definition of RCRA hazardous waste or non-RCRA, state regulated hazardous waste. Complying with these RCRA ARARs would also be protective for any PCB contamination in the dredged sediment.

Construction of the shoreline revetment also would result in filling in a wetland, approximately 1,300 square feet in size. The discharge of fill material into the waters of the United States is regulated under Clean Water Act § 404; therefore, the Navy has identified Clean Water Act § 404 as a federal action-specific ARAR. Section 404 of the Clean Water Act of 1977 governs the discharge of dredged and fill material into waters of the United States, including adjacent wetlands. Wetlands are areas that are inundated by water frequently enough to support vegetation typically adapted for life in saturated soil. Wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mudflats, natural ponds, and similar areas. Both EPA and the U.S. Army Corps of Engineers have jurisdiction over wetlands. EPA's § 404 guidelines are promulgated in 40 CFR § 230, and the U.S. Army Corps of Engineer's guidelines are promulgated in 33 CFR § 320.

Construction of the shoreline revetment will not result in the discharge of dredged material into the wetland or the bay. Pursuant to 33 CFR § 323.2(d)(2), earth moving in waters of the United States does not constitute discharge of dredged material if project-specific evidence shows that the activity results only in incidental fallback. Title 33 CFR § 323.2(d) defines incidental fallback as the redeposit of small volumes of dredged material that is incidental to excavation in waters of the United States when the material falls back to substantially the same place as the initial removal. Dredging the sediment around the bay at Parcel B is necessary for construction of the shoreline revetment; however, the Navy would remove the sediment for off-site disposal, and only incidental fallback of the dredged material would result.

Construction of the shoreline revetment will result in the discharge of fill material into the wetland and the bay. Pursuant to 33 CFR § 323.2(e), fill material is defined as any material placed in waters of the United States where the material has the effect of replacing any portion of a water of the United States with dry land. Construction of the shoreline revetment would result in the complete filling in of the wetland, the loss of which will be replaced by the Navy. The Navy has identified specific substantive provisions contained in titles 33 and 40 of the Code of Federal Regulations as ARARs for the discharge of fill material.

The Navy will discharge fill material into the wetland in a manner consistent with Nationwide General Permit 38 (Cleanup of Hazardous and Toxic Waste) available under the U.S. Army Corps of Engineers Nationwide Permit program at 33 CFR § 330. Nationwide Permit 38 is contained in 67 Fed. Reg. 2020, Appendix B. The Navy is not required to first obtain authorization from the U.S. Army Corps of Engineers, either through an individual permit or by filing a notice of intent to discharge under a general permit because CERCLA § 121(e) does not require permits for remedial actions conducted entirely on site. Instead, the Navy will comply

with the substantive provisions of the Nationwide Permit 38, including general conditions contained in 67 Fed. Reg. 2020, Appendix C as a means of complying with § 404 of the Clean Water Act and its implementing regulations (33 U.S.C. § 1344, 40 CFR § 230 and 33 CFR §§ 320 and 323) identified above as ARARs. These conditions include requirements to delineate the wetland, discharge suitable material, and mitigate the loss of the wetland by creating a new wetland that provides a functional replacement for the wetland loss. The Navy will mitigate the loss of the wetland using one of the following methods: compensatory mitigation, mitigation banking, or an in-lieu fee arrangement. The final details of the plan for wetland mitigation will be included in the remedial design.

Soil Vapor Extraction

The Navy has identified specific substantive provisions of BAAQMD regulations as federal ARARs.

Institutional Controls

The Navy has identified specific substantive provisions of California Civil Code, California Health and Safety Code, and Cal. Code Regs. tit. 22, as state ARARs for implementing institutional controls and entering into a Covenant to Restrict Use of Property with DTSC.

- California Civil Code Land Use Controls § 1471
- California Health and Safety Code Land Use Controls §§ 25202.5, 25222.1, 25232(b)(1)(A)-(E), 25233(c), 25234, and 25355.5(a)(1)(C)
- Cal. Code Regs. tit. 22, § 67391.1

The substantive provisions of California Civil Code § 1471 are the following general narrative standard: "… to do or refrain from doing some act on his or her own land … where…: (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety of the environment as a result of the presence on the land of hazardous materials, as defined in § 25260 of the Health and Safety Code." This narrative standard would be implemented through incorporation of restrictive environmental covenants in the deed at the time of transfer. These covenants would be recorded with the Covenant to Restrict Use of Property and run with the land.

The substantive provision of California Health and Safety Code § 25202.5 is the general narrative standard to restrict "present and future uses of all or part of the land on which the … facility … is located …." This substantive provision would be implemented by incorporation of restrictive environmental covenants in the Covenant to Restrict Use of Property at the time of transfer for purposes of protecting present and future public health and safety.

California Health and Safety Code §§ 25222.1 and 25355.5(a)(1)(C) provide the authority for the state to enter into voluntary agreements to establish land use covenants with the owner of property. The substantive requirements of the following California Health and Safety Code § 25222.1 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 California Health and 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."

The Navy would comply with the substantive requirements of California Health and Safety Code §§ 25222.1 and 25355.5(a)(1)(C) by incorporating CERCLA use restrictions into the Navy's deed of conveyance in the form of restrictive covenants under the authority of California Civil Code § 1471. The substantive provisions of California Health and Safety Code §§ 25222.1 and 25355.5(a)(1)(C) may be interpreted in a manner that is consistent with the substantive provisions of California Civil Code § 1471. The covenants would be recorded with the deed and run with the land.

Actual land-use restriction requirements are set forth in California Health and Safety Code § 25232(b)(1)(A)–(E). These include prohibitions on construction of residences, hospitals for humans, schools for persons under 21 years of age, day care centers, or any permanently occupied human habitation on hazardous waste property. California Health and Safety Code § 25233(c) sets forth relevant and appropriate substantive criteria for granting variances from prohibited uses set forth in California Health and Safety Code § 25232(b) (that is, a residence used for permanently occupied human habitation, a hospital for humans, a school for persons under 21 years of age, a day care center for children, and any permanently occupied human habitation) based upon specified environmental and health criteria.

California Health and Safety Code § 25234 sets forth the following relevant and appropriate substantive criteria for the removal of a land use restriction on the grounds that "… the waste no longer creates a significant existing or potential hazard to present or future public health or safety."

In addition to being implemented through the Covenant to Restrict Use of Property between the Navy and DTSC, the relevant and appropriate portions of California Health and Safety Code §§ 25202.5, 25222.1, 25232(b)(1)(A)-(E), 25233(c), 25234, and 25355.5(a)(1)(C) and California Civil Code § 1471 would also be implemented through the deed between the Navy and the transferee.

DTSC promulgated a regulation on April 19, 2003, regarding "Requirements for Land-Use Covenants" at Cal. Code Regs., tit. 22, § 67391.1. 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 state statutes and regulations referenced in this section are ARARs. EPA specifically considers §§ (a), (b), (d), and (e) of Cal. Code Regs., tit. 22 § 67391.1, to be ARARs for this amended ROD. DTSC's position is that all of the state statutes and regulations referenced in this section are ARARs.

13.2.3.2 Groundwater Remedy

Groundwater Monitoring

The Navy has identified specific substantive provisions of Cal. Code Regs. tit. 22 as federal ARARs for groundwater monitoring.

Any hazardous substance, pollutant, or contaminant that is shipped off site as a result of the implementation of this alternative will be shipped to a facility in compliance with 42 U.S.C. § 9621(d)(3) and EPA's off-site rule at 40 CFR § 300.440.

The Navy has identified specific substantive provisions of Cal. Code Regs. tit. 27 as state ARARs for groundwater monitoring.

In Situ Treatment

Under the selected remedy, the Navy will inject substrates into groundwater to actively treat contaminants where concentrations are highest.

The Navy has identified specific substantive provisions of the Underground Injection Control Program of the Safe Drinking Water Act as action-specific ARARs.

Chemicals (either a biological amendment or organo-sulfur compound) would be injected into the groundwater through a Class V injection well. Class V injection wells are authorized by rule under 40 CFR § 144.24(a), so a specific permit is not required. Basic information about the Class V well is required under 40 CFR § 144.83. The requirement to compile and submit this basic information is procedural and, therefore, cannot be an ARAR; however, the Navy will use the basic information requirements at 40 CFR § 144.83 as TBCs for complying with the substantive requirement of the federal ARAR at 40 CFR § 144.12(a).

Institutional Controls

The Navy has identified specific substantive provisions of California Civil Code, California Health and Safety Code, and Cal. Code Regs. tit. 22 as state ARARs for implementing institutional controls and entering into a Covenant to Restrict Use of Property with DTSC.

These ARARs related to implementing institutional controls are described in detail as part of the discussion of the soil remedy in Section 13.2.3.1.

13.3 COST-EFFECTIVENESS

The Navy has concluded that the selected alternatives would provide overall effectiveness in proportional to their costs; thus, they are considered cost effective. All of the technologies included in the selected remedy are readily implementable and have been widely used and demonstrated to be effective. The costs are proportional to overall effectiveness by achieving long-term effectiveness and permanence within a reasonable timeframe.

13.4 USE OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

The Navy has determined that the amended selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner for Parcel B. Of all the alternatives that are protective of human health and the environment and comply with ARARs, the Navy has concluded that the amended selected remedy for soil, groundwater, and radiologically impacted soil and structures would provide the best balance of tradeoffs among short-term effectiveness, long-term effectiveness and permanence, implementability, and cost. The amended selected remedy is expected to be permanent and effective over the long-term land use. The nature and distribution of the COCs in soil, especially metals and radionuclides, do not allow treatment to be an effective remedy. Excavation and disposal as well as covers (that are regularly inspected and maintained) will provide long-term effectives.

13.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The amended selected remedy for soil satisfies the statutory preference for treatment as a principal element of the remedy to the maximum extent practicable. The SVE component of the remedy for soil will provide treatment of VOCs to reduce the toxicity, mobility, or volume of contaminants through treatment. Treatment is not practicable for the other COCs in soil, especially metals and radionuclides.

The amended selected remedy for groundwater satisfies the statutory preference for treatment as a principal element of the remedy. The in situ treatment component of the remedy for groundwater will reduce the toxicity, mobility, or volume of contaminants as a principal element.

The selected remedy for radiologically impacted soil and structures does not satisfy the statutory preference for treatment as a principal element of the remedy. The remedy for radiologically impacted soil and structures will not reduce the toxicity, mobility, or volume of contaminants through treatment. Treatment is not practicable for radionuclides on structures or in soil.

13.6 5-YEAR REVIEW REQUIREMENTS

A 5-year review pursuant to CERCLA § 121 and the NCP is required if the selected remedy results in hazardous waste or chemicals remaining at the site above levels allowing for unrestricted use of the site. Because contaminants will remain on site which will preclude unrestricted use, a statutory review will be conducted every 5 years until institutional controls are no longer necessary or the site is suitable for unrestricted use. Statutory 5-year reviews are in progress for remedial actions at Hunters Point Shipyard, including Parcel B, based on the original remedial actions started in 1998. The first 5-year review was completed in 2003, the second 5-year review is in progress and will be completed in 2008, and the next 5-year review is scheduled for 2013.

