Final

Third Five-Year Review of Remedial Actions

Hunters Point Naval Shipyard San Francisco, California

November 8, 2013

Prepared for:

Department of the Navy
Base Realignment and Closure
Program Management Office West
San Diego, California

Prepared by:

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DEPARTMENT OF THE NAVY

REVIEW AND APPROVAL

Project Manager: Timothy E. Mower Date: November 8, 2013

Tim Mower, TriEco-Tt

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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
§	Section
AFA	AFA Construction Group
ARAR	Applicable or relevant and appropriate requirement
Arcadis	Arcadis U.S., Inc.
ARIC	Area requiring institutional controls
AST	Aboveground storage tank
bgs	Below ground surface
BGMP	Basewide groundwater monitoring program
BMP	Best management practice
BRAC	Base realignment and closure
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	Chemical of concern
COPEC	Chemical of potential ecological concern
CRUP	Covenant to restrict use of property
cy	Cubic yard
DoD	U.S. Department of Defense
DTSC	Department of Toxic Substances Control
EBS	Environmental baseline survey
EEC	Eagle Environmental Construction
EPA	U. S. Environmental Protection Agency
ERA	Ecological risk assessment
ERM-West	Environmental Resources Management-West
ERRG	Environmental/Remediation Resources Group, Inc.
ESD	Explanation of significant differences
FFA	Federal facility agreement
FOST	Finding of suitability to transfer
FS	Feasibility study
GMP	Gas monitoring probe
HHRA	Human health risk assessment
HLA	Harding Lawson Associates

ACRONYMS AND ABBREVIATIONS (CONTINUED)

HPAL	Hunters Point ambient level
HPNS	Hunters Point Naval Shipyard
HRA	Historical radiological assessment
IC	Institutional control
Insight	Insight Environmental, Engineering, and Construction, Inc.
IR	Installation Restoration
ITSI	Innovative Technical Solutions, Inc.
KCH	CH2M Hill Kleinfelder Joint Venture
LFR	Levine-Fricke-Recon
LLRW	Low-level radioactive waste
LUC	Land use control
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	Maximum contaminant level
MNA	Monitored natural attenuation
msl	Mean sea level
NAPL	Nonaqueous phase liquid
NAVSEA	Naval Sea Systems Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDMA	n-Nitrosodimethylamine
NMOC	Nonmethane organic compound
NPL	National Priorities List
NRDL	Naval Radiological Defense Laboratory
O&M	Operation and maintenance
OTIE	Oneida Total Integrated Enterprises, Inc.
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
pCi/L	PicoCuries per liter
ppmv	Part per million by volume
PRC	PRC Environmental Management, Inc.
RACR	Remedial action completion report
RAMP	Remedial action monitoring plan
RAO	Removal action objective
RAWP	Remedial action work plan

ACRONYMS AND ABBREVIATIONS (CONTINUED)

RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RI	Remedial investigation
RMP	Risk management plan
ROD	Record of decision
SARA	Superfund Amendments and Reauthorization Act
Sealaska	Sealaska Environmental Services LLC
SES-TECH	SES-TECH Remediation Services, Inc.
SFRA	San Francisco Redevelopment Agency
Shaw	Shaw Environmental, Inc.
SLERA	Screening-level ecological risk assessment
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
SWRCB	State Water Resources Control Board
TBC	To be considered
TCE	Trichloroethene
TCRA	Time-critical removal action
Tetra Tech	Tetra Tech EM Inc.
Tetra Tech EC	Tetra Tech EC, Inc.
Tetra Tech FW	Tetra Tech FW, Inc.
TMSRA	Technical memorandum in support of a ROD amendment
TPH	Total petroleum hydrocarbons
Triple A	Triple A Machine Shop, Inc.
UCSF	University of California, San Francisco
URS	URS Corporation
UST	Underground storage tank
VOC	Volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board
ZVI	Zero-valent iron

EXECUTIVE SUMMARY

This report presents the third five-year review of remedial actions conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at Hunters Point Naval Shipyard (HPNS) in San Francisco, California. The review was conducted in accordance with the Navy and Marine Corps *Policy for Conducting CERCLA Statutory Five-Year Reviews* (Department of the Navy [Navy] 2011b) and the U.S. Environmental Protection Agency's (EPA) *Comprehensive Five-Year Review Guidance* (EPA 2001, 2011, 2012).

This five-year review includes document and data review, site inspections, personnel interviews, regulatory agency comments, and report development. The purpose of this review is to evaluate the performance of the remedies implemented at HPNS to verify that they remain protective of human health and the environment. The review is documented in this five-year review report that will state whether each remedy is or will be protective, document any deficiencies identified in the review, and recommend actions for improvement if the remedy has not performed as designed.

This statutory five-year review is required by, and conducted according to, CERCLA Section (§) 121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at Title 40 *Code of Federal Regulations* (CFR) § 300.430(f)(4)(ii) because the selected remedies will not reduce contaminant concentrations to levels allowing unlimited use and unrestricted exposure, and because records of decision (ROD) were signed after October 17, 1986. The trigger date for this five-year review is the date of the second five-year review, November 11, 2008 (Jonas and Associates 2008).

HPNS is a closed military base located in southeastern San Francisco on a peninsula that extends to the east into the San Francisco Bay. HPNS currently consists of 866 acres: 420 acres on land and 446 acres under water in the San Francisco Bay. The current area does not include former Parcel A (about 75 acres), which has been transferred out of federal ownership. The remaining property is currently divided into 11 parcels, as described below.

In 1992, the Navy divided HPNS into five contiguous parcels (A through E). In 1996, the Navy added a sixth parcel (Parcel F), which encompasses immediately adjacent areas of San Francisco Bay; Parcel F is referred to as the "offshore area." In September 2004, the Navy divided Parcel E into two parcels (Parcels E and E-2) to facilitate closure of the Parcel E-2 landfill and its adjacent areas. In December 2004, the Navy transferred Parcel A to the San Francisco Redevelopment Agency (SFRA). In July 2008, the Navy subdivided Parcel D into four separate parcels (Parcels D-1, D-2, G, and UC-1) and separated the western edge of Parcel C to create Parcel UC-2; these changes were made to expedite closure and transfer of the new parcels. In December 2012, the Navy separated the Crisp Road roadway and adjacent areas of Parcel E to create Parcel UC-3. The UC-series parcels encompass mostly roadways and were created to facilitate the overall transfer and development of HPNS.

RODs have been completed for all parcels, except Parcels E, F, and UC-3. This third five-year review focuses on the parcels where remedial actions have been completed or are under way (Parcels B, C, D-1, D-2, G, UC-1, and UC-2) but includes summary status information for all parcels, except former Parcel A.