TABLES

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
GROUNDWATER				
FEDERAL				
Safe Drinking Water Act (42 U.S.C., ch. 6A, § 300[f]–300[j]-26)[b]				
National primary drinking water standards are health-based standards for public water systems (MCLs).	Public water system.	40 CFR § 141.61(a) and (c)	Relevant and appropriate	The Navy considers the B-aquifer a Class II aquifer under federal criteria and a potential source of drinking water based on an evaluation of site-specific factors. The Navy has determined that the A-aquifer is not a potential source of drinking water; therefore, drinking water standards (MCLs) are not ARARs.
MCLGs pertain to known or anticipated adverse health effects (also known as recommended MCLs).	Public water system.	40 CFR § 141.51	Relevant and appropriate	The Navy considers the B-aquifer a Class II aquifer under federal criteria and a potential source of drinking water based on an evaluation of site-specific factors. The Navy has identified the non-zero MCLG for thallium as a potential chemical-specific ARAR for the B-aquifer. The Navy has determined that the A-aquifer is not a potential source of drinking water; therefore, drinking water standards (MCLs and non-zero MCLGs) are not ARARs.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
GROUNDWATER (Continued)				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[b]				
Groundwater protection standards: owners/operators of RCRA treatment, storage, or disposal facilities must comply with conditions in this section that are designed to ensure that hazardous constituents entering the groundwater from a regulated unit do not exceed the concentration limits for contaminants of concern set forth under Cal. Code Regs. tit. 22, § 66264.94 in the uppermost aquifer underlying the waste management area of concern at the POC.	A regulated unit that receives or has received hazardous waste before July 26, 1982, or regulated units that ceased receiving hazardous waste prior to July 26, 1982, where constituents in or derived from the waste may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.94(a)(1), (a)(3), (c), (d), and (e)	Relevant and appropriate	There is no RCRA-regulated unit at HPS Parcel B; therefore, these standards are not applicable. These standards are relevant and appropriate for the A- and B-aquifers. The Navy will develop site-specific concentration limits for use in its groundwater monitoring program for the A-aquifer. MCLs are the lowest concentrations technically and economically feasible for groundwater in the B-aquifer.
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	These requirements are ARARs for all waste generated by the Navy in constructing monitoring wells. The Navy would determine if the waste is RCRA hazardous at the time it is generated.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
GROUNDWATER (Continued)				
STATE				
State and Regional Water Quality Control Boards[b]				
Authorizes the SWRCB and Water Board 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, §§ 13240, 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Water Quality Control Act)	Applicable	The Navy accepts the substantive provisions of §§ 13240, 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 Region as ARARs.
Describes the water basins in the San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes WQOs, including narrative and numerical standards, and incorporates statewide water quality control plans and policies.	Waters of the state.	Chapters 2 and 3 of the Water Quality Control Plan for the San Francisco Bay Basin (Cal. Water Code §13240), Except the MUN designation for the A-aquifer	Applicable	Substantive requirements pertaining to beneficial uses, WQOs, and certain statewide water quality control policies are state ARARs for the groundwater components of this response action.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
GROUNDWATER (Continued)				
STATE				
State and Regional Water Quality Control Boards[b]				
Incorporated into all Water 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 reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	Waters of the state.	SWRCB Res. 88-63	Applicable	Pursuant to SWRCB Res. 88-63, groundwater in the A and B-aquifers is not a potential source of drinking water. The Navy will consider groundwater in the B-aquifer a potential source of drinking water under federal criteria and site-specific factors.
California Environmental Protection Agency, Department of Toxic Substances Control[b]				
Definition of "non-RCRA hazardous waste."	Waste.	Cal. Code Regs. tit. 22, § 66261.22(a)(3) and (4), § 66261.24(a)(2)–(a)(8), § 66261.101, § 66261.3(a)(2)(C) or § 66261.3(a)(2)(F)	Applicable	These requirements are ARARs for all waste the Navy generates in constructing monitoring wells. The Navy would determine if the waste is non-RCRA hazardous waste when it is generated.
Definitions of designated and nonhazardous waste.	Waste.	Cal. Code Regs. tit. 27, §§ 20210 and 20220	Applicable	These requirements are ARARs for all waste the Navy generates in constructing monitoring wells. The Navy would determine if the waste is non-RCRA hazardous waste when it is generated.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
SURFACE WATER				
FEDERAL				
Clean Water Act (Title 33 U.S.C., Chapter 26, §§ 1251-1387)[b]				
Surface water quality standards.	Discharge to waters of the United States.	40 CFR § 131.38	Applicable	These standards, known as the CTR, are applicable surface water ARARs for the bay. The Navy has identified the CTR as ARARs for surface waters surrounding HPS Parcel B because contaminated groundwater may discharge to the bay. The Navy will meet the CTR ARARs at the interface of the A-aquifer groundwater and the bay for contaminants in the groundwater that do not have a promulgated concentration in Table 3-3 of the Basin Plan, identified as state chemical-specific ARARs.
SURFACE WATER				
STATE				
State and Regional Water Quality Control Boards[b]				
Surface water quality standards.	Marine waters with salinities equal to or greater than 10 ppt 95 percent of the time.	Basin Plan Table 3-3	Applicable	These standards are potentially applicable to the bay. The Navy has identified Table 3-3 as ARARs for HPS Parcel B because contaminated groundwater may discharge to the bay. The Navy will meet the Table 3-3 ARARs at the interface of the A-aquifer groundwater and the bay.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
SOIL				
FEDERAL				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[b]				
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	These requirements are ARARs for all waste generated by the Navy in implementing the soil remedy. The Navy would determine if the waste is RCRA hazardous at the time it is generated.
Toxic Substances Control Act (15 U.S.C., ch. 53, §§ 2601–2692)[b]				
Regulates storage and disposal of PCB remediation waste. There are three options: (a) self-implementing on-site cleanup and disposal; (b) performance-based disposal using existing approved disposal technologies; and (c) risk-based disposal.	Soils, debris, sludge, or dredged materials contaminated with PCBs at concentrations greater than 50 mg/kg.	40 CFR § 761.61(c)	Applicable and relevant and appropriate	This requirement is applicable for soil containing PCB concentrations equal to or greater than 50 mg/kg. This requirement is relevant and appropriate for soil containing PCB concentrations less than 50 mg/kg. A measured concentration of 50 mg/kg has been documented near the shoreline at IR-07.
Uranium Mill Tailings Radiation Control Act (42 U.S.C., ch. 88, §§ 192.12(a),(b), 192.42)[b]				
Standards for cleanup of land and buildings contaminated with 226radium, 228radium, and thorium from inactive uranium processing sites. As a result of residual radioactive materials from any designated processing site: (a) The concentration of 226radium in land averaged over any area of 100 square meters shall not exceed the background level by more than: (1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and (2) 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface.	UMTRCA sites	40 CFR § 192.12(a),192.32(b)(2) and 192.41	Relevant and appropriate	Not applicable because Parcel B is not an UMTRCA site but is relevant and appropriate for sites with soil contaminated with radioactive waste. The surface and subsurface concentration of 5 pCi/g is relevant and appropriate only for an unrestricted land-use scenario. Not an ARAR for IR-07, IR-18, or the deep pump shaft beneath Building 140.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
SOIL (Continued)				
FEDERAL				
Uranium Mill Tailings Radiation Control Act (42 U.S.C., ch. 88, §§ 192.12(a),(b), 192.42)[b]				
In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Provisions applicable to 222radon shall also apply to 220radon.	UMTRCA sites	40 CFR § 192.12(b)(1) and §192.41(b)	Relevant and appropriate	Not applicable because Parcel B is not an UMTRCA site. Relevant and appropriate because the alternatives will result in excavation of radioactive material with radioactive contamination that may produce this level of dose.
Concentration limits for cleanup of gamma radiation in buildings at inactive uranium processing sites designated for remedial action. In any occupied or habitable building, the level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.	UMTRCA sites	40 CFR § 192.12(b)(2)	Relevant and appropriate	Not applicable because Parcel B is not an UMTRCA site. An ARAR since the alternatives will leave a building with radioactive contamination at the remedial action objective level.
Radiological Criteria for License Termination				
Requires that the TEDE to individual members of the public not exceed 0.1 rem from licensed operation: construction, operation, and decommissioning of commercial reactors and fuel cycle facilities; possession, use, processing, exporting, and certain aspects of transporting nuclear materials and waste; and siting, design, construction, operations, and closure of waste disposal sites.	Existing NRC-licensed site.	10 CFR § 20.1301	Relevant and appropriate	Not applicable because Parcel B is not an NRC regulated site. This requirement is relevant and appropriate for sites where radioactive waste will remain on-site.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
SOIL (Continued)				
FEDERAL				
Radiological Criteria for License Termination				
A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in TEDE to an average member of the critical group that does not exceed 25 mrem/y, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to ALARA.	Existing NRC-licensed radiologically contaminated site	10 CFR § 20.1402	Relevant and appropriate	This ARAR is relevant and appropriate for an unrestricted land use scenario. Not an ARAR for IR-07, IR-18, or the deep pump shaft beneath Building 140. U.S. EPA does not believe this NRC regulation is protective of human health and the environment, and the HPS cleanup goals are more protective. This regulation is an ARAR only for radiologically impacted sites that are undergoing TCRAs and any additional remedial action required for those sites. It is not an ARAR for radiologically impacted portions of IR Sites 7 and 18 and Building 140 that will be transferred with engineering and institutional controls for radiological contaminants.
Performance objectives for the land disposal of LLRW. Concentrations of radioactive material that may be released into the general environment must not result in an annual dose exceeding 25 mrem to the body or any organ of a member of the general public.	Existing NRC-licensed LLRW disposal site	10 CFR § 61.41	Relevant and appropriate	This ARAR is relevant and appropriate for a restricted land use scenario when radioactive waste remains on site.
STATE				
California Environmental Protection Agency, Department of Toxic Substances Control[b]				
Definition of "non-RCRA hazardous waste."	Waste.	Cal. Code Regs. tit. 22, § 66261.22(a)(3) and (4), § 66261.24(a)(2)–(a)(8), § 66261.101, § 66261.3(a)(2)(C) or § 66261.3(a)(2)(F)	Applicable	These requirements are ARARs for all waste the Navy generates in implementing various alternatives. The Navy would determine if the waste is non-RCRA hazardous waste when it is generated.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
SOIL (Continued)				
State and Regional Water Quality Control Boards[b]				
Definitions of designated and nonhazardous waste.	Waste.	Cal. Code Regs. tit. 27, §§ 20210 and 20220	Applicable	These requirements are ARARs for all waste generated by the Navy in implementing various alternatives. The Navy would determine if the waste is designated or nonhazardous waste when it is generated.
AIR				
FEDERAL				
NESHAPs under Clean Air Act that Apply to Radionuclides				
Emissions of radionuclides into the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/y.	Facility owned or operated by the Department of Energy that emits any radionuclide other than 222radon and 220radon into the air	40 CFR Part 61 Subpart H, § 61.92	Relevant and appropriate	Not applicable because Parcel B is not a Department of Energy site but may be relevant and appropriate if there is the potential for airborne emissions of radionuclides other than radon. Only an ARAR until cleanup action is completed. Not an ARAR for residual contamination after cleanup.
Emissions of radionuclides, including iodine, into the ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/y. Emissions of iodine into the ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 3 mrem/y.	Facilities owned or operated by any federal agency other than the Department of Energy and not licensed by the NRC	40 CFR Part 61 Subpart I § 61.102	Applicable	The requirements are applicable since fugitive dust may be generated during implementation of remedial action at Parcel B. The exposure to the public caused by remedial action operations at Parcel B is not likely to exceed 10 mrem/y because of the following reasons: (1) The concentrations of any radionuclide in dust are relatively low as previously measured in air samples, and (2) the concentration of any radionuclide in dust will be reduced by use of engineering controls such as wetting of soils.

TABLE 13-1: CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

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.

§	Section
§§	Sections
ALARA	As low as reasonably achievable
ARAR	Applicable or relevant and appropriate requirement
Cal. Code Regs.	California Code of Regulations
CFR	*Code of Federal Regulations*
cm	Centimeter
CTR	California Toxics Rule
gpd	Gallon per day
HPS	Hunters Point Shipyard
LLRW	Low-level radioactive waste
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
mg/kg	Milligram per kilogram
mrem/y	Millirem per year
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NRC	Nuclear Regulatory Commission
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated biphenyl
pCi/g	Picocurie per gram
POC	Point of compliance
ppm	Part per million
ppt	Part per thousand
RCRA	Resource Conservation and Recovery Act
SWRCB	State Water Resources Control Board
TCRA	Time-critical removal action
TCLP	Toxicity characteristic leaching procedure
TDS	Total dissolved solids
TEDE	Total effective dose equivalent
UMTRCA	Uranium Mill Tailings Radiation Control Act
U.S.C.	*United States Code*
Water Board	San Francisco Regional Water Quality Control Board
WQO	Water quality objective

TABLE 13-2: LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Location	Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
FEDERAL					
Exec. Order No. 11990, Protection of Wetlands[b]					
Wetland	Avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and avoid support of new construction in wetlands if practicable alternatives exist.	Wetland meeting definition of Section 7.	40 CFR § 6.302(a) and 40 CFR pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007)	Relevant and appropriate	Construction of the shoreline revetment will result in filling of a small (1,300 ft^2) wetland.
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)(1)(A) 15 CFR Part 930	Relevant and appropriate	The CZMA excludes federal lands from the coastal zone; however, since portions of HPS Parcel B are within the coastal zone, the Navy has determined that it is relevant and appropriate.
National Historic Preservation Act of 1966, as amended (16 U.S.C. §§ 471-470x-6)[b]					
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.	Properties included in or eligible for the national Register of Historic Places	Activities affecting the coastal zone, including lands thereunder and adjacent shore land.	16 U.S.C. §§ 470-470x-6, 36 CFR Part 800, and 40 CFR Part 6.301(b)	Applicable	The Navy has determined that Building 140 is eligible for inclusion on the National Register of Historic Places. The following substantive requirements of 36 CFR Part 800 are ARARs: 1. Identify the geographic area potentially affected by the undertaking (area of potential effects under 36 CFR § 800.4[a]) 2. Identify historic properties within the area of potential effects (36 CFR § 800.4[b]) 3. Evaluate the historic significance of the properties (36 CFR § 800.4[c]) 4. Identify and take into account the possible effects of CERCLA remedial alternatives on the eligible historic properties (36 CFR § 800.4[d]) 5. Identify and take into account adverse effects of proposed remedial alternatives on historic properties (36 CFR § 800.5) 6. Resolution of Adverse Effects (36 CFR § 800.6)

TABLE 13-2: LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Location	Requirement	Prerequisite	Citation[a]	Preliminary ARAR Determination	Comments
STATE					
McAteer-Petris Act (California Government Code §§ 66600 through 66661)[b]					
Within the San Francisco Bay coastal zone	Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	Activities affecting the San Francisco Bay and 100 feet landward of the shoreline.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	Relevant and appropriate	The Navy has determined that the substantive provisions of the CZMA are relevant and appropriate federal location-specific requirements for HPS Parcel B. The CZMA requires federal agency activity be conducted in a manner consistent with approved state management programs to the maximum extent practicable. The McAteer-Petris Act is enabling legislation for the San Francisco Bay Plan, an approved state management program for the San Francisco Bay. Substantive provisions of the McAteer-Petris Act and the San Francisco Bay Plan are relevant and appropriate because their authority is derived from the CZMA, a relevant and appropriate federal requirement. The Navy will continue to conduct its response actions in accordance with the substantive provisions of the San Francisco Bay Plan.