The following five-year review summary form provides additional information on the results of the review assessment and the effectiveness of the remedies implemented at HPNS.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION

Site Name: Hunters Point Naval Shipyard

EPA ID: CA1170090087

Region: 9	**State:** California	**City/County:** San Francisco/San Francisco County

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify): Non NPL Status

Remediation status *(choose all that apply)*: ☒ Under Construction ☒ Operating ☐ Complete

Multiple OUs? ☒ Yes ☐ No | **Construction completion date:** varies by parcel

Has site been put into reuse? ☐ Yes ☒ No

REVIEW STATUS

Lead Agency ☐ EPA ☐ State ☐ Tribe ☒ Other Federal Agency – U.S. Navy

Author name: Timothy Mower

Author title: Project Manager/Professional Geologist | **Author affiliation:** TriEco-Tt JV

Review period: 07/2008 to 11/2013

Date(s) of site inspection: 03/01/2013

Type of review:

☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify) ________________

Triggering action:

☐ Actual RA Onsite Construction ☐ Actual RA Start
☐ Construction Completion ☒ Previous Five-Year Review Report
☐ Other *(specify)* ____________________________

Triggering action date: 11/11/2008

Due date (*five years after triggering action date*): 11/11/2013

FIVE-YEAR REVIEW SUMMARY FORM

ISSUES

Summarize issues:

1. Concentrations of mercury in groundwater in two wells at Parcel B (IR26MW49A and IR26MW51A) remain above trigger levels even after removal and stabilization of mercury in soil and bedrock in the area.

RECOMMENDATIONS AND FOLLOW UP ACTIONS:

Summarize recommendations and follow-up actions:

1. Groundwater at wells IR26MW49A and IR26MW51A should continue to be monitored semiannually for mercury to evaluate the trend in mercury concentrations. The mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A should be evaluated.

PROTECTIVENESS STATEMENT(S)

Protectiveness statements are presented below for parcels where some or all of the remedy has been or is in the process of being constructed.

PARCEL B

Installation Restoration (IR) Sites 07/18. The remedy for the portion of Parcel B at IR-07/18 is protective of human health and the environment.

Previous soil removals and durable covers on upland areas and the revetment along the shoreline have achieved the remedial action objective (RAO) of preventing exposure to contaminants, including radionuclides, in soil and sediment. Removal of the methane source has achieved the RAO for methane. Data collected during ongoing groundwater monitoring along the bay margin do not indicate migration of chemicals of concern (COC) at levels that would pose a risk to human health or the environment. The institutional control (IC) performance objectives specified in the amended ROD are being met by access controls until the time of transfer to prevent potential exposure. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and covenants to restrict use of property (CRUP) at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

Remainder of Parcel B. The remedy for the remainder of Parcel B is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

The excavation and off-site disposal of soil was completed in 2010. Likewise, the radiologically related portions of the remedy have been completed, and the California Department of Toxic Substances Control (DTSC) approved an unrestricted release for radionuclides in the remainder of Parcel B (that is, excluding IR-07/18) in 2012. Construction of the remaining components of the remedy, including covers and revetment, operation of the soil vapor extraction system at IR-10, and treatment of groundwater at IR-10, are under way. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

PARCEL C

The remedy for Parcel C is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Soil excavation and off-site disposal, groundwater treatment using lactate injection, and soil vapor extraction (SVE) are under way. Radiological removals are also under way. Construction of the remaining component of the remedy (durable covers) will proceed after the radiological removals have been completed. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

FIVE-YEAR REVIEW SUMMARY FORM

PROTECTIVENESS STATEMENT(S) (CONTINUED)

PARCEL D-1

The remedy for Parcel D-1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

The excavation and off-site disposal of soil was partially completed in 2010. Groundwater treatment using zero-valent iron (ZVI) injection was completed in 2008. Radiological removals are under way. Construction of the remaining components of the remedy (removal of two remaining areas and covers) will proceed after completion of the radiological removals. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

PARCEL G

The remedy for Parcel G is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

The excavation and off-site disposal of soil and removal of soil stockpiles were completed in 2010. Groundwater treatment using ZVI injection was completed at IR-09 and IR-71 in 2008. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel G in 2012. Construction of the remaining component of the remedy (covers) is substantially completed. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

PARCEL UC-1

The remedy for Parcel UC-1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Previous soil removals and durable covers have achieved the RAO of preventing exposure to contaminants in soil. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel UC-1 in 2011. The effective implementation of ICs prevents exposure to any other COCs in soil, soil vapor, and groundwater, as well as prevents activities that could damage the integrity of the remedy. Plans for a soil vapor survey at Parcel UC-1 are in progress. The IC performance objectives specified in the ROD are being met by access controls until the time of transfer to prevent potential exposure. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

PARCEL UC-2

The remedy for Parcel UC-2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Previous soil removals and durable covers have achieved the RAO of preventing exposure to contaminants in soil. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel UC-2 in 2011. Concentrations of volatile organic compounds in groundwater are less than remediation goals or are decreasing. During monitoring of natural attenuation, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

Notes:

COC	Chemical of concern
CRUP	Covenant to restrict use of property
DTSC	Department of Toxic Substances Control
IC	Institutional control
IR	Installation Restoration
RAO	Remedial action objective
SVE	Soil vapor extraction
ZVI	Zero-valent iron

1.0 INTRODUCTION

This report documents the results of the third five-year review conducted for Hunters Point Naval Shipyard (HPNS) in San Francisco, California. The purpose of the third five-year review is to provide an update on the status of remedial actions implemented since the second five-year review, evaluate whether these remedial actions are protective of human health and the environment, and assess the progress of the recommendations made in the second five-year review. This third five-year review report also identifies issues found during this third five-year review and recommendations to address them.

The five-year review applies to all remedial actions selected pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section (§) 121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA § 121(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

This requirement is further interpreted in the NCP, Title 40 *Code of Federal Regulations* (CFR) § 300.430(f)(4)(ii), which states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Consistent with Executive Order 12580, the Secretary of Defense is responsible for ensuring that five-year reviews are conducted at all qualifying U.S. Department of Defense (DoD) cleanup sites. The Department of the Navy is authorized to conduct the five-year review for HPNS in accordance with CERCLA § 121 and the NCP. The Navy, through a contract with TriEco-Tt, conducted a five-year review of the remedial actions implemented at HPNS in San Francisco, California. This review was conducted for all the parcels at HPNS, with a focus on parcels where a remedial action has been taken or is under way. The review was conducted from September 2012 through August 2013. This report documents the results of the review.

This third five-year review includes all the parcels at HPNS. The following list provides the status of parcels within the CERCLA process.

- Remedial actions have been completed or are under way: Parcels B, C, D-1, D-2, G, UC-1, and UC-2

- Remedial design in process: Parcel E-2Record of decision (ROD) in process: Parcels E and UC-3

- Final feasibility study (FS) in process: Parcel F

This third five-year review for HPNS summarizes the significant work conducted by the Navy in collaboration with the regulatory agencies, including the U.S. Environmental Protection Agency (EPA), the California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board, San Francisco Bay Region (Water Board). This review is triggered by the date of the second five-year review, November 11, 2008 (Jonas and Associates 2008).

Five-year reviews are required for HPNS because (1) ongoing and completed remedial actions have left contaminants in place above concentrations that would allow unlimited use and unrestricted exposure, and (2) the decision documents were signed on or after October 17, 1986 (the effective date of the Superfund Amendments and Reauthorization Act [SARA]). The review was conducted in accordance with the following guidance documents:

- Navy and Marine Corps *Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act Statutory Five-Year Reviews* (Navy 2011b).

- EPA *Comprehensive Five-Year Review Guidance* (EPA 2001).

- EPA *Recommended Evaluation of Institutional Controls: Supplement to the "Comprehensive Five-Year Review Guidance"* (EPA 2011).

- EPA *Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews* (EPA 2012b).

Following this introduction, this five-year review report is organized in the following sections:

- Section 2.0, Site Chronology, summarizes the sequence of events at each parcel.