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.

§ Section
§§ Sections
ARAR Applicable or relevant and appropriate requirement
CFR *Code of Federal Regulations*
CZMA Coastal Zone Management Act
ft^2 Square foot
HPS Hunters Point Shipyard
U.S.C. *United States Code*

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
SOIL – EXCAVATION					
FEDERAL					
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Excavate soil or generate waste.	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11	Applicable	These regulations are applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is RCRA hazardous waste when it is generated.
Excavate soil or generate waste.	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste.	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	Applicable	These regulations are applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is RCRA hazardous waste when it is generated.
Stockpile soil for off-site disposal.	Allows generators to accumulate solid remediation waste in an EPA-designated pile for storage only up to 2 years during remedial operations without triggering land disposal restrictions.	RCRA hazardous remediation waste temporarily stored in piles.	40 CFR § 264.554(d)(1)(i) through (ii), (d)(2), (e), (f), (h), (i), (j), and (k)	Applicable or relevant and appropriate	The Navy will temporarily stockpile soil in staging piles for off-site disposal. The Navy will characterize the soil, but does not anticipate that all soil will be RCRA hazardous waste, in which case the requirements will be relevant and appropriate. These requirements would be applicable to stockpiled soil that meets the definition of RCRA hazardous waste. Therefore, the Navy will identify these requirements as either applicable or relevant and appropriate, depending on the results of sampling and analysis for waste characterization.
FEDERAL					
Clean Water Act, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)[a]					
Excavate soil.	Owners and operators of construction activities must be in compliance with discharge standards.	Construction activities at least 1 acre in size.	Clean Water Act §402 40 CFR § 122.44(k)(2) and (4)	Applicable	The Navy anticipates disturbing more than 1 acre in the alternatives that involve excavation and off-site disposal of soil and constructing soil covers. The Navy will use the requirements of state general storm water discharge permit, Order 99-08-DWQ, as TBCs for complying with the storm water discharge requirements under the Clean Water Act.
Clean Air Act (42 U.S.C. §§ 7401–7671)[a]					
Construct a shoreline revetment or soil cover; excavate soil.	Prohibits emission equal or greater to 20 percent opacity.	Emission from a source.	BAAQMD Rule 6-302	Applicable	This requirement is applicable to excavation.
STATE					
State Water Resources Control Board[a]					
Excavation of soil and generation of waste.	Sampling and analysis of discharges shall be used for accurate characterization of wastes.	Waste.	Cal. Code Regs. tit. 27, 20200(c)	Applicable	This regulation is applicable to excavation of soil and generation of waste. The Navy will characterize the soil or any waste when it is generated.
State Water Resources Control Board[a]					
Excavation of soil and generation of waste.	Requires that designated waste as defined at *California Water Code* § 13173 be discharged to Class I or Class II waste management units.	Discharges of designated waste after July 18, 1997, (nonhazardous waste that could cause degradation of surface or groundwaters) to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20210	Applicable	This regulation is applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is designated waste when it is generated.
Excavation of soil and generation of waste.	Requires that nonhazardous solid waste as defined at § 20220(a) be discharged to a classified waste management unit.	Discharge of nonhazardous solid waste after July 18, 1997, to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20220(b), (c), and (d)	Applicable	This regulation is applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is nonhazardous solid waste when it is generated.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
SOIL – EXCAVATION (Continued)					
STATE					
Air Resources Board					
Excavating soil, constructing a shoreline revetment, and constructing soil covers.	No person shall engage in any construction or grading operation on property where the area to be disturbed is greater than 1 acre unless an asbestos dust mitigation plan for the operation has been submitted to and approved by the district before the start of any construction or grading; and the provisions of that dust mitigation plan are implemented at the beginning and maintained throughout the duration of the construction or grading. Further, upon completion of project, the disturbed areas must be stabilized using one of the following methods: (1) vegetative cover, (2) placement of at least 3 inches of non-asbestos-containing material; (3) paving; (4) any other measure deemed sufficient to prevent wind speeds of 10 miles per hour or greater from causing visible dust emissions.	Construction and grading activities in an ultramafic rock unit; or naturally occurring asbestos, serpentine, or ultramafic rock.	Cal. Code Regs. tit. 17, § 93105	Applicable	The Navy has determined that this regulation is a potential ARAR for maintained landscaping, excavating, constructing a shoreline revetment, and soil covers.
SOIL – CONSTRUCTION OF SOIL COVERS AND SHORELINE REVETMENT					
FEDERAL					
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Construct a shoreline revetment or soil cover.	The final cover must accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the final cover is maintained.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22, § 66264.310(a)(5)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Resource Conservation and Recovery Act CONTINUED(42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Construct a shoreline revetment or soil cover.	Maintain the integrity and effectiveness of the final cover, including making repairs to the cover as necessary to correct the effects of settling, subsidence, erosion, or other events throughout the post-closure period. Prevent runon and runoff from eroding or otherwise damaging the final cover throughout the post-closure period.	RCRA hazardous waste management unit.	Cal Code Regs. tit. 22, § 66264.310(b)(1) and (4)	Relevant and appropriate	The Navy has determined that these requirements are potential ARARs for constructing a shoreline revetment and covers for the soil. These requirements are relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Construct a shoreline revetment or soil cover.	Protect and maintain surveyed benchmarks throughout the post-closure period.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22, § 66264.310(b)(5)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Clean Water Act					
Construct a soil cover or excavate soil.	Owners and operators of construction activities must be in compliance with discharge standards.	Construction activities at least 1 acre in size.	Clean Water Act §402 40 CFR § 122.44(k)(2) and (4)	Applicable	The Navy anticipates disturbing more than 1 acre in the alternatives that involve excavation and off-site disposal of soil and constructing soil covers. The Navy will use the requirements of state general storm water discharge permit, Order 99-08-DWQ, as TBCs for complying with the storm water discharge requirements under the Clean Water Act.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
SOIL – CONSTRUCTION OF SOIL COVERS AND SHORELINE REVETMENT (Continued)					
FEDERAL					
Clean Air Act					
Construct a shoreline revetment or soil cover; excavate soil.	Prohibits emission equal or greater to 20 percent opacity.	Emission from a source.	BAAQMD Rule 6-302	Applicable	This requirement is applicable to excavation.
STATE					
State Water Resources Control Board[a]					
Constructing a shoreline revetment and soil covers.	Alternatives to construction or prescriptive standards contained in the SWRCB-promulgated regulations of this subdivision may be considered.	Waste management unit. Cal. Code Regs. tit. 27 requirements are only applicable for waste discharged after 18 July 1997 unless otherwise noted.	Cal. Code Regs. tit. 27 § 20080(b)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
State Water Resources Control Board[a]					
Constructing a shoreline revetment and soil covers.	Actions taken by or at the direction of public agencies to clean up or abate conditions of pollution or nuisance resulting from unintentional or unauthorized releases of waste or pollutants to the environment; provided that wastes, pollutants, or contaminated materials removed from the immediate place of release shall be discharged according to the SWRCB-promulgated sections of Article 2, Subchapter 2, Chapter 3, Subdivision 1 of this division (§ 20200 et seq.); and further provided that remedial actions intended to contain the wastes at the place of release shall implement applicable SWRCB-promulgated provisions of this division to the extent feasible.	Action taken by or at the direction of a public agency to cleanup release of pollutant.	Cal. Code Regs. tit. 27, § 20090(d)	Relevant and appropriate	This requirement is a potential ARAR for the Navy's response actions.
Constructing a shoreline revetment and soil covers.	Closed units shall be provided with at least two permanent monuments installed by a licensed land surveyor or a registered civil engineer, from which the location and elevation of containment structures can be determined throughout the post-closure maintenance period.	Waste management unit.	Cal. Code Regs. tit. 27 § 20950(d)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
SOIL – CONSTRUCTION OF SOIL COVERS AND SHORELINE REVETMENT (Continued)					
STATE					
State Water Resources Control Board[a]					
Constructing a shoreline revetment and soil covers.	In spite of differential settlement, the final cover of closed landfills (including waste piles and surface impoundments closed as landfills) shall be designed, graded, and maintained to prevent ponding and to prevent soil erosion caused by high run-off velocities. All portions of the final cover shall have a slope of at least 3 percent unless Water Board allows portions of the final cover to be built with slopes of less than three percent when the discharger proposes an effective system for diverting surface drainage from laterally adjacent areas and preventing ponding in the allowed flatter portion. The final grading design shall be designed and approved by a registered civil engineer or certified engineering geologist taking into consideration pertinent natural and constructed topographic features (including any related to the proposed post-closure land use), and climate.	Waste management unit.	Cal. Code Regs. tit. 27, § 21090(b)(1)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Constructing a shoreline revetment and soil covers.	Throughout post-closure maintenance period, the discharger shall prevent erosion and related damage of the final cover caused by drainage.	Waste management unit.	Cal. Code Regs. tit. 27, § 21090(c)(4)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Constructing a shoreline revetment and soil covers.	For a closed landfill, when all closure activities are complete for the unit, the discharger shall conduct an aerial photographic survey, or alternative survey under (e)(3), of the closed portions of the unit and of its immediate surrounding area, including at least the surveying monuments [of § 20950(d)]. The data obtained shall be used to produce a topographic map of the site at a scale and contour interval sufficient to depict the as-closed topography of each portion of the unit, and to allow the early identification of any differential settlement. The map produced pursuant to this paragraph shall act as a baseline against which to measure the total settlement, through time, of all portions of the final cover since the date when that landfill, or portion thereof, was closed.	Waste management unit.	Cal. Code Regs. tit. 27, § 21090(e)(1) and (3)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Constructing a shoreline revetment and soil covers.	The final cover shall function with minimum maintenance and shall be compatible with post-closure land use. Alternative final cover designs shall meet the performance requirements of paragraph (a). The local enforcement agency may require additional thickness, quality, and type of final cover depending on, but not limited to the future reuse of the site.	Waste management unit.	Cal. Code Regs. tit. 27, § 21140	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
SOIL – CONSTRUCTION OF SOIL COVERS AND SHORELINE REVETMENT (Continued)					
STATE					
State Water Resources Control Board[a]					
Constructing a shoreline revetment and soil covers.	The operator shall ensure the integrity of final slopes under both static and dynamic conditions to protect public health and safety and prevent damage to post-closure land uses, roads, structures, utilities, and to prevent exposure of waste.	Waste management unit.	Cal. Code Regs. tit. 27, §21145(a)	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Constructing a shoreline revetment and soil covers.	The drainage and erosion control system shall be designed and maintained to ensure integrity of post-closure land uses, roads, and structures; to prevent public contact with waste; to prevent safety hazards; and to prevent exposure of waste. Slopes not underlain by waste shall be stabilized to prevent soil erosion. Methods used to protect slopes and control erosion shall include, but are not limited to, terracing, contour furrows, and trenches.	Waste management unit.	Cal. Code Regs. tit. 27, § 21150	Relevant and appropriate	The Navy has determined that this regulation is a potential ARAR for constructing a shoreline revetment and covers for the soil. This regulation is relevant and appropriate because the revetment and covers will not be constructed as landfill waste management units. Instead, the revetment and covers will be constructed solely to prevent exposure to contaminants in the soil.
Air Resources Board[a]					