- Section 3.0, Background, describes background information for each parcel, including physical characteristics, land use, contamination history, actions taken before the ROD, and the basis for taking action.

- Section 4.0, Remedial Actions, presents remedial actions implemented in accordance with the RODs.

- Section 5.0, Progress Since Last Five-Year Review, summarizes actions since the 2008 five-year review.

- Section 6.0, Five-Year Review Process, describes the five-year review process, including administrative process, community notification and involvement, document review, data review, site inspections, and interviews.

- Section 7.0, Technical Assessment, presents the analysis of whether the remedies are functioning as intended, whether exposure assumptions and cleanup levels used at the time of the RODs are still valid, and whether any new information has come to light to suggest the remedies may not be protective.

- Section 8.0, Issues, Recommendations, and Follow-up Actions, provides issues and recommended actions based on the technical assessment.

- Section 9.0, Protectiveness Statement, lists the protectiveness statement for each site.

- Section 10.0, Next Review, provides the schedule for the next five-year review.

- Section 11.0, References, lists the documents used to prepare this five-year review report.

Figures and tables are presented after Section 11.0. Appendices containing supporting information are presented following the figures and tables. Appendix A contains the interview forms. Appendix B provides responses to comments received on the draft five-year review report. Appendix C contains the bibliography listing documents reviewed in support of this five-year review. Appendix D provides graphs of concentration trends in groundwater that are used as part of the data analysis presented in Section 6.4. Appendix E contains the site inspection checklist. Appendix F provides the photographic log, documenting observations made during the five-year review site inspection. Appendix G contains the presentation made at the June 26, 2013, community meeting describing the five-year review process and the draft five-year review report.

2.0 CHRONOLOGY OF SITES

This section summarizes events in the history of contaminant detection, characterization, and remediation at HPNS. The following table is organized by parcel and presents a summary of major events. Parcel A is no longer Navy property but is included in the table below for completeness.

Event	Date
Basewide	
Navy dry dock and shipyard operations	1939 to 1974
Shipyard deactivated	1974
Triple A Machine Shop lease	1976 to 1986
Navy resumes occupancy	1987
Shipyard enters the Base Realignment and Closure (BRAC) program	1988
Shipyard placed on the National Priorities List (NPL)	1989

Event	Date
Basewide (Continued)	
Federal Facility Agreement (FFA) signed	1990
Phase I radiological investigation	1992
Basewide site assessment	1994
Basewide environmental baseline survey (EBS)	1998
First five-year review	December 10, 2003
Historical radiological assessment (HRA)	2004
Basewide action memorandum for radionuclide removal action	April 21, 2006; removals ongoing
Second five-year review	November 11, 2008
Parcel A	
Underground storage tank (UST) S-812 removed	1991
Site inspection	1993
Soil removals	1993 through 1994
Remedial investigation (RI), including a human health risk assessment (HHRA) and ecological risk assessment (ERA)	1995
Record of decision (ROD) (no further action)	November 16, 1995
Parcel A deleted from NPL	1999
Finding of suitability to transfer (FOST)	October 2004
Transfer to San Francisco Redevelopment Agency (SFRA)	December 2004
Parcel B	
Two USTs and seven aboveground storage tanks (AST) removed	1991 to 1993
Preliminary assessment	1994
RI	1996
Feasibility study (FS)	1996
Exploratory excavation soil removals	1996
ROD (soil excavation and off-site disposal; groundwater monitoring; institutional controls [IC])	October 7, 1997
Remedial action, phase I excavations	July 1998 to September 1999
First explanation of significant differences (ESD)	October 1998
Remedial action, phase II excavations	May 2000 to December 2001
Second ESD	May 2000
Groundwater monitoring indicates more extensive contamination	2001
Groundwater treatability studies:	
Soil vapor extraction (SVE) at Installation Restoration (IR) Site 10 (IR-10)	June 2000 to September 2002
Zero-valent iron (ZVI) injection at IR-10	September 2003 to March 2004

Event	Date
Parcel B (Continued)	
Technical memorandum in support of a ROD amendment (TMSRA), including an updated HHRA	December 2007
Removal actions for methane source at IR-07 and mercury source at IR-26	August to October 2008
Amended ROD (excavation, covers and revetment for soil; SVE; treatment and monitored natural attenuation [MNA] for groundwater; ICs)	January 26, 2009
Final remedial design (RD) for IR-07/18	January 2010
Remedial action at IR-07/18 (covers and revetment)	June 2010 to September 2011
Final remedial action completion report (RACR) for IR-07/18	May 2012
Final operation and maintenance (O&M) plan for IR-07/18	October 2012
Final RD for the remainder of Parcel B	December 2010
Revised final land use control (LUC) RD for remainder of Parcel B	July 2011
Amendment to final RD for the remainder of Parcel B (revetment revisions)	September 2012
Remedial action start for remainder of Parcel B	November 2012
Parcel C	
28 USTs removed or closed in place	1991 to 1993
Sandblast waste collected and removed	1991 to 1995
Preliminary assessment and site inspection	1994
Exploratory excavation soil removals	1996 to 1997
RI	1997
FS (draft and draft final)	1998
Risk management review	1999
Soil removal; subsurface fuel and steam line removals	2001 to 2002
Groundwater treatability studies:	
SVE at Buildings 134, 211/253, 231, 251, and 272	2001 to 2002
Potassium permanganate injection at Building 253	2001
ZVI injection at Building 272	2002
Sequential anaerobic and aerobic biodegradation at Building 134	2004 to 2005
ZVI injection at Building 272 follow-on	2004 to 2005
Final FS	July 2008
ROD (excavation, SVE, and covers for soil; treatment and MNA for groundwater; ICs)	September 30, 2010
Radiological removals begin	November 2010
Pre-design groundwater characterization	2010 to 2012
Additional groundwater treatability studies:	
Anaerobic bioremediation at Building 253	June 2009 to June 2010
ZVI injection at Building 134	May 2010 to April 2011

Event	Date
Parcel C (Continued)	
Final RD	October 2012
Final remedial action work plans (RAWP) for groundwater	March 2013
Remedial action start for remedial unit C2	March 2013
Parcel D-1	
Soil contaminated with polychlorinated biphenyls (PCB) removed at IR-08	1989
Nine USTs removed and one closed in place; three ASTs removed	1991 to 1993
Sandblast waste collected and removed	1991 to 1995
Preliminary assessment and site inspection	1994
Contaminated equipment and residue removed at IR-09, pickling and plating yard	1994 to 1996
RI	1996
Exploratory excavation soil removals	1996 to 1997
FS	1997
Risk management review	1999
Soil removal; subsurface fuel line removals	2000 to 2001
Revised FS	2002
Soil stockpile inventory and removal of nine stockpiles	2003 to 2004
Final revised FS	November 2007
Groundwater treatability study, ZVI injection	October 2008 to April 2009
ROD (excavation, soil stockpile removal, and covers for soil; treatment and MNA for groundwater; ICs)	July 24, 2009
Removal of pickling vault at IR-09	April to May 2010
Radiological removals begin	August 2010
Final RD	February 2011
Soil excavation and stockpile removals	February to July 2011
Draft RAWP for covers	Expected fall 2013
Parcel D-2	
Parcel created out of a portion of Parcel D to address potential radiological contamination related to Building 813. Area had been moved from Parcel A in 2006. Remaining portions of Parcel D became Parcels D-1, G, and UC-1.	2008
Radiological removal actions	November 2006 to June 2007
Additional radiological removal actions	April 2007 to July 2009
ROD (no further action)	August 9, 2010
Final FOST	March 2012
Parcel E	
Soil contaminated with PCBs removed at IR-08	1989
Floating product removed at IR-03	1991
Eight USTs removed, two USTs closed in place, and 12 ASTs removed	1991 to 1994