Excavating soil, constructing a shoreline revetment, and constructing soil covers.	No person shall engage in any construction or grading operation on property where the area to be disturbed is greater than 1 acre unless an asbestos dust mitigation plan for the operation has been submitted to and approved by the district before the start of any construction or grading; and the provisions of that dust mitigation plan are implemented at the beginning and maintained throughout the duration of the construction or grading. Further, upon completion of project, the disturbed areas must be stabilized using one of the following methods: (1) vegetative cover, (2) placement of at least 3 inches of non-asbestos-containing material; (3) paving; (4) any other measure deemed sufficient to prevent wind speeds of 10 miles per hour or greater from causing visible dust emissions.	Construction and grading activities in an ultramafic rock unit; or naturally occurring asbestos, serpentine, or ultramafic rock.	Cal. Code Regs. tit. 17, § 93105	Applicable	The Navy has determined that this regulation is a potential ARAR for maintained landscaping, excavating, constructing a shoreline revetment, and soil covers.
SOIL – CONSTRUCTION OF SHORELINE REVETMENT ONLY					
Federal					
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Construct a shoreline revetment.	Alternative requirements that are protective of human health or the environment may replace design, operating, or closure standards for temporary tanks and container storage areas.	Temporary storage of RCRA hazardous waste.	Cal Code Regs. tit. 22, § 66264.553(b), (d), (e), and (f)	Applicable or relevant and appropriate	These requirements are applicable for the temporary storage of dredged material that meets the definition of RCRA hazardous waste or non-RCRA, state regulated hazardous waste under Cal. Code Regs. tit. 22, including sediment with TTLC wet weight concentrations of PCBs greater than or equal to 50 mg/kg. Concentrations of PCBs equal to or greater than 50 mg/kg have been measured in the sediment along the shoreline of IR-07. These requirements are relevant and appropriate for dredged material that does not meet the definition of RCRA hazardous waste.
Stockpile soil for off-site disposal.	Allows generators to accumulate solid remediation waste in an EPA-designated pile for storage only up to 2 years during remedial operations without triggering land disposal restrictions.	RCRA hazardous remediation waste temporarily stored in piles.	40 CFR § 264.554(d)(1)(i) through (ii), (d)(2), (e), (f), (h), (i), (j), and (k)	Applicable or relevant and appropriate	The Navy will temporarily stockpile soil in staging piles for off-site disposal. The Navy will characterize the soil, but does not anticipate that all soil will be RCRA hazardous waste, in which case the requirements will be relevant and appropriate. These requirements would be applicable to stockpiled soil that meets the definition of RCRA hazardous waste. Therefore, the Navy will identify these requirements as either applicable or relevant and appropriate, depending on the results of sampling and analysis for waste characterization.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
SOIL – CONSTRUCTION OF SHORELINE REVETMENT ONLY					
Federal					
Clean Water Act, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)[a]					
Construct a shoreline revetment.	Action to prohibit discharge of dredged or fill material into waters of the United States without permit.	Waters of the United States.	33 U.S.C. § 1344 40 CFR § 230.10; 230.11; 230.20 through 230.25; 230.31; 230.32; 230.41; 230.42; 230.53	Applicable	The soil remedy includes construction of a shoreline revetment that will result in the discharge of fill material into a wetland sufficiently connected to the bay to be regulated under the Clean Water Act. This discharge will be in compliance with the substantive provisions of Nationwide General Permit 38. The Navy is not required to obtain a permit or submit notification that it will discharge in compliance with Nationwide General Permit 38; however, the Navy will use the substantive requirements of this permit as a means to comply with these potential ARARs. In addition, the Navy will mitigate the loss of the wetland.
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Construct a shoreline revetment.	U.S. Army Corps of Engineers requirements for permitting discharges of dredged material into waters of the United States.	Discharge of dredged material into waters of the United States.	33 CFR § 320.4 and 323	Applicable	The soil remedy includes construction of a shoreline revetment that will result in the discharge of fill material into a wetland sufficiently connected to the bay to be regulated under the Clean Water Act. This discharge will be in compliance with the substantive provisions of Nationwide General Permit 38. The Navy is not required to obtain a permit or submit notification that it will discharge in compliance with Nationwide General Permit 38; however, the Navy will use the substantive requirements of this permit as a means to comply with these potential ARARs. In addition, the Navy will mitigate the loss of the wetland.
SOIL – SOIL VAPOR EXTRACTION SYSTEM					
FEDERAL					
Clean Air Act (42 U.S.C. §§ 7401–7671)[a]					
Operate an SVE system.	New emission sources must use best available control technology.	New emission source.	BAAQMD Regulation 2-1-301	Applicable	The Navy would treat the off-gas resulting from the SVE system with a granular activated carbon unit.
Operate an SVE system.	Requirements for SVE systems.	SVE system.	BAAQMD Regulation 8-47	Applicable	These requirements are applicable to the SVE system.
INSTITUTIONAL CONTROLS (FOR BOTH SOIL AND GROUNDWATER ACTIONS)					
STATE					
California Civil Code (Cal. Civil Code § 1471)[a]					
Land use controls.	Provides conditions under which land use restrictions will apply to successive owners of land.	Transfer property from the Navy to a nonfederal agency.	Cal. Civil Code § 1471	Relevant and Appropriate	Substantive provisions are the following general narrative standard: "to do or refrain from doing some act on his or her own land … where (c) each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety of the environment as a result of the presence of hazardous materials, as defined in § 25260 of the California Health & Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed at the time of transfer.
California Health and Safety Code Land Use Controls (Cal. Health & Safety Code § 25202.5, § 25222.1, § 25232(b), § 25233(c), § 25234, § 25355.5)[a]					
Land use controls.	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the Navy to a nonfederal agency.	Cal. Health & Safety Code § 25202.5	Relevant and Appropriate	The substantive provisions of this section are the general narrative standards to restrict "present and future uses of all or part of the land on which the facility …is located."
Land use controls.	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 nonfederal agency.	Cal. Health & Safety Code § 25222.1	Relevant and Appropriate	Cal. Health & Safety Code § 25222.1 provides the authority for the state to enter into voluntary agreements to establish land use covenants with the owner of the property. The substantive provision of Cal. Health & Safety Code § 25222.1 is the general narrative standard: "restricting specified uses of the property."
Land use controls.	Prohibits certain uses of land containing hazardous waste without a specific variance.	Hazardous waste property.	Cal. Health & Safety Code § 25232(b)(1)(A)–(E)	Relevant and Appropriate	This section is a potential ARAR for ICs that prohibit construction of residences, hospitals for humans, schools for persons under 21 years of age, day care centers, or any permanently occupied human habitation on hazardous waste property. ARAR only for IR-07 and IR-18.
Land use controls.	Provides a process and criteria for obtaining a written variance from a land use restriction.	Transfer property from the Navy to a nonfederal entity.	Cal. Health & Safety Code § 25233(c)	Relevant and Appropriate	Cal. Health & Safety Code § 25233(c) sets forth substantive criteria for granting variances from the uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
INSTITUTIONAL CONTROLS (FOR BOTH SOIL AND GROUNDWATER ACTIONS) (Continued)					
STATE					
California Health and Safety Code Land Use Controls (Cal. Health & Safety Code § 25202.5, § 25222.1, § 25232(b), § 25233(c), § 25234, § 25355.5)[a]					
Land use controls.	Provides a process and criteria by which DTSC can remove land use restrictions.	Transfer property from the Navy to a nonfederal entity.	Cal. Health & Safety Code § 25234	Relevant and Appropriate	Cal. Health & Safety Code § 25234 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land use restriction on the grounds that "…the waste no longer creates a significant existing or potential hazard to present or future public health or safety."
Land use controls.	Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present and future uses of the property.	Transfer property from the Navy to a nonfederal entity.	Cal. Health & Safety Code § 25355.5(a)(1)(C)	Relevant and Appropriate	The substantive requirements of the following Cal. Health & Safety Code § 25355.5(a)(1)(C) provisions are "relevant and appropriate": "…execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof, as appropriate, upon the present and future uses of the site."
Department of Toxic Substances Control[a]					
Implementing an institutional control.	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Property transfer by federal government to non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1	Relevant and appropriate	These requirements are relevant and appropriate when the Navy is transferring property to a nonfederal agency. EPA specifically considers substantive provisions of §§ (a), (b), (d), and (e) to be potential ARARs.
GROUNDWATER – INJECT CHEMICALS AND MONITOR GROUNDWATER					
FEDERAL					
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Monitor groundwater.	In conjunction with corrective action measures, the owner or operator shall establish and implement a water quality monitoring program to 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.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22 § 66264.100(d)	Relevant and appropriate	These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of the groundwater response action.
Monitor groundwater.	Contaminants of concern are the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from the waste contained in the regulated unit.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22 § 66264.93	Relevant and appropriate	These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of the groundwater response action.
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Monitor groundwater.	Owner or operator of shall establish a groundwater monitoring system for each regulated unit and include a sufficient number of monitoring points installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22 § 66264.97(b)(1)(A), (b)(1)(D)(1) and (b)(1)(D)(2)	Relevant and appropriate	These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of the groundwater response action.
Monitor groundwater.	Requirements for monitoring well construction and sampling intervals.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22 § 66264.97(b)(4), (5), (6), and (7)	Relevant and appropriate	These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of the groundwater response action.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
GROUNDWATER – INJECT CHEMICALS AND MONITOR GROUNDWATER (Continued)					
FEDERAL					
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
Monitor groundwater.	Requirements for collecting samples.	RCRA hazardous waste management unit.	Cal. Code Regs. tit. 22 § 66264.97(e)(6), (e)(12)(A)(3), (e)(12)(B), (e)(13), and (e)(15)	Relevant and appropriate	These requirements are applicable to RCRA hazardous waste facilities; however, the Navy has determined that they are relevant and appropriate to the monitoring component of the groundwater response action.
Generate waste.	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11	Applicable	These regulations are applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is RCRA hazardous waste when it is generated.
Generate waste.	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste.	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	Applicable	These regulations are applicable to the excavation of soil and the generation of waste. The Navy will determine whether the soil or any waste is RCRA hazardous waste when it is generated.
Safe Drinking Water Act (42 U.S.C. § 300[f]-300[j]-26)[a]					
Inject chemicals (biological amendment, zero-valent iron, or organo-sulfur compound) into groundwater.	The underground injection control program prohibits injection that allows movement of contaminants into underground sources of drinking water that may result in violations of MCLs or adversely affect health.	An approved UIC program is required in states listed under SDWA Section 1422. Class I wells and Class IV wells are the relevant classifications for CERCLA sites. Class I wells are used to inject hazardous waste beneath the lowermost formation that contains an underground source of drinking water within 0.25 mile of the well.	40 CFR § 144.12(a) excluding the reporting requirements in § 144.12(b) and 144.12(c)(1)	Applicable	This requirement is applicable to the Navy's injection of a biological amendment, zero-valent iron, or organo-sulfur compound into the groundwater. The Navy will use the basic information requirements contained in 40 CFR §144.83 as TBCs for complying with the requirement in 40 CFR §144.12(a).
STATE					
State Water Resources Control Board[a]					
Monitor groundwater.	Actions taken by or at the direction of public agencies to clean up or abate conditions of pollution or nuisance resulting from unintentional or unauthorized releases of waste or pollutants to the environment; provided that wastes, pollutants, or contaminated materials removed from the immediate place of release shall be discharged according to the SWRCB-promulgated sections of Article 2, Subchapter 2, Chapter 3, Subdivision 1 of this division (§ 20200 et seq.); and further provided that remedial actions intended to contain the wastes at the place of release shall implement applicable SWRCB-promulgated provisions of this division to the extent feasible.	Action taken by or at the direction of a public agency to cleanup release of pollutant.	Cal. Code Regs. tit. 27, § 20090(d)	Relevant and appropriate	This requirement is a potential ARAR for the Navy's response actions.
Generate waste.	Sampling and analysis of discharges shall be used for accurate characterization of wastes.	Waste.	Cal. Code Regs. tit. 27, 20200(c)	Applicable	This regulation is applicable to excavation of soil and generation of waste. The Navy will characterize the soil or any waste when it is generated.

TABLE 13-3: ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (CONTINUED)
Parcel B Amended Record of Decision, Hunters Point Shipyard, San Francisco, California

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
GROUNDWATER – INJECT CHEMICALS AND MONITOR GROUNDWATER (Continued)					
STATE					
State Water Resources Control Board[a]					
Generate waste.	Requires that designated waste as defined at *California Water Code* § 13173 be discharged to Class I or Class II waste management units.	Discharges of designated waste after July 18, 1997, (nonhazardous waste that could cause degradation of surface or groundwaters) to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20210	Applicable	This regulation is applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is designated waste when it is generated.
Generate waste.	Requires that nonhazardous solid waste as defined at § 20220(a) be discharged to a classified waste management unit.	Discharge of nonhazardous solid waste after July 18, 1997, to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20220(b), (c), and (d)	Applicable	This regulation is applicable to excavation of soil and generation of waste. The Navy will determine whether the soil or any waste is nonhazardous solid waste when it is generated.

Notes:

a Statutes and policies, and their citations, are provided as headings to identify general categories of potential 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 potential ARARs. Specific potential ARARs follow each general heading, and only substantive requirements of the specific citations are considered potential ARARs.

§ Section
§§ Sections
ARAR Applicable or relevant and appropriate requirement
BAAQMD Bay Area Air Quality Management District
Cal. Code Regs. *California Code of Regulations*
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFR *Code of Federal Regulations*
DTSC Department of Toxic Substances Control
EPA U.S. Environmental Protection Agency
IR Installation Restoration
MCL Maximum contaminant level
mg/kg Milligram per kilogram
PCB Polychlorinated biphenyl
RCRA Resource Conservation and Recovery Act
SDWA Safe Drinking Water Act
SVE Soil vapor extraction
SWRCB State Water Resources Control Board
TBC To be considered
TTLC Total threshold limit concentration
UIC Underground injection control
U.S.C. *United States Code*

14.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The proposed plan for Parcel B was released for public comment on June 28, 2008 (Navy 2008). The proposed plan identified the following preferred alternatives:

- Alternative S-5 – Excavation, Methane and Mercury Source Removal, Disposal, Covers, SVE, Institutional Controls, and Shoreline Revetment
- Alternative GW-3A – In Situ Treatment, Groundwater Monitoring, and Institutional Controls
- Alternative R-3 – Survey, Decontamination, Disposal, Release, Close In Place, and Institutional Controls

The Navy has reviewed all written and verbal comments submitted during the public comment period. Based on a review of these comments, the Navy determined that no significant changes to the selected remedial actions as originally identified in the proposed plan were necessary or appropriate.

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ATTACHMENT A
ADMINISTRATIVE RECORD INDEX

[To Be Provided in Draft Final Amended ROD]

ATTACHMENT B
TRANSCRIPT FROM PUBLIC MEETING, SIGN-IN SHEET, AND PUBLIC NOTICE

[To Be Provided in Draft Final Amended ROD]

ATTACHMENT C
RESPONSIVENESS SUMMARY

ATTACHMENT C RESPONSIVENESS SUMMARY

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comments by Sudeep Rao received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	How do the regulatory agencies assess community input and how are the criteria in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) weighted? Community input is at the bottom of the list of nine criteria. [Refer to the transcript of the public meeting beginning on page 106 for the complete comment.]	The Navy uses the nine criteria in the NCP to evaluate remedial alternatives. The first two criteria (protection of human health and the environment and compliance with applicable laws) are threshold requirements that all alternatives must meet to be selected. The next five criteria are called primary balancing criteria and are equally weighted in the evaluation. These five criteria include (1) long-term protectiveness, (2) reduction of toxicity, mobility, and volume through treatment, (3) short-term effectiveness, (4) implementability, and (5) cost. These criteria are the primary factors used to weigh the advantages and disadvantages of the alternatives and to select the preferred alternative. The remaining two criteria are called modifying criteria and they include (1) state acceptance and (2) community acceptance. Feedback from the state regulatory agencies and the community is used to modify the proposed remedial actions. These two criteria are addressed later in the evaluation process because input from the state and community is not complete until after the public comment period on the proposed plan. EPA's guidance on this issue includes: "Although community acceptance is not addressed as early as the primary balancing factors, which serve as the principal basis for determining the preferred alternative, it nonetheless is an important factor in EPA's final remedy selection decision." (55 Federal Register 46, p. 8730)
2	Table 11 on page 13 of the revised proposed plan does not mention any injection of chemicals for heavy metal immobilization. So that means we are not factoring in the costs? Costs will be included in the analysis after future groundwater tests are taken into account? My assumption is that current groundwater data do not necessitate any mobilization of metals. [Refer to the transcript of the public meeting beginning on page 107 for the complete comment.]	With the exception of mercury at Installation Restoration (IR) Site 26, data collected in 2008 do not indicate the need to inject chemicals to immobilize metals in groundwater. Removal of mercury source material at IR-26 is planned as a time-critical removal action. The Navy believes that this removal will eliminate the source of mercury to groundwater and that injection of chemicals to immobilize mercury will not be necessary as a result. Some wells where metals were of concern were destroyed by excavations during the remedial actions from 1999 to 2001 and new wells will need to be installed and sampled to evaluate the need to immobilize metals at those locations. Costs for injection of chemicals to immobilize metals were not included on Table 11 of the proposed plan because injection is considered only as a contingency measure.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comments by Sudeep Rao received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
3	Table 12 of the revised proposed plan shows Alternatives R-2 and R-3 differ only in long-term effectiveness and implementability. Why is R-3 better than R-2 for these two criteria? [Refer to the transcript of the public meeting beginning on page 107 for the complete comment.]	The only difference between Alternatives R-2 and R-3 relates to how the pump shaft beneath Building 140 is addressed. Alternative R-2 would leave the pump shaft as it is and control exposure by limiting access to the shaft. Alternative R-3 would close the pump shaft in place with backfilled stone and a concrete cap. Closing the pump shaft would eliminate exposure and additional access restrictions would not be needed. Alternative R-3 has better long-term effectiveness because closing the shaft in place permanently eliminates exposure. While, if access is allowed, under Alternative R-2, restrictions would need to be maintained. The implementability of Alternative R-3 is also slightly better than Alternative R-2 because physically closing the shaft in place would be easier than developing access restrictions that would need to be effective into the distant future. For example, an access restriction might involve locking a door or building a fence to prevent access to the pump shaft. However, future reconstruction inside Building 140 might remove those features and allow exposure. Filling the shaft and sealing the top with a concrete cap will provide a more secure barrier and eliminate any exposure pathway.
4	The original 1997 Record of Decision (ROD) did not account for radionuclides. What activities will the regulatory agencies undertake to minimize the chance for future uncertainties that might cause another amendment to the ROD? [Refer to the transcript of the public meeting beginning on page 124 for the complete comment.]	The Navy and the regulatory agencies are working to ensure the amended ROD for Parcel B will be as complete and comprehensive as possible. The protectiveness of the remedy will be evaluated at least every 5 years to ensure it remains protective. These 5-year reviews are required by law and will include any new information that may become available in the future.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comment by Oscar James received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	We want this shipyard 100 percent clean. We want nothing less than 100 percent clean. [Refer to the transcript of the public meeting beginning on page 108 for the complete comment.]	The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the federal and state regulatory agencies. The remedies proposed in the Parcel B proposed plan, and detailed in this amended ROD, address all contamination at Parcel B that resulted from past Navy activities. After all the proposed actions are conducted and operation and maintenance and institutional controls (IC) are implemented, the actions proposed will be protective of human health.

Spoken Comments by Espanola Jackson received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	I feel, like the speaker before me, we are not going to accept any less than that total shipyard to be clean to residential standards. [Refer to the transcript of the public meeting beginning on page 109 for the complete comment.]	The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the federal and state regulatory agencies. Cleanup goals consider the expected future land use so not all areas will be remediated to residential levels. For example, areas that will become open space will be remediated to standards that consider recreational use. Nevertheless, all of Parcel B will be covered to protect all users from exposure to surface soil.
2	Weren't other parcels contaminated by dust blowing from Parcel A during construction there? [Refer to the transcript of the public meeting beginning on page 111 for the complete comment.]	Parcel A did not contain any spills or releases from Navy activities. Dust from Parcel A did not contaminate other parcels. Any dust from Parcel A would be expected to contain the same naturally occurring minerals as on all the parcels (as well as in much of the San Francisco area). Some of those minerals may pose risk to people and the remedy at Parcel B includes covers to protect people from exposure to them.
3	Don't fast-track the cleanup of Parcel B; take your time. For example, recognition and understanding of radiation at Parcel B took a number of years. [Refer to the transcript of the public meeting beginning on page 111 for the complete comment.]	The Navy works together with the regulatory agencies during each step to complete the remediation of Parcel B according to all applicable laws to protect human health and the environment. The Navy develops schedules for remediation in coordination with both the regulatory agencies and the public (through the Restoration Advisory Board [RAB]). The schedule for transfer of Parcel B will not affect the completeness or effectiveness of the remediation.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comments by Pamela Calvert received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	I'd like to enter into the comments the suggestion that the risk assessment and the ROD take into account a major seismic event, the impact of that on the capping and the control of the contaminants in place. [Refer to the transcript of the public meeting beginning on page 113 for the complete comment.]	The remedy components (for example, covers) at Parcel B will be designed to withstand earthquakes in accordance with California state laws (California Code of Regulations Title 22 Section 66264.310[a][5]). In addition, the operation and maintenance plans for the covers will include provisions for repairs to follow an earthquake, also in accordance with state law (California Code of Regulations Title 22 Section 66264.310[b][1]).
2	The human health risk assessment (HHRA) should consider a resident who works at an industrial site on the base and then goes out to recreate on site and also lives there. [Refer to the transcript of the public meeting beginning on page 113 for the complete comment.]	The HHRA for Parcel B evaluated health risks separately for residents, industrial workers, and recreational users. The HHRA did not specifically evaluate a resident who lives, works, and recreates at the site. However, the residential risk evaluation is protective of a resident who also works and recreates at the site because the residential evaluation assumes continuous exposure, 24 hours a day, 350 days a year, for 30 years. After all the proposed actions are conducted and operation and maintenance and ICs are implemented, the actions proposed will be protective of human health and the environment and meet all cleanup objectives.
3	Solving problems for Bayview—Hunters Point shouldn't involve creating problems for other people's communities. I would like to see a cradle-to-grave analysis of what's being taken from here, put somewhere else, and then what? I would like to see that taken into account in the analysis in the ROD. [Refer to the transcript of the public meeting beginning on page 114 for the complete comment.]	Some wastes removed from Parcel B must be disposed of at facilities that are not located in California because adequate facilities do not exist in the state. For instance, the State of California does not allow disposal of low-level radioactive waste within the boundaries of the state. Therefore, all waste containing radioactive material must be disposed of elsewhere.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comments by Francisco DaCosta received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	At one time on Hunters Point, there were shell mounds of the Muwekma Ohlone which were demolished during construction of the shipyard. All of the shipyard should be archaeologically surveyed. [Refer to the transcript of the public meeting beginning on page 115 for the complete comment.]	Remedial actions at Parcel B will follow all applicable laws related to archaeological sites that may be present.
2	Radiological elements that are on the shipyard have to be removed. [Refer to the transcript of the public meeting beginning on page 116 for the complete comment.]	The preferred alternative for remediation of radionuclides uses removal and off-site disposal to the maximum extent practicable. However, some areas will be addressed by covers (IR Sites 7 and 18) or caps (deep pump shaft beneath Building 140). IR Sites 7 and 18 include a large area (about 13 acres) of fill that is also very deep (approximately 45 feet in some locations). This area has "unlikely" potential for radioactive contamination according to the Hunters Point Historical Radiological Assessment (HRA). Identification of buried radionuclides through subsurface testing would be very difficult, and, if radioactivity is present, it would be very limited and not spread throughout the sites. The excavation of the entire area of fill would also be very difficult because of the presence of groundwater. Upon evaluation of these factors, the Navy proposed that removal would not be the preferred alternative for IR Sites 7 and 18. After considerable review by the Navy and regulatory agencies, it was proposed that a radiological surface scan of IR Sites 7 and 18 with removal of any contamination in the top 12 inches followed by a 2-foot-thick soil cover will effectively prevent exposure to any radionuclides that may be present in the subsurface soil. Additionally, it was proposed that institutional controls will be placed, inspected, and enforced for IR Sites 7 and 18 to ensure the continued integrity of the covers and allow proper control of any activities that would penetrate the cover. Removal of potential radionuclides in the deep pump shaft beneath Building 140 cannot be accomplished because of safety and health issues. Filling the shaft and sealing the top with a concrete cap will provide a secure barrier against exposure to any radionuclides that may be present in the shaft.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comments by Francisco DaCosta received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
3	Areas of Parcel B which are prone to liquefaction and rising sea level should be taken into an account. [Refer to the transcript of the public meeting beginning on page 117 for the complete comment.]	The remedy components (for example, covers) at Parcel B will be designed to withstand earthquakes in accordance with California state laws. Likewise, the designs will consider the potential for rising sea level. For example, the top of the shoreline revetment will be sufficiently above sea level (about 13 to 15 feet) to account for a potential future rise in sea level. In addition, changes in site conditions, such as a rise in sea level, will be addressed during future 5-year reviews which address changes in site conditions and recommend modifications to the remedy if necessary to protect human health and the environment.
4	It is a request of the Muwekma Ohlone tribe to do whatever is right on behalf of the people to clean up the entire shipyard to residential standards according to Proposition P that passed in the year 2000. [Refer to the transcript of the public meeting beginning on page 118 for the complete comment.]	The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the regulatory agencies. Cleanup goals consider the expected future land use so not all areas will be remediated to residential levels. For example, areas that will become open space will be remediated to standards that consider recreational use. Nevertheless, all of Parcel B will be covered to protect all users from exposure to the surface soil.