Event	Date
Parcel E (Continued)	
Preliminary assessment and site inspection	1994
Sandblast waste collected and removed	1991 to 1995
RI	1992 to 1996
Exploratory excavation soil removals at IR-11/14/15	1996
Sheet pile wall and cap installed at former oil reclamation ponds at IR-03	1996 to 1998
Draft FS	1998
Treatability study, SVE at Building 406	2000 to 2001
Soil removal at IR-08	2001
Wetlands delineation and functions and values assessment	2001 to 2002
Groundwater and shoreline data gaps investigations	2001 to 2002
Removal of bricks and industrial debris from shoreline	2003 to 2004
Soil stockpile inventory and five stockpiles removed from IR-02 southeast and IR-73	2003 to 2004
Soil removals at IR-05, IR-36 west, IR-39, and IR-73	2004
Soil removal for petroleum, PCBs, and radiological contaminants at IR-02 northwest and central areas	2005 to 2007
Removal of soil, metal slag, and debris at IR-02 southeast Metal Debris Reef	2005 to 2007
Groundwater treatability study, ZVI injection at IR-12 and IR-36	2009 to 2010
Radiological removals begin	August 2010
Final FS	August 2012
Proposed plan	February 2013
Draft ROD	July 2013
Parcel E-2	
Solid waste air quality assessment test	1988 to 1989
Intertidal sediment studies	1991 to 1992
Sandblast waste collected and removed	1991 to 1995
RI	1992 to 1996
Phase 1A and 1B ERA	1994 to 1996
Baseline ERA	1997
Sheet pile containment wall and groundwater extraction system installed at landfill area	1997 to 1998
FS	1998
ERA validation study	1999
Interim landfill cap constructed	2000 to 2001
Wetlands delineation and functions and values assessment	2001 to 2002
Landfill gas characterization, lateral extent evaluation, and liquefaction potential evaluation	2002
Landfill gas barrier wall constructed and gas monitoring probes and gas extraction wells installed	2002 to 2003
Characterization of metal slag area	2004

Event	Date
Parcel E-2 (Continued)	
Parcel E-2 created out of a portion of Parcel E to facilitate closure of the landfill and adjacent areas within Parcel E.	2004
Removal of soil, metal slag, and debris at IR-02 Metal Slag Area and Metal Debris Reef	2005 to 2007
Removal of soil for petroleum, PCBs, and radiological contaminants at PCB hotspot area	2005 to 2007
Additional soil removal from PCB hotspot area, mainly bayward of 2005 to 2007 removals	2010 to 2012
Final RI/FS	May 2011
Soil removal for radiological contaminants at the ship shielding area	May to October 2012
ROD (excavation, covers and revetment for soil, groundwater flow barriers, landfill gas removal and treatment, ICs)	November 20, 2012
Parcel F	
RI, including qualitative and quantitative ERA	1996
Draft FS	1998
Validation study to refine the ERA	2000
Shoreline characterization to evaluate contaminant transport offshore	2002
Data gaps investigation	2003
Treatability study for sediment, activated carbon	2006 to 2007
Final FS	April 2008
Removal of wooden piers adjacent to Parcels B and C	January to September 2011
Radiological data gaps investigations	2009 to 2012
Parcel G	
Parcel created out of Parcel D to address potential reuse options for a portion of Parcel D. Remaining portions of Parcel D became Parcels D-1, D-2, and UC-1.	2008
Groundwater treatability study, ZVI injection	October 2008 to April 2009
ROD (excavation, soil stockpile removal, and covers for soil; treatment and MNA for groundwater; ICs)	February 18, 2009
Final RD	October 2010
Revised final LUC RD	January 2011
Soil excavation and stockpile removals	February to July 2011
Remedial action for covers	January to July 2013
Parcel UC-1	
Parcel created out of Parcel D to address potential reuse options (utility corridor) for a portion of Parcel D. Remaining portions of Parcel D became Parcels D-1, D-2, and G.	2008
Radiological removals completed	March 2009 to July 2010
ROD (covers for soil; ICs)	July 24, 2009

Event	Date
Parcel UC-1 (Continued)	
Final RD	December 2010
Remedial action for covers	May to September 2012
Final RACR	February 2013
Final O&M plan	April 2013
Parcel UC-2	
Parcel created out of Parcel C to address potential reuse options (utility corridor) for a portion of Parcel C.	2008
Radiological removals completed	March 2009 to July 2010
ROD (covers for soil; MNA for groundwater; ICs)	December 17, 2009
Final RD	December 2010
Remedial action for covers	May to September 2012
Final RACR	February 2013
Final O&M plan	April 2013
Parcel UC-3	
Radiological removals completed	March to October 2010
Parcel created out of Parcel E to address potential reuse options (utility corridor) for a portion of Parcel E.	2012
Proposed plan	February 2013
Draft ROD	July 2013

3.0 BACKGROUND

This section describes potential threats posed to the public and environment that were identified when the RODs for the various parcels at HPNS were developed. This section facilitates comparison of performances of selected remedies with site conditions the remedies were intended to address. General site conditions and all major cleanup activities for each parcel before its ROD was signed are discussed, including physical characteristics, land and resource use, history of contamination, initial responses, and basis for taking action.

3.1 PHYSICAL CHARACTERISTICS

HPNS is located in southeastern San Francisco on a peninsula that extends to the east into the San Francisco Bay (Figure 1). HPNS currently consists of 866 acres: 420 acres on land and 446 acres under water in the San Francisco Bay. The current area does not include former Parcel A (about 75 acres), which has been transferred out of federal ownership. The remaining property is currently divided into 11 parcels, as shown on Figure 2. The approximate area of each parcel is listed below.

Parcel	Area, in acres
B	54
C	73
D-1	49
D-2	6
E	128
E-2	46
F	451
G	40
UC-1	4
UC-2	4
UC-3	11

3.1.1 Geography

In 1992, the Navy divided HPNS into five contiguous parcels (A through E). In 1996, the Navy added a sixth parcel (Parcel F), which encompasses immediately adjacent areas of San Francisco Bay; Parcel F is referred to as the "offshore area." In September 2004, the Navy divided Parcel E into two parcels (Parcels E and E-2) to facilitate closure of the Parcel E-2 landfill and its adjacent areas. In December 2004, the Navy transferred Parcel A to the San Francisco Redevelopment Agency (SFRA). In July 2008, the Navy subdivided Parcel D into four separate parcels (Parcels D-1, D-2, G, and UC-1) and separated the western edge of Parcel C to create Parcel UC-2; these changes were made to expedite closure and transfer of the new parcels. In December 2012, the Navy separated the Crisp Road roadway and adjacent areas of Parcel E to create Parcel UC-3. The UC-series parcels encompass mostly roadways and were created to facilitate the overall transfer and development of HPNS.

The Navy divided HPNS into smaller areas based on similar historical activities to facilitate investigation and remediation of the site. These areas are known as Installation Restoration (IR-series) sites. Figure 3 shows the locations of the IR- sites.

The Bayview/Hunters Point district of the City of San Francisco lies generally northwest of HPNS. About 100,000 people live in the three ZIP codes (94107, 94124, and 94134) nearest to HPNS (Navy 2011a).

3.1.2 Topography

The topography of HPNS is characterized by a central hill (former Parcel A) and surrounding areas extending radially out to the San Francisco Bay. Ground surface elevations for the current parcels range from about 30 to 60 feet above mean sea level (msl) near their landward edges and slope down to msl as they meet the bay. Large areas of HPNS are flat lowlands with elevations of about 10 to 15 feet above msl where most of the base roads, buildings, and operating areas were built. The Navy created most of the dry land portion of HPNS in the 1940s by excavating the hills surrounding the shipyard and using the resulting spoils to expand the shoreline into San Francisco Bay. Some additional shoreline filling operations continued into the 1960s.

Most of the shoreline at HPNS is constructed seawalls or dry docks. The shorelines at portions of the Parcel B, most of Parcel E, and all of Parcel E-2 are either unimproved or partially to completely covered by revetments which range from engineered riprap to informally placed concrete rubble and debris. Most upland areas that are not paved or covered by buildings support a ruderal habitat characterized by scattered to moderately dense growths of grasses and shrubs. Small wetland areas exist in intertidal areas at Parcels E and E-2 and in limited inland areas in the panhandle of Parcel E-2 (Navy 2012; ERRG 2012b).

Environmentally sensitive areas. Shoreline and offshore areas at HPNS are considered environmentally sensitive areas, and effects to ecological receptors in these areas are considered during risk assessments. The small wetland areas that exist within the intertidal zone and in limited inland portions of Parcel E-2 are also environmentally sensitive areas.

3.1.3 Hydrostratigraphy

The hydrostratigraphic units at HPNS include (1) the A-aquifer, (2) the B-aquifer, and (3) the bedrock water-bearing zone. An aquitard composed of the Bay Mud separates the A-aquifer from the B-aquifer across most of HPNS. General descriptions of the hydrostratigraphic units at HPNS are presented below.

The **A-aquifer** primarily consists of heterogeneous Artificial Fill but may also include (1) Undifferentiated Upper Sands; (2) sandy units within the Bay Mud; and (3) the upper weathered bedrock zone, where the A-aquifer directly overlies bedrock. The A-aquifer covers most of HPNS and ranges in thickness from a few feet to more than 50 feet. The A-aquifer is generally unconfined throughout most of HPNS, but semi-confined conditions may exist in places where fine-grained sediments below the water table overlie more permeable materials. Depth to groundwater ranges from about 5 to 20 feet below ground surface (bgs), with an average depth to groundwater of approximately 10 feet bgs.

Bay Mud acts as an aquitard that typically separates the A-aquifer from the underlying B-aquifer. The Bay Mud deposits consist of highly plastic clay to sandy clay and generally thicken from 0 feet near the historical shoreline to more than 50 feet thick near the bay margin. The Bay Mud aquitard is absent in several locations across HPNS and in areas of bedrock highs.

The **B-aquifer** consists of Undifferentiated Sediments, in a sequence of relatively thick (about 30 to 40 feet), laterally continuous layers of sand and silty and clayey sand, which are separated by laterally continuous layers of silt and clay. The lower portions of the B-aquifer are overlain by layers of silts and clay; therefore, it is less likely to be affected by contamination from site activities. The uppermost B-aquifer generally corresponds to the upper 20- to 40-foot-thick layer of sand and silty sand of Undifferentiated Sedimentary deposits. The B-aquifer is generally confined by the Bay Mud aquitard, which separates it from the A-aquifer across most of HPNS. In areas where the aquitard is absent, the A- and B-aquifers are in hydraulic communication and behave as a single aquifer.

Deeper portions of saturated fractured bedrock that are not in direct contact with the A- or B-aquifers are hydrostratigraphically classified as the **bedrock water-bearing zone**. The fractured, unweathered bedrock is not considered an aquifer because of its limited flow capability and low storage capacity.

Primary sources of recharge for the A-aquifer are infiltration of precipitation and runoff, leakage from utility supply lines, intrusion of bay water, horizontal flow of groundwater from upgradient areas, and vertical flow of water from the B-aquifer. The primary sources of recharge for the B-aquifer include infiltration of precipitation and runoff and horizontal groundwater flow from upgradient areas. The bedrock water-bearing zone likely discharges into the B-aquifer at upgradient contacts and is recharged by infiltration of precipitation at landward outcrop areas.

3.1.4 Basis for Taking Action

Chemicals of concern (COC) in soil, sediment, soil gas, and groundwater pose potentially unacceptable risk to human health and the environment at HPNS. Table 1 lists these COCs and contaminated media. Table 1 includes COCs estimated to pose a risk for carcinogens greater than 10^{-6} or for noncarcinogens a hazard index greater than 1. Significant exposure pathways that resulted in the highest levels of risk to human health include exposure to metals and organic chemicals (especially polycyclic aromatic hydrocarbons [PAH] and polychlorinated biphenyls [PCB]) in soil and exposure to volatile organic compounds (VOC) in soil gas (from either soil or groundwater) via vapor intrusion into indoor air. Exposure to radionuclides in soil or structures via direct radiation or windblown dust and exposure to VOCs in groundwater if used for domestic use also resulted in potentially unacceptable risks. Exposure to metals, PAHs, PCBs, and pesticides in shoreline sediment resulted in the highest levels of risk to ecological receptors.

3.2 LAND AND RESOURCE USE

Past and present land uses. The shipyard was owned and operated by Bethlehem Steel as a commercial dry dock facility until 1939, when the Navy purchased the property. Quays, docks, and support buildings were built on an expedited wartime schedule to support the shipyard's mission of fleet repair and maintenance (Naval Sea Systems Command [NAVSEA] 2004). After the end of World War II, the Navy used the berthing facilities at HPNS for ships returning from the Pacific. By 1951, HPNS shifted from operating as a general repair facility to specializing in submarine maintenance and repair. However, the Navy continued to operate Pacific Fleet carrier overhaul and ship maintenance repair facilities at HPNS through the 1960s. In addition to these shipyard operations, the Naval Radiological Defense Laboratory (NRDL) occupied buildings at HPNS during the 1950s and 1960s to conduct practical and applied research on radiation decontamination methods and on the effects of radiation on living organisms and natural and synthetic materials. The NRDL ceased operations in 1969 (NAVSEA 2004). Use of HPNS began to decline steadily in the late 1960s and early 1970s, and HPNS was disestablished as an active Naval facility in 1974 (NAVSEA 2004).

In 1976, the Navy leased 98 percent of HPNS to a private ship repair company, Triple A Machine Shop, Inc. (Triple A). Triple A leased the property from July 1, 1976, to June 30, 1986. During the lease period, Triple A used dry docks, berths, machine shops, power plants, various offices, and warehouses to repair commercial and Navy vessels. Triple A also subleased portions of the property to various other businesses. In 1986, the Navy resumed occupancy of HPNS. Many of the subtenants under Triple A's lease remained tenants under the Navy's reoccupancy in 1986. Triple A vacated the property in March 1987. Only a few tenants remain at HPNS, primarily the San Francisco Police Department (Parcel E) and an artist colony (Parcel B).