Spoken Comment by Adela Andrea Flores Bolanos received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	I would like the Navy to do a hundred percent cleanup. I don't want a cap or anything like that. Now is the time to do the right thing, clean everything up, take everything that is hazardous to human health away from the shipyard. [Refer to the transcript of the public meeting beginning on page 118 for the complete comment.]	The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the regulatory agencies. All of Parcel B will be covered to protect all users from exposure to the soil regardless of the future use. Covers are an effective way to eliminate exposure and protect human health.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comments by Octavio Guillermo Solorzano received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	What will be the proper precautions that will be taken to make sure that everybody's health stays normal or it gets better? [Refer to the transcript of the public meeting beginning on page 120 for the complete comment.]	The overall goal of the remedial action at Parcel B is to protect human health. All components of the remedy are designed for that purpose. Appropriate engineering measures (for example, dust control) will be used during remediation to limit risks to site workers and the surrounding Bayview Hunters Point community. After the remedy is in place, operation and maintenance requirements will ensure it is maintained properly. In addition, land use controls will be imposed to limit or prohibit activities that might pose risk to future residents or the surrounding community. For example, use of groundwater will be prohibited. However, the protectiveness of the remedy will be evaluated at least every 5 years to ensure it remains protective. These 5-year reviews are required by law and will include any new information that may become available in the future.
2	I don't want the Navy to put caps or covers. Just 100 percent cleanup. [Refer to the transcript of the public meeting beginning on page 120 for the complete comment.]	The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the regulatory agencies. All of Parcel B will be covered to protect all users from exposure to the soil regardless of the future use. Covers are an effective way to eliminate exposure and protect human health.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comment by Raymond Tompkins received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	I understand from the presentation that we're using a medical model that only takes into account a 35-year-old white male and does not deal with women or subset populations or at-risk populations. In Bayview we have a disproportionately high-risk population and this population should be considered in the risk assessment. [Refer to the transcript of the public meeting beginning on page 121 for the complete comment.]	The Navy recognizes that some individuals are more sensitive to chemical exposures and this adds uncertainty to the risk assessment. The HHRA was not based solely on exposure to a 35-year-old white male. The HHRA for Parcel B used conservative exposure assumptions so that risk estimates were protective of sensitive populations (children, for example). The HHRA combined multiple conservative assumptions so that the resulting risk estimates over-predict cancer risks and noncancer hazards. For example, residents were assumed to be continually exposed 24 hours per day, 350 days per year, for 30 years to evaluate health risks for residential exposures. Likewise, workers were assumed to be continually exposed 8 hours per day, 250 days per year, for 25 years for industrial exposures. In a few cases, specific toxicity studies and data were available that address sensitive populations. For example, the risk assessment of health effects from exposure to lead was protective of children and nursing women. Also, health risks were assessed separately for children, since exposure is greater for children than adults, relative to body weight. Data for sensitive populations were incorporated in the HHRA for Parcel B when available.
2	The Navy should require a system of accountability for the citizens to know who to call and to have oversight similar to the RAB for public participation. [Refer to the transcript of the public meeting beginning on page 122 for the complete comment.]	The Navy maintains active contact with the public through the RAB and through direct contact by telephone, email, facsimile, and regular mail. The RAB will remain in place as long as the Navy owns the property at Hunters Point. The RAB would be discontinued after the Navy's ownership ends. However, Navy staff would still be available by the same direct contact methods. Other oversight mechanisms available include the Community Advisory Committee provided through the San Francisco Redevelopment Agency. In addition, citizens can contact local elected officials and regulatory agencies to express any concerns about oversight.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Spoken Comment by Kristine Enea received at the public meeting held July 8, 2008		
Comment Number	**Comment**	**Response**
1	I had a request for IR-18 that Blocks 1 and 2 be considered separately and that Block 1 be cleaned to residential or mixed-use standards so that that entire block between Earl, Donahue, Hudson, and Innes can be used more actively than just open space. And I also wanted to state for the record that the community is seeking to have the Hudson right-of-way opened for at least pedestrians and bicyclists. So I'd like to see cleanup along that alignment that allows for whatever grading or other roadway construction is required. If it's to be used as a commuter bike path, the grade, I think, can be no more than 5 percent. And so I just want to make sure that whatever cleanup is done will accommodate that potential future use. [Refer to the transcript of the public meeting beginning on page 125 for the complete comment.]	The Navy will conduct remedial actions that are consistent with the proposed reuse areas which are detailed in the City of San Francisco's 1997 Redevelopment Plan. The Navy cannot assume other reuses (for example, that all of Redevelopment Block 1 is mixed use instead of the current partial mixed use and partial open space) until a new plan is issued. However, the remedy for soil at Redevelopment Blocks 1 and 2 includes a soil cover. The presence of the cover should not deter use of the area by pedestrians or bicyclists. Future documents will describe the requirements for digging into the cover (for example, if grading is needed to change the surface slope).

Written Comment by Tanya Joyce received July 8, 2008 at public meeting		
Comment Number	**Comment**	**Response**
1	I am an artist with a studio in Hunters Point Shipyard. Mixed use is vital for the shipyard, for southeast San Francisco, and for the city as a whole. Retaining genuinely affordable artists' studios is vital to San Francisco's economy. Retaining open space linked to the Bay Trail is vital for our regional and local environments. Studies have shown that arts-related activity provides 13 percent of San Francisco's revenue. Studies have also shown that the city desperately needs low-income housing and increased job opportunities to remain financially robust for residents and visitors alike. Keep studios and open space in the yard!	The planned reuse for Parcel B includes mixed uses as well as open space areas.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by City and County of San Francisco received July 25, 2008 by email		
Comment Number	**Comment**	**Response**
1	Figure 7 which shows the boundaries of the ARIC [area requiring institutional controls] for IR-07/18 and the related text in Overview of Proposed Institutional Controls, specifically the "Proposed Land Use Restrictions for IR Sites 7 and 18", imply that the entire area of IR-07/18 will need the proposed radiological restrictions. The extent of proposed restriction is not supported by the historical information. The boundaries of IR-07/18 were originally drawn because of historical uses (including a paint shop) unrelated to suspected radiological contamination. The suspicions about radiological contamination in the area were not identified until the publication of the HRA – long after the IR-07/18 boundary had been drawn. It was convenient to refer to the whole area when discussing the radiological concerns because detailed research had not been performed to identify the area within IR-07/18 that actually contained possible radiological contamination – which may or may not exist. The Navy has since performed research into the extent of the debris fill in the IR-07/18 area. The debris fill may contain possible radiological contamination, but the Navy's research indicates that the fill does not extend all the way to the boundaries of the IR-07/18 area. We request that the Navy propose boundaries for the extent of the radiological restricted area that are limited to the areas supported by the historical information and not overly restrict land where it is not warranted. Specifically, we request that all references to the proposed radiological restriction in IR-07/18 be changed to "a portion of IR-07/18" and that a footnote should be added to Figure 7 that clearly states that the final boundaries will be decided as part of the Radiological Remedial Design (to be completed prior to transfer).	The HRA is the source document for the definition of areas that are radiologically impacted. The HRA considered all of IR Sites 7 and 18 to be radiologically impacted as the boundaries of the IR sites were consistent with the boundaries of the fill areas. To address various concerns of the regulatory agencies and the City and County of San Francisco, the Navy is reviewing the history of the Parcel B fill area to confirm the fill area boundaries that could be considered radiologically impacted. The Navy will provide the results of this review to the regulatory agencies to discuss the determination of the boundaries of radiologically impacted areas in comparison to the boundaries of the area requiring institutional controls (ARIC) at IR Sites 7 and 18.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by City and County of San Francisco received July 25, 2008 by email		
Comment Number	**Comment**	**Response**
2	In the Overview of Proposed Institutional Controls, Proposed Activity Restrictions Relating to VOC vapors at Specific Locations within Parcel B, it states that "Initially, the ARIC includes all of Parcel B except Redevelopment Block 4" and Figure 7 illustrates this statement with a yellow highlight on the Parcel in every location except Redevelopment Block 4. We think this is a misrepresentation of the current state of knowledge about the ARIC for VOC vapors and unnecessarily restricts Parcel B. Our request is to phrase the restriction as "Initially, the ARIC will include all areas of the parcel with soil gas levels above the remediation goals" and to remove the yellow highlight from Figure 7. This sentence more accurately reflects the current state of knowledge about the ARIC for VOC vapors and describes where the ARIC will be required. The soil gas surveys will be performed in areas where past uses and data suggest possible concerns regarding soil gas and establishment of the soil gas remediation goals will be done in the future. However, based on the current knowledge of the site we are certain that there are many areas where no soil gas sampling will be required and there will be no requirement for an ARIC for VOCs.	The ARIC for vapor intrusion may be modified as remediation is completed or in response to further sampling and analysis that establishes that areas now in the ARIC do not pose unacceptable potential exposure risk to volatile organic compound (VOC) vapors. The initial ARIC is proposed to include the entire parcel (except Redevelopment Block 4) because existing data for soil gas are insufficient to further reduce the size of the ARIC.
3	We understand that the design of the IR-07/18 engineering controls including the demarcation layer and depth of the clean fill will be finalized in the Radiological Remedial Design (to be completed prior to transfer). We will be closely reviewing these documents prior to transfer to verify that the type of demarcation layer and depth of clean fill will be robust enough to provide physical cues to anyone digging in the area that will prevent them from inadvertently digging below the demarcation layer. We are not concerned that there will be any undue health risk to accidental digging below the demarcation layer but we want to be certain that any accidental digging will trigger proper notifications as required and that the damage to the cover will be repaired.	The Navy will coordinate with the city during preparation of the design of the cover at IR-07 and IR-18 to work out the details of the demarcation layer.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by City and County of San Francisco received July 25, 2008 by email		
Comment Number	**Comment**	**Response**
4	We appreciate that the Navy has revised the text of the proposed plan to discuss some of the remedy implementation plans in relation to reuse areas instead of redevelopment blocks. In future documents please continue to work toward the goal of dropping the use of the redevelopment blocks to describe areas of the parcel because land planning efforts are anticipating a change to the configuration of the blocks.	The proposed plan was revised to reduce the use of and emphasis on redevelopment blocks to the extent possible. However, a means to clearly and unambiguously identify areas within Parcel B is still needed to explain the proposed remedial actions, and redevelopment blocks still serve that purpose. The Navy would appreciate communication from the city when changes to redevelopment blocks, and especially those changes that affect the reuse exposure, are identified. The Navy will work closely with the city to use the most current plans for land reuses at Parcel B. The Navy will continue to use redevelopment blocks, as necessary, in the amended ROD.
5	We would like to point out for the record, that once the engineering controls and institutional controls are properly installed and maintained the current design of the proposed remedies will cut off pathways for: (a) contact with soil contaminants and (b) inhalation of indoor VOC vapors and this means that the entire property will be health protective for all types of uses.	The proposed remedial alternatives are specific to the reuse identified for each area. Future residents would be protected in areas currently identified for industrial or recreational reuse only by the consistent enforcement of the activity restrictions described by the proposed ICs. For example, the ARIC for vapor intrusion would need to be maintained in areas currently identified as open space (unless the ARIC could be modified by new data for soil gas, as discussed above in the response to comment 2). The Navy believes stating that the proposed remedy would result in an environment that would not pose health risks for future residents implies that future reuse would be unrestricted, and unrestricted use will not be the case. The following text was added to the proposed plan to note the general protectiveness of the planned revised remedy: "*After all the proposed actions are conducted and operation and maintenance and ICs are implemented, the actions proposed will be protective of human health and the environment and meet all cleanup objectives*."