Various industrial activities at HPNS, including shipbuilding and repair, metal working, degreasing, painting, foundry operations, radiological research, and other industrial operations have resulted in a broad distribution of chemicals in soil and groundwater. These chemicals include VOCs; semivolatile organic compounds (SVOC) including PAHs, PCBs, and pesticides; total petroleum hydrocarbons (TPH); metals; and radionuclides.

Future land uses. The original redevelopment plan developed by SFRA in 1997 divided HPNS into reuse areas (SFRA 1997). The reuse areas included residential, educational and cultural, maritime and industrial, mixed use, open space, and research and development uses. SFRA issued an amended reuse plan in 2010 that incorporated "land use districts" in the subdivision of HPNS. Principal uses within these land use districts include residential; institutional; retail sales and services; office and industrial; multi-media and digital arts; athletic and recreational facilities; civic, arts, and entertainment; parks and recreation and other open space uses (SFRA 2010).

Surface water and groundwater use. No permanent surface water features exist at HPNS. Surface water runoff flows to nearby San Francisco Bay or percolates through the soil. Groundwater beneath HPNS is not currently used for drinking water, irrigation, or industrial supply. Drinking water is supplied to HPNS by the City and County of San Francisco through its municipal supply from the Hetch Hetchy watershed in the Sierra Nevada.

On September 25, 2003, Water Board staff concurred with the Navy that A-aquifer groundwater at HPNS meets the exception criteria in the State Water Resources Control Board (SWRCB) Sources of Drinking Water Resolution No. 88-63; therefore, the groundwater in the A-aquifer is not suitable as a potential source of drinking water. Likewise, on July 29, 2008, Water Board staff concurred with the Navy that the B-aquifer groundwater in the central and southern area of Parcel C at HPNS meets the exception criteria in the SWRCB Sources of Drinking Water Resolution No. 88-63; therefore, the groundwater in the B-aquifer at those locations is not suitable as a potential source of drinking water.

Similar to the evaluation for SWRCB Resolution No. 88-63, the Navy concluded that maximum contaminant levels (MCL) were not applicable or relevant and appropriate requirements (ARAR) for CERCLA cleanups at HPNS based on an evaluation of site-specific factors. Results of the evaluation of site-specific factors showed that:

- There is no historical or current use of groundwater as a water supply;

- The City and County of San Francisco will not allow the use of groundwater for drinking water because the city prohibits installation of domestic wells within city boundaries;

- Arsenic and other metals occur in A-aquifer groundwater at ambient levels that exceed MCLs, and the cost to reduce concentrations of these chemicals below MCLs would likely be prohibitive and it may be technically impracticable to do so; and

- The proximity of saline groundwater and surface water from San Francisco Bay creates a high potential for saltwater intrusion if significant quantities are produced from the aquifer.

Future drinking water is expected to continue to be supplied by the city's municipal system. RODs that require action all require institutional controls (IC) to prohibit the use of groundwater and, consequently, future use of groundwater is expected to be prohibited, except for uses allowed by RODs (for example, maintenance of groundwater monitoring wells).

3.3 HISTORY OF CONTAMINATION AND INITIAL RESPONSES

Activities at HPNS involved a wide variety of industrial operations related to shipbuilding, repair, and maintenance, including: metal working and welding, degreasing, painting, battery overhaul, acid mixing, metal forging and casting, pickling and plating, fuel and oil storage, and sandblasting. Shops operated at HPNS for machining, painting, forging, pipefitting, rigging, electronics, and shipfitting in addition to radiological research operations. Wastes from these operations were disposed of in an industrial landfill (now Parcel E-2) as well as released at other locations across the base including oil reclamation ponds, scrap yards, and transformer storage areas. From 1945 through 1987, contaminant releases occurred during site operations under the Navy and Triple A; however, specific dates of releases are not known. Contaminant releases have been evidenced by a variety of organic and inorganic chemicals discovered in soil, sediment, soil gas, and groundwater at levels exceeding cleanup goals in the various RODs.

Exposures to chemicals in soil, shoreline sediment, soil gas, and groundwater are associated with significant potential risk to human health. Human health risk assessments (HHRA) for the various parcels evaluated exposures to industrial and construction workers as well as potential future residents and recreational users. VOCs, PAHs, PCBs, and metals were associated with the highest levels of potential risk. Likewise, chemicals in soil, shoreline sediment, and groundwater have the potential to affect aquatic life in San Francisco Bay. PAHs, PCBs, pesticides, and metals were associated with the highest levels of potential risk. These potentially unacceptable risks were the basis for taking action to remediate the contaminated media (soil, sediment, soil gas, and groundwater) at HPNS.

Before 1984 and the initial discovery of a problem and contamination at HPNS, investigations and surveys of various HPNS sites included:

- 1946 through 1948 Radiological Safety Section and NRDL decontaminated and surveyed OPERATION CROSSROADS ships and HPNS berths and dry docks (NAVSEA 2004).
- 1955 NRDL surveys to decommission NRDL buildings (NAVSEA 2004).
- 1969 NRDL survey for disestablishment of NRDL (NAVSEA 2004).

Initial activities at HPNS occurred across the base and included:

- **1984:** Initial discovery of problem or contamination.
- **1984 through 1989:** Pre-National Priorities List (NPL) investigations.
- **1988:** Designated for closure under Base Realignment and Closure (BRAC) Program.
- **1989:** NPL listing.
- **1990:** Federal Facility Agreement (FFA) signed (Navy 1990).
- **1992:** Phase I radiological investigation (PRC Environmental Management, Inc. [PRC] 1992).
- **1994:** Basewide site assessment (PRC and Harding Lawson Associates [HLA] 1994).

The following sections describe the history of initial cleanup responses at each parcel. Remedial actions taken after the RODs are described in more detail in Section 4.0. Parcel A is not discussed because it has been transferred out of federal ownership.

3.3.1 Parcel B

In addition to the basewide actions, activities at Parcel B included:

- **1991 to 1993:** Two underground storage tanks (UST) and seven aboveground storage tanks (AST) removed.
- **1996:** Removal actions at IR-23 and IR-26 exploratory excavations and IR-50 (sediment in Parcel B storm drains). About 1,700 cubic yards (cy) of soil removed from five areas (EE-01 through EE-05) (IT Corporation 1999a). Most of the excavated areas were expanded or deepened during subsequent remedial actions.
- **July 8, 1998:** Remedial action start (construction mobilization start). This action was the trigger for the first five-year review.

- **July 1998 through September 1999:** First phase of remedial action. About 54,400 cy of soil removed from 84 areas and disposed of off site (ChaduxTt 2008). COCs included PAHs, PCBs, VOCs, and metals. Many of these excavated areas were expanded in a second phase in 2000 to 2001.

- **May 2000 through December 2001:** Second phase of remedial action. About 47,200 cy of soil removed from 43 areas and disposed of off site (ChaduxTt 2008). COCs for the second phase were primarily metals. In total, the Navy removed and disposed off site about 101,600 cy of contaminated soil from 106 excavation areas and backfilled the excavations with imported clean material during both phases of the remedial action. The Navy met the cleanup requirements of the ROD (Navy 1997) and subsequent explanations of significant difference (ESD) (Navy 1998, 2000) at 93 of the excavation sites. However, the ubiquitous distribution of metals, especially arsenic and manganese, led to the reevaluation of the remedy for soil and, ultimately, the addition of covers to the remedy to minimize exposure to the soil.

- **2001:** Quarterly groundwater monitoring results indicate that the concentrations of chemicals in groundwater and the extent of those chemicals in groundwater is greater than initially considered in the ROD.

- **June 2000 through September 2002:** Soil vapor extraction (SVE) treatability study at IR-10 (IT Corporation 2002a; Tetra Tech EM Inc. [Tetra Tech] 2003d). This study showed the initial effectiveness of SVE to treat soil vapor at IR-10.

- **2002:** The historical radiological assessment (HRA) designated sites as impacted or nonimpacted with respect to radiological contamination. Phase V investigations and surveys were completed at Buildings 103, 113, 130, and 146 and Dry Dock 6. Details of these activities are included in Sections 6 and 8 and Table 6-6 of the HRA (NAVSEA 2004).

- **2003 through 2004:** Basewide actions to address aboveground issues identified previously at and near buildings, including removal of waste material, decontamination or removal of equipment and structures, and abatement of friable, accessible, and damaged asbestos-containing materials. The primary objective of this action was to address potential environmental issues associated with the industrial use of buildings that could affect the planned transfer of the property to the City and County of San Francisco (Tetra Tech FW, Inc. [Tetra Tech FW] 2004).

- **May through June 2003:** Characterization and sampling of the shoreline at IR-07 and IR-26 (Tetra Tech and Innovative Technical Solutions, Inc. [ITSI] 2004a). Samples collected during this investigation provided the basis for the evaluation of potential risk to aquatic receptors, which, in turn, contributed to the subsequent selection of a shoreline revetment as part of the amended remedy.

- **September 2003 through March 2004:** Groundwater treatability study at IR-10 using injection of zero-valent iron (ZVI) (Engineering/Remediation Resources Group, Inc. [ERRG] and URS Corporation [URS] 2004). This study showed the effectiveness of ZVI in treating VOCs in groundwater at IR-10 and resulted in large concentration reductions (see Section 6.4.1 for more detail).

- **May 2006 through September 2010:** Radiological removal actions completed at Parcel B. A total of 24,826 linear feet of trench and 65,184 cy of soil were excavated; approximately 2,910 cy of soil was disposed of off site as low-level radioactive waste (LLRW) (Tetra Tech EC, Inc. [Tetra Tech EC] 2012a).

- **August through October 2008:** Excavation and disposal off site of about 17,000 cy of soil from IR-07 to remove a methane source area. The time-critical removal action (TCRA) found that debris was confined to a layer that extended from about 2 to 8 feet bgs and was above the water table, which was at about 18 feet bgs at the excavation site. Material below 8 feet bgs was predominantly clean, engineered fill without debris or staining. A layer of material at the top of the Bay Mud at about 23 to 25 feet bgs was observed to be highly organic and odiferous. Excavation continued into the native Bay Mud to a depth of about 27 feet bgs to remove the organic layer. The Navy concluded that the organic layer was the likely source of methane and that the debris used as fill located above the water table was not a likely source of methane. Five soil gas monitoring probes were installed in the excavation area in 2008 (SES-TECH Remediation Services, Inc. [SES-TECH] 2009). These probes were removed in 2012 after semiannual monitoring indicated no detections of methane (ERRG 2012c) (see Section 4.1.3.1 for more details of the remedial action at IR-07).

- **September through October 2008:** Excavation and disposal off site of about 6,000 cy of soil from IR-26 to remove a mercury source area. A total of 98 soil and 19 groundwater samples were collected from 21 borings advanced to the underlying bedrock to delineate mercury source areas. Three excavations to bedrock, ranging from 13 to 18 feet bgs, were completed. Excavations were backfilled with controlled density fill (a Portland cement mixture that is denser than groundwater) to the water table elevation and then with drain rock and clean soil to surface grade (Insight Environmental, Engineering, and Construction, Inc. [Insight] 2009). Groundwater samples from two monitoring wells (IR26MW49A and IR26MW51A) adjacent to this excavation continue to exhibit mercury concentrations that exceed the trigger level for potential impact to aquatic life. Refer to Sections 4.1.4 and 6.4.1 for more details on mercury in groundwater at IR-26.

- **June 2010 to September 2011:** Remedial action completed at IR-07/18 (ERRG 2012a). Shoreline revetment installed over about 950 feet of IR-07 shoreline. Durable covers constructed over the remainder of IR-07/18. Covers included 3 feet of soil and an orange geofabric demarcation layer over the area potentially containing radionuclides, 2 feet of soil or a 6-inch-thick asphalt cover over other areas. The total area of IR-07/18, including both the revetment and soil covers, is about 14 acres.

- **September 2010:** Soil vapor survey completed for selected areas at Parcel B, including areas overlying a VOC plume in groundwater and other areas where VOCs were suspected based on previous soil or groundwater sample results (Sealaska Environmental Services LLC [Sealaska] 2013).

- **February 2011:** Newly discovered underground storage tank (UST) 113A removed (ITSI 2011a, 2012). The tank capacity was estimated to be 200 to 230 gallons and the tank was suspected to contain gasoline. The tank appeared intact when removed and confirmation sampling of soil and water in the excavation did not indicate a release to soil or groundwater.

- **February to July 2011:** Soil excavations in the remainder of Parcel B (ERRG 2011). A total of 569 loose cy was removed and disposed of off site from nine locations on Parcels B, D-1, and G. Three of the removal areas were located at Parcel B.

- **July 2012:** First year of operation and maintenance (O&M) completed at IR-07/18 (ERRG 2012c).

- **November 2012:** Remedial action starts for the remainder of Parcel B.

Refer to Section 4.1 for the remaining history of the remedial action at Parcel B.

3.3.2 Parcel C

In addition to the basewide actions, activities at Parcel C included:

- **1991 to 1993:** 28 USTs removed or closed in place.

- **1991 to 1995:** Sandblast waste collected and removed basewide (Battelle 1996).

- **1996 to 1997:** Removal actions at exploratory excavations and removal of sediment in Parcel C storm drains. About 800 cy of soil removed from six areas (EE-06 through EE-11) (IT Corporation 1999a).

- **1997:** Sediment in drainage culverts at Dry Dock 4 was partially removed.

- **July 1998 through September 1999:** Soil removals at IR-06 and IR-25 during the remedial action at Parcel B before these areas were moved to Parcel C (IT Corporation 2000). Removed soil was disposed of off site and excavations were backfilled with clean material.

- **April 2001:** Treatability study for groundwater at Building 253 using chemical oxidation by potassium permanganate injection (Tetra Tech 2004b).

- **2001 to 2002:** All subsurface fuel lines and contaminated steam lines were removed during a TCRA. About 8,800 cy of soil also removed and disposed of off site (Tetra Tech 2002).

- **2001 to 2002:** Treatability studies completed for SVE at Buildings 134, 211/253, 231, 251, and 272 (IT Corporation 2001, 2002b, 2002c, 2002d, 2002e).

- **September 2002:** Treatability study for groundwater at Building 272 using ZVI injection (Tetra Tech 2003c).

- **2002 to 2004:** Activities to consolidate and remove waste throughout Parcel C. Industrial process equipment was decontaminated, sumps cleaned, and waste was consolidated, including removal of waste materials stored in or near buildings and removal or encapsulation of asbestos-containing materials (Tetra Tech FW 2004).

- **2003:** Contaminated sediment encapsulated in two culverts under Dry Dock 4 (Tetra Tech 2003a).

- **April 2004 to May 2005:** Treatability study for groundwater at Building 134 using in situ sequential anaerobic-aerobic bioremediation (Shaw Environmental Inc. [Shaw] 2005).

- **August 2004 to January 2005:** Follow-on treatability study for groundwater at Building 272 using ZVI injection (ITSI 2005).

- **June 2009 to June 2010:** Treatability study for groundwater at Building 253 using anaerobic bioremediation (sodium lactate and emulsified vegetable oil injection) (Oneida Total Integrated Enterprises, Inc. [OTIE] 2011).

- **May 2010 to April 2011:** Treatability study for groundwater at Building 134 using ZVI injection (CDM Smith 2012).

- **November 2010:** Radiological removals begin.

- **March 2013:** Remedial action starts at remedial unit C2.

Refer to Section 4.2 for the remaining history of the remedial action at Parcel C.

3.3.3 Parcel D-1

In addition to the basewide actions, activities at Parcel D-1 included a variety of removal actions. The discussion below includes all of the former Parcel D, until 2008 when Parcel D was subdivided to form Parcels D-1, D-2, G, and UC-1. Activities included:

- **1989:** About 1,255 cy of soil contaminated by PCBs removed at IR-08 (Environmental Resources Management-West [ERM-West] 1989).

- **1991 to 1993:** Nine USTs removed and one closed in place; three ASTs removed.
- **1991 to 1995:** Sandblast waste collected and removed basewide (Battelle 1996).
- **1994 to 1996:** Contaminated equipment and residue removed from IR-09, the pickling and plating yard. Approximately 200,000 pounds of hazardous waste liquids, 1,500 cy of hazardous waste solids, 100,000 pounds of nonhazardous waste liquids, and 350,000 pounds of scrap metal were removed and disposed of off site (SulTech 2007).
- **1996:** Approximately 1 cy of soil affected by a cesium-137 spill was removed from an area behind Building 364.
- **1996 to 1997:** Removal actions at exploratory excavations and removal of sediment in Parcel C storm drains. About 350 cy of soil removed from five areas (EE-12 and EE-14 through EE-17) (IT Corporation 1999a).
- **2001:** About 63 cy of soil was removed from IR-08, IR-09, IR-37, IR-53, IR-55, and IR-65. Steam lines saturated with oil were removed; other steam lines were pressure-tested, cleaned, and left in place. About 150 feet of fuel line was also removed (Tetra Tech 2001).
- **2001 to 2002:** Approximately 15 cy of soil affected by a cesium-137 spill were removed from IR-33 South.
- **April 2002 to June 2003:** Decontamination and waste consolidation were conducted, including encapsulating or removing asbestos-containing material; removing and disposing of structural materials, paint booths, and numerous abandoned waste items; removing and disposing of hoods, vents, and ducts associated with industrial processes; removing or disabling existing ASTs; and cleaning industrial process-related sumps, vaults, trenches, and equipment foundations (Foster Wheeler Environmental Corporation 2003).
- **July through August 2003:** Navy inventoried all the stockpiles at HPNS and identified 37 stockpiles at Parcel D.
- **February 2004:** Nine soil and waste asphalt stockpiles were removed (Tetra Tech and ITSI 2005).
- **October 2008 to April 2009:** Treatability study for groundwater at Parcels D-1 and G using ZVI injection (Alliance Compliance 2010). This study showed the effectiveness of ZVI in treating VOCs in groundwater at Parcels D-1 and G and resulted in large concentration reductions. All concentrations of VOCs in groundwater at Parcel D-1 remain below remediation goals established in the ROD (see Section 6.4.2 for more detail).
- **April to May 2010:** Removal of pickling vault at IR-09 and placement of about 31,000 pounds of ZVI in the excavation (Tetra Tech EC 2010).

- **August 2010:** Radiological removals begin.

- **September 2010:** Soil vapor survey completed for selected areas at Parcel D-1, including areas overlying VOC plumes in groundwater and other areas where VOCs were suspected based on previous soil or groundwater sample results (Sealaska 2013).

- **February to July 2011:** Soil excavation and stockpile removals (ERRG 2011). A total of 569 loose cy was removed and disposed of off site from nine locations on Parcels B, D-1, and G. Four of the removal areas were located at Parcel D-1. A total of 197 loose cy was removed and disposed of off site from one stockpile at Parcel D-1. Two locations, inaccessible beneath an active radiological screening yard, remain to be removed.

Refer to Section 4.3 for the remaining history of the remedial action at Parcel D-1.

3.3.4 Parcel D-2

In addition to the basewide actions and other activities at Parcel D (see Section 3.3.3), activities at Parcel D-2 included:

- **November 2006 to June 2007 and April 2007 to July 2009:** Radiological removal actions completed. The final status survey for Building 813 concluded that no radiological material at or above risk levels exists at or in Building 813 (Tetra Tech EC 2008a). A total of 1,988 linear feet of trench and 1,434 cy of soil were excavated; approximately 45 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2011c).

3.3.5 Parcel E

In addition to the basewide actions, activities at Parcel E included:

- **1988 to 1989:** Solid waste air quality assessment test completed at landfill area (HLA 1989).

- **1989:** About 1,255 cy of soil contaminated by PCBs removed at IR-08 (ERM-West 1989).

- **1991:** About 25 gallons of floating petroleum product on the water table and 70 gallons of subsurface waste oil recovered at IR-03 (HLA 1991).

- **1991 to 1994:** Eight USTs removed and two closed in place; 12 ASTs removed.

- **1991 to 1995:** Sandblast waste collected and removed basewide (Battelle 1996).

- **1996 to 1997:** Removal actions at exploratory excavations and removal of sediment in Parcel E storm drains. About 36 cy of soil removed from an area east of Building 521 at IR-11/14/15 (IT Corporation 1999a).

- **1996 to 1998:** Sheet pile wall and geosynthetic clay liner with 1-foot topsoil layer installed at IR-03 (IT Corporation 1999b).

- **2000 to 2001:** Treatability study completed for SVE at Building 406 (IT Corporation 2002f).

- **2001:** About 1,550 cy of soil contaminated by PCBs and PAHs removed at IR-08 (Tetra Tech and IT Corporation 2001).

- **2002 to 2004:** Decontamination and waste consolidation activities conducted, including encapsulating or removing asbestos-containing material; removing and disposing of waste material stored in or near buildings, and removing ASTs. Eight ASTs located at Building 521 were also removed (Tetra Tech FW 2004).

- **2003 to 2004:** Removal of bricks and other industrial debris along the Parcel E shoreline. About 468 cy of non-Resource Conservation and Recovery Act (RCRA) hazardous waste debris (poles with creosote), 400 cy of nonhazardous waste debris, and 81 tons of recyclable metals were removed (Tetra Tech FW 2004).

- **July through August 2003:** Navy inventoried all the stockpiles at HPNS and identified 80 stockpiles at Parcel E.

- **February 2004:** Five soil stockpiles were removed from IR-73 and IR-02 Southeast