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by Kristine Enea, India Basin Neighborhood Association, received by email on July 28, 2008		
Comment Number	**Comment**	**Response**
1	We are concerned with the lack of testing beyond 12" from the surface for radiological contaminants in Sites IR-07 and IR-18. We would like further testing to be done on those sites.	As documented in the Hunters Point HRA, the potential for radiological contamination at IR Sites 7 and 18 is considered "unlikely." As IR Sites 7 and 18 constitute approximately 13 acres and radiological contamination, if present, would most likely consist of small pockets of contamination (approximately 1 to 2 feet in diameter), subsurface testing is not considered practical as it would be very expensive and the contamination could be easily missed. Surface scans will effectively and efficiently locate any radiological anomalies within the top 12 inches of soil. Any radiological contamination found during the scan will be excavated and disposed of at an off-site low-level radioactive waste disposal facility.
2	Our understanding is that the regulators in charge of assessing radiological risk have informed the Navy that the only avenue to an unrestricted transfer of IR-07 and IR-18 would be to excavate the soil in those areas down to the sea floor, and that this unrealistic requirement leaves no practical testing alternative beyond a surface screen.	Navy's discussions with the regulatory agencies have indicated that unrestricted transfer is not an option for IR Sites 7 and 18.
3	We would like to see systematic core testing for radioactive material in Sites IR-07 and IR-18, and a reasonable standard set for unrestricted transfer of those sites, to achieve the re-use plans the neighborhood is seeking, including mixed use construction on all of Block 1 of IR-18 and construction of a paved vehicle road along the Hudson right-of-way between Earl and Donohue, as well as more active use of the large percentage of those sites that has already been excavated and backfilled from four to ten feet.	As documented in the Hunters Point HRA, the potential for radiological contamination at IR Sites 7 and 18 is considered "unlikely." As IR Sites 7 and 18 constitute approximately 13 acres and radiological contamination, if present, would most likely consist of small pockets of contamination (approximately 1 to 2 feet in diameter), subsurface testing is not considered practical as it would be very expensive and the contamination could be easily missed. Surface scans will effectively and efficiently locate any radiological anomalies in the top 12 inches of soil. Any radioactive contamination found will be excavated and disposed of at an off-site low-level radioactive waste disposal facility. This will allow for 1 foot of radiologically cleared soil under the 2-foot-thick soil cover remedy. This cover will allow for use of the surface of the area as a radiologically unrestricted area, providing the use does not penetrate the remedy. Complete unrestricted transfer of IR Sites 7 and 18 is not acceptable to the regulatory agencies. Use of IR Sites 7 and 18 for residences would be allowable only in accordance with the Covenant(s) to Restrict Use of the Property, Quitclaim Deed(s), and the Parcel B risk management plan. However, the proposed remedy for IR Sites 7 and 18 (covers) would accommodate a paved vehicle road.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by Kristine Enea, India Basin Neighborhood Association, received by email on July 28, 2008		
Comment Number	**Comment**	**Response**
4	A more realistic cleanup standard for Sites IR-07 and IR-18 will benefit the community beyond enabling our desired re-uses. We want to feel safe in our neighborhood. If a reasonable amount of testing is done and no rad material is found, then in combination with the rad screens that were already performed on some of the excavated soil as it was being trucked out, the additional surface scans, and the large percentage of clean backfill already in place, we would have a large degree of confidence that we are not burying dangerous radioactive material underneath the proposed cap.	As documented in the Hunters Point HRA, the potential for radiological contamination at IR Sites 7 and 18 is considered "unlikely." As IR Sites 7 and 18 constitute approximately 13 acres and radiological contamination, if present, would most likely consist of small pockets of contamination (approximately 1 to 2 feet in diameter), subsurface testing is not considered practical as it would be very expensive and the contamination could be easily missed. Covers at IR Sites 7 and 18 will effectively mitigate exposure to any radionuclides that may be present at depth within the original fill materials. Institutional controls will be placed, inspected, and enforced to ensure the continued integrity of the covers.
5	If necessary in light of a potential early transfer of Parcel B, we would like Sites IR-07 and IR-18 to be carved out and considered for transfer separately. We also request a more fine-grained division of those IR parcels in order to develop institutional controls that more accurately reflect the excavation work that has already been completed.	Subdivision of IR Sites 7 and 18 would not change the status of any of the area as radiologically impacted nor would it change the necessary ICs. The Hunters Point HRA is the source document for the definition of areas that are radiologically impacted. The HRA considered all of IR Sites 7 and 18 to be radiologically impacted as the boundaries of the IR sites were consistent with the boundaries of the fill areas. To address various concerns of the regulatory agencies and the City and County of San Francisco, the Navy is reviewing the history of the Parcel B fill area to confirm the fill area boundaries that could be considered radiologically impacted and determine the types of radioactive materials that could be in the fill. The Navy will provide the results of this review to the regulatory agencies to discuss the determination of the boundaries of radiologically impacted areas in comparison to the boundaries of the area requiring institutional controls (ARIC) at IR Sites 7 and 18. Until such time as portions of IR Sites 7 and 18 can be considered as non-radiologically impacted, a conservative approach is necessary for protection of human health and the environment from potential risks posed by potential radiological contamination within the fill material. Additionally, as the previous excavations at IR Sites 7 and 18 have not removed all the fill to its full depth, it is not practical to limit the ARIC based on those excavations.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comment by Lee Geeter received by mail on July 29, 2008		
Comment Number	**Comment**	**Response**
1	My comment is more in the form of a question. I am concerned about the safety of the proposed development. My concern is about the time line the Lennar Corp. is proposing to use on the Hunters Point development. I am asking, how can the development be safe by "capping" in 2 years when a total cleaning will take 4 or maybe 5?	The Navy works together with the regulatory agencies during each step to complete the remediation of Parcel B according to all applicable laws to protect human health and the environment. The Navy develops schedules for remediation in coordination with both the regulatory agencies and the public (through the RAB). The schedule for transfer of Parcel B will not affect the completeness or effectiveness of the remediation. The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the regulatory agencies. All of Parcel B will be covered to protect all users from exposure to the soil regardless of the future use. Covers are an effective way to eliminate exposure and protect human health.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by J.V. McCarthy received by email on July 31, 2008		
Comment Number	**Comment**	**Response**
Introduction	If the "Proposed Plan"- "Revised"- for Hunters Point Shipyard is expected to meet CERCLA 120 (h)(3)(C), this seems doubtful where out of compliance at time of proposed transfer. If restrictions specified by the "…Covenants to Restrict Use of Property…" apply as condition of transfer, the proposed construction related "covers" can only be certified in place after transfer. Transfer restriction site "covers" are furthermore in compromise by installation of foundation support piers, which require a deep penetration under "covers."	If the property in Parcel B is conveyed as an "early transfer" subject to the requirements of Section 120(h)(3)(C) of CERCLA, it is anticipated that the transferee will be responsible for constructing covers after transfer with the exception of IR Sites 7 and 18 where the Navy will construct them. The covers will be constructed to meet all the requirements of the remedial design, and will be conducted under the oversight of the regulatory agencies regardless of whether they are constructed by the Navy or its transferee. The deed of transfer will contain any necessary interim land use restrictions required to protect covers following construction and comply with Section 120(h)(3)(C) of CERCLA. Please see the response to Comment Number 1 below for a discussion of foundation support piers.
1	Construction related "covers", as well as foundation support piers where required through bay mud and fill, are out of compliance with "… land disturbing activity…" restriction ("Restricted Activities", a.) where this occurs following transfer.	Any construction-related covers or foundation support piers constructed after transfer will be constructed to be protective of human health and the environment, and will meet the requirements of the remedial design.
2	Construction related "alteration, disturbance, or removal…" is likely to be out of compliance where this may involve installation of public utilities for permanent structures, as required by construction activities which follow property transfer.	Any breaching or alteration of the cover post-transfer will be conducted in compliance with the Covenant(s) to Restrict Use of the Property, Quitclaim Deed(s), and the Parcel B risk management plan, all of which will be reviewed and approved by the regulatory agencies.
3	Incomplete discovery, or fluid migration, is an unspecified source of potentially irradiated soil vapors which could become trapped within a permanent structure, to become a source of future hazard exposure where earthquake damage occurs.	The remedy components (for example, covers) at Parcel B will be designed to withstand earthquakes in accordance with California state laws (California Code of Regulations Title 22 Section 66264.310[a][5]). In addition, the operation and maintenance plans for the covers will include provisions for repairs to follow an earthquake, also in accordance with state law (California Code of Regulations Title 22 Section 66264.310[b][1]).

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by J.V. McCarthy received by email on July 31, 2008		
Comment Number	**Comment**	**Response**
4	Other vapors, such as mercury or methane, could be a source of future exposure which by impact from a radiation source could further complicate subsurface toxicologies available for any “cover” breaching.	Remedies are proposed for the methane and mercury sources in the Revised Proposed Plan. These remedies will address the risk to human health and the environment from these sources. Further, time-critical removal actions (TCRA) are being conducted to address these sources. The use of TCRAs allows the Navy to get an early start on cleanup of these newly identified sources. Although the TCRAs may not be completed by the time the amended ROD is signed, the Navy anticipates that the TCRAs will meet the cleanup objectives described in the proposed plan. After the TCRAs are completed, the Navy will evaluate the need for additional response actions.
5	Consequences from potential long-term exposure of foundation piers to any unspecified radioactivity, in combination with other chemistry, not only puts any construction at structural risk but introduces risk of “cover” breaching exposure.	IR Sites 7 and 18 and the pump shaft beneath Building 140 are the only areas on Parcel B that may be transferred with potential radioactive contamination in place below protective covers and it is anticipated that foundation piers will not be require there. Additionally, institutional controls will be placed, inspected, and enforced for IR Sites 7 and 18 to ensure the continued integrity of the protective covers and allow proper control of any activities that would penetrate the cover. Further, filling the shaft beneath Building 140, and sealing the top with a concrete cap will provide a secure barrier against exposure to any radionuclides that may be present in the shaft.
6	The basic issues cited for “Parcel G”, per notice to Congresswoman N. Pelosi and Supervisor A. Peskin also apply to Covenant Restriction for “Parcel B” (refer to the following page with items # 1.- 10.)	The Navy does not have a copy of this notice and cannot respond. However, the Navy team is aware of and is ensuring that there is consistency between land use restrictions being considered and developed for the different parcels.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by J.V. McCarthy received by email on July 31, 2008		
Comment Number	**Comment**	**Response**
Introduction to items 1-10	How inappropriate is a linking of "Candlestick Park" development with Hunter's Point Shipyard reuse? If "Parcel 49" of the former Hunter's Point Shipyard is to be considered fit for new stadium construction, the potential liability is worth more than a passing glance. A deferral or covenant agreement required as the waiver to federal conditions of the city's exclusive discretion, to federal conditions in transfer, is specified from CERCLA 120 h(3)(C). This is because the environmental remediation is not without conditions. No matter what the political priorities, the land speculation, or the wishful thinking, parcel areas requiring this kind of covenant agreement will remain so for good reasons (refer to CLEAN II, Department of the Navy, 09/04/98, HPS). "Parcel 49" is not exempt. The local SF CUPA or HAZMAT agency, the involved state agencies, and the title insurance people will all have serious obligations and concerns to be maintained.	A new San Francisco 49ers stadium had been proposed for Parcel G (formerly Parcel 49). This ROD is for Parcel B. Therefore, this comment will be forwarded to the Navy Remedial Project Manager (RPM) for consideration in the Parcel G remedy selection process. The draft Parcel G ROD is scheduled for submittal on August 29, 2008.
Item 1	Subparcels S-28, S-29, S-38, and S-39 are co-located where "Parcel 49", formerly in Parcel D, has been proposed. All are cited for sandblast waste and radioactive materials, at least some of which are likely to have been left from "Operation Crossroads" (1946-1947, see "Historical Radiological Assessment", 2004).	This is the Responsiveness Summary for Parcel B, not D; therefore, this comment will be forwarded to the Navy RPM for consideration in the Parcel G remedy selection process. The draft Parcel G ROD is scheduled for submittal on August 29, 2008.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by J.V. McCarthy received by email on July 31, 2008		
Comment Number	**Comment**	**Response**
Item 2	It is unlikely that the maximum extent of excavation in the foreseeable future, as sponsored by the Navy, will go any farther than the inconclusive excavation, to be capped, for IR-07 and IR-18 of Parcel B where the radiation at depth will go unresolved. Consider the implications in D for S-28, S-29, S-38, and S-39.	IR Sites 7 and 18 include a large area (about 13 acres) of fill that is also very deep (approximately 45 feet in some locations). This area has "unlikely" potential for radioactive contamination according to the Hunters Point HRA. Identification of buried radionuclides through subsurface testing would be very difficult, and if radioactivity is present it would be very limited and not spread throughout the sites. The excavation of the entire area of fill would also be very difficult because of presence of groundwater. Upon evaluation of these factors, the Navy proposed that removal would not be the preferred alternative for IR Sites 7 and 18. After considerable review by the Navy and regulatory agencies, it was proposed that a radiological surface scan of IR Sites 7 and 18 with removal of any contamination in the top 12 inches followed by a 2-foot-thick soil cover will effectively prevent exposure to any radionuclides that may be present in the subsurface soil. Additionally, it was proposed that institutional controls will be placed, inspected, and enforced for IR Sites 7 and 18 to ensure the continued integrity of the covers and allow proper control of any activities that would penetrate the cover. Please also see the Responsiveness Summary in the Parcel G ROD, to be issued on August 29, 2008, for a discussion of Parcel D.
Item 3	The materials applied for support piers to penetrate landfill are likely to be what is planned for building foundation support, as under the cap required for "Parcel 49" remediation.	Please see the Responsiveness Summary in the Parcel G ROD, to be issued on August 29, 2008.
Item 4	The materials within Type II or Type V cement are likely to be sheathed in polyethylene, which could be degraded to penetration, seepage, and breaching by subsurface exposure to radiation, at depth over time.	Materials used during remediation, including the cover material, will be selected during the remedial design phase of the project and will be constructed to be robust and persistent over time. However, the protectiveness of the remedy will be evaluated at least every 5 years to ensure it remains protective. These 5-year reviews are required by law and will include any new information that may become available in the future.
Item 5	Where exposed, although the Type II cement is more flexible it is also more readily penetrated. Type V cement is more resistant, from greater density, although less flexible.	Please see the response to Item 4 above.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by J.V. McCarthy received by email on July 31, 2008		
Comment Number	**Comment**	**Response**
Item 6	In considering the seismic safety prospects, on top of bay mud, would you care to insure or invest in this site if adequate information about all the unknown factors were available, which could be more?	The remedy components (for example, covers) at Parcel B will be designed to withstand earthquakes in accordance with California state laws (California Code of Regulations Title 22 Section 66264.310[a][5]). In addition, the operation and maintenance plans for the covers will include provisions for repairs to follow an earthquake, also in accordance with state law (California Code of Regulations Title 22 Section 66264.310[b][1]).
Item 7	Much of the suggested potential for discovery, at depth, ("Historical Radiological Assessment", 2004) is likely to be awaiting survey and investigation beyond transfer dates of parcels, from the Navy to the city.	IR Sites 7 and 18 include a large area (about 13 acres) of fill that is also very deep (approximately 45 feet in some locations). This area has "unlikely" potential for radioactive contamination according to the Hunters Point HRA. Identification of buried radionuclides through subsurface testing would be very difficult, and if radioactivity is present it would be very limited and not spread throughout the sites. The excavation of the entire area of fill would also be very difficult because of presence of groundwater. Upon evaluation of these factors, the Navy proposed that removal would not be the preferred alternative for IR Sites 7 and 18. After considerable review by the Navy and regulatory agencies, it was proposed that a radiological surface scan of IR Sites 7 and 18 with removal of any contamination in the top 12 inches followed by a 2-foot-thick soil cover will effectively prevent exposure to any radionuclides that may be present in the subsurface soil. Additionally, it was proposed that institutional controls will be placed, inspected, and enforced for IR Sites 7 and 18 to ensure the continued integrity of the covers and allow proper control of any activities that would penetrate the cover.
Item 8	The gas seepage from landfills may or may not be chemically bonded to or as a contaminant, which could become an airborne source of contamination available across the shipyard and elsewhere as a contingency.	There are no landfills present on Parcel B. However, the area containing IR Sites 7 and 18 is a fill area with documented methane gas. A remedy is proposed for the methane source area in the Revised Proposed Plan. This remedy will address the risk to human health and the environment from this source. Further, a time-critical removal action (TCRA) is being conducted to address this source. The use of TCRAs allows the Navy to get an early start on cleanup of this source area. Although the TCRA may not be completed by the time the amended ROD is signed, the Navy anticipates that the TCRA will meet the cleanup objectives described in the proposed plan. After the TCRA is completed, the Navy will evaluate the need for additional response actions.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by J.V. McCarthy received by email on July 31, 2008		
Comment Number	**Comment**	**Response**
Item 9	Geological survey is understood to be incomplete, at depth, and is likely to remain incomplete beyond transfer dates of parcels, from the Navy to the city.	For a discussion of IR Sites 7 and 18, please see the response to Item 7 above. Regarding the remainder of Parcel B, the Navy has conducted investigations, with regulatory oversight, at areas where past Navy activities may have impacted the parcel. Extensive remediation has been conducted, and more is planned, in these areas with the goal of reducing risk from past Navy contamination, and making the parcel safe for human health and the environment.
Item 10	Parcels transferred, such as Parcel A or subsequent transfers, could become a subject of future litigation resulting from covenant breach or prior cases.	The remedies proposed in the Parcel B proposed plan, and detailed in this amended ROD, address all contamination at Parcel B that resulted from past Navy activities. After all the proposed actions are conducted and operation and maintenance and ICs are implemented, the actions proposed will be protective of human health and the environment and comply with all requirements of CERCLA and the NCP.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by Michael F. McGowan, Arc Ecology, received by email on August 1, 2008		
Comment Number	**Comment**	**Response**
1	The use of the term "cleanup" is unfortunate because it leads to expectations on the part of the public that contaminants will be removed from the site when, in fact, there are many alternative methods available for remediation of the site and a cover is the principal method proposed at Parcel B. Please change the wording in this and future documents to more accurately describe the process as remediation and more precisely describe the approach as excavation, chemical or biological treatment, or other method to achieve protection of human health and the environment. Alternatively, clearly define cleanup to mean a variety or combination of remediation methods and provide the definition conspicuously at the beginning of documents so the public is not surprised to learn that a cleanup proposed by the Navy is not what the public thinks a "cleanup" is.	The amended ROD was revised to use the term "remediation" instead of "cleanup."
2	Some of the proposed methods such as biological or chemical treatment are still in the experimental stage and may not be cost effective. This uncertainty in their efficacy, or even if they will be used, should be acknowledged in the plan and the alternative methods to accomplish remediation should be specified if, in fact biological or chemical in situ methods are not used.	Treatability studies using the proposed in situ biological and chemical treatment technologies have been conducted at or adjacent to Parcel B and shown to be effective.
3	Presentation of risk in terms of different exposure scenarios dependent on proposed uses by redevelopment block is confusing because it seems to imply that areas other than residential would be left more contaminated and riskier than the areas designated for residential use. This opens the question, what if future development plans call for residences on the areas now designated industrial or open space? If the proposed remedies will render risks less than 1 in 1 million for cancer and a Hazard Index of less than or equal to 1 for other impacts over the entire parcel for a residential risk scenario, then the Proposed Plan should state this. If the remediation in some areas will not achieve residential exposure standards then this should be clearly stated, too, because the public has clearly expressed a desire for the shipyard to be "cleaned" to "residential standards."	The goal of the remedial action at Parcel B is to protect human health and the environment to the standards set by the federal and state regulatory agencies. All of Parcel B will be covered to protect all users from exposure to surface soil regardless of future land use. After all the proposed actions are conducted and operation and maintenance and ICs are implemented, the actions proposed will be protective of human health, and areas proposed for reuse other than residential (e.g. recreational) will not present more risk.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by Michael F. McGowan, Arc Ecology, received by email on August 1, 2008		
Comment Number	**Comment**	**Response**
4	The plan assumes a great deal of background information that was presented in Remedial Investigations, Feasibility Studies, Time Critical Removal Action Reports, Five Year Reviews, and others, but it only refers to them briefly in the section on the Administrative Record. Please provide an annotated bibliography of these and other key supporting documents to guide those who would like to review the administrative record but are not necessarily familiar with the relevant contents of CERCLA documents.	Descriptions of past activities and background information are summarized in the amended ROD, as well as in the previous Technical Memorandum in Support of a ROD Amendment. Both documents are available at the information repositories for review by the public. A list of documents from the Administrative Record Index, pertinent to the remedy decision for Parcel B, will be included in the amended ROD as Attachment A.
5	On page 9 the second Remedial Action Objective states that the lifetime cancer risk should not exceed the 10^{-6} to 10^{-4} range for future use scenarios. It is our understanding that at Hunters Point the risk must be 10^{-6} or lower. Please correct or clarify this risk range for radiologically impacted soil and structures.	The second remedial action objective (RAO) listed on page 9 of the proposed plan, which refers to a lifetime cancer risk of 10^{-6} to 10^{-4}, is already listed under the heading "Radiologically Impacted Soil and Structures." For non-radiological chemicals, the risk must be at or below 10^{-6}. This is stated in the last sentence of the third paragraph on page 6.
6	Long term effectiveness and permanence of the remediation should be evaluated for a time period of at least 100 years and should take into consideration likely changes in existing conditions such as a sea level rise of more than three feet over that period. The maps of 100 year flood plains are being revised and estimates of sea level rise as a result of global climate change get revised upwards whenever new data or better models are introduced. Please acknowledge that this was considered in evaluating remedial alternatives or that it will be addressed in the Remedial Design.	The remedy components at Parcel B will be designed to consider the potential for rising sea level. For example, the top of the shoreline revetment will be sufficiently above sea level (about 13 to 15 feet) to account for a potential future rise in sea level. In addition, changes in site conditions, such as a rise in sea level, will be addressed during future 5-year reviews which address changes in site conditions and recommend modifications to the remedy if necessary to protect human health and the environment.
7	Children are more vulnerable to radiation in the soil than adults because, in part, their internal organs are only about one-third as far from the ground when standing and more likely to be right next to the ground when crawling or playing. Please confirm that the radiological risk calculations considered these differences that make children more sensitive receptors to radiation than adults.	As documented in Appendix A of the Technical Memorandum in Support of a Record of Decision Amendment, Radiological Addendum, the radiological risk calculations were performed using the residual radioactivity (RESRAD) model (for soils) and RESRAD-BUILD (for buildings). The receptors considered were: resident (adult), resident (child), industrial worker, recreational (adult), recreational (child), and construction worker. The following pathways were evaluated for each of the receptors: external exposure, inhalation, ingestion, and drinking water.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by Michael F. McGowan, Arc Ecology, received by email on August 1, 2008		
Comment Number	**Comment**	**Response**
8	Ecology-specific comments. Considering that Parcel B has a considerable shoreline on San Francisco Bay the treatment of ecological exposure to contaminants is very brief and incomplete and should be expanded and clarified.	Please refer to the responses below.
8a	On page 6, "The SLERA concluded that …chemicals in shoreline sediment including several metals, pesticides, and PCBs may pose risk to organisms that live along the shoreline." The alternatives only mention removal of lead, mercury, and organic chemicals. They do not include aluminum, copper, and zinc that are listed in Table 4 as chemicals of concern. Please explain how the environment will be protected from these and other chemicals of concern in addition to those specifically listed in the description of the alternatives.	The shoreline revetment will provide protection from all the chemicals in shoreline sediment that are of concern for ecological receptors.
8b	Page 8 Groundwater bullet 4 states that the Remedial Action Goal for groundwater is to prevent or minimize the migration to surface water of San Francisco Bay of chromium VI above 50 ug/L, copper above 28.04 ug/L, lead above 14.44 ug/L, and mercury above 0.6 ug/L. What is the basis for these values and why weren't they included in Table 5 or in a separate table of preliminary remediation goals for ecological receptors?	The values for copper, lead, and mercury are based on the Hunters Point groundwater ambient levels for these chemicals. The value for chromium VI is based on the criterion in Table 3-3 of the Water Quality Control Plan for the San Francisco Bay Basin prepared by the San Francisco Bay Regional Water Quality Control Board. These values are applicable to surface water, not groundwater, and therefore were not included in Table 5. The need for remediation of groundwater to protect the beneficial uses of the bay, including ecological receptors, will be established based on the trigger level analysis that will be conducted during the remedial design. Section 7.3 of the amended ROD discusses the use of trigger levels in more detail.
8c	Page 7 states that "Ecological RAOs were developed only for soil and sediment in shoreline areas." Does this mean that ecological RAOs for soil and sediment were developed only for shoreline areas? What about ecological risks to songbirds or earthworms or other organisms away from the shoreline?	RAOs were developed only for the shoreline area. The majority of Parcel B, approximately 75 percent, is covered by pavement and buildings. With little open space for flora and fauna, Parcel B is considered to have insignificant habitat value and poses an insignificant risk to terrestrial ecological receptors. Exposure pathways to terrestrial species are incomplete because of a lack of habitat and the predominance of paved areas at Parcel B.

Amended Proposed Plan for Parcel B, Hunters Point Shipyard		
Written Comments by Michael F. McGowan, Arc Ecology, received by email on August 1, 2008		
Comment Number	**Comment**	**Response**
9	ARARS. Page 15 states that the significant potential ARARs listed in Attachment 1 will be met by the preferred alternatives. It is my understanding that an Applicable or Relevant and Appropriate Regulation is by definition significant and must be complied with by the remediation alternative. Please confirm that all ARARs will be complied with including those considered most significant that are listed in Attachment 1.	All applicable or relevant and appropriate requirements (ARAR) will be met by the proposed remedial actions, including those listed on Attachment 1 of the proposed plan.
10	The time period between the end of the comment period and the issuance of the Record of Decision seems very brief to fully respond to comments from the public. This is especially true considering that many comments are likely to be submitted near the end of the period and that weekend days and the need for any internal reviews by the Navy legal authorities substantially reduce the actual work days available to respond to comments. Furthermore, the revised (corrected) Proposed Plan was not released to the public until just before the public meeting in the middle of the nominal review period. Community acceptance is one of the nine CERCLA criteria for a remedial design so responses to community comments should be done thoroughly and completely, not rushed to meet a self-imposed timeline. Please respond to this concern for Parcel B, which already has a ROD that was developed over a longer time frame, and keep it in mind for other parcels such as D and G that have not had the same amount of time for the public to consider proposed cleanup alternatives.	The Navy has considered and responded to all comments received during the public comment period on the Proposed Plan. The Navy works together with the regulatory agencies during each step to complete the cleanup of Parcel B according to all applicable laws to protect human health and the environment. The Navy develops schedules for cleanup in coordination with both the regulatory agencies and the public (through the RAB). The schedule for transfer of Parcel B will not affect the completeness or effectiveness of the cleanup. The changes made to between the Proposed Plan and the Revised Proposed plan were minor in nature and did not involve or affect the information that the Navy is relying upon to make its remedy selection decision. Specifically, Figure 4 was inadvertently omitted, Figure 5 was printed in place of Figure 4, and Figure 7 was duplicated as Figure 5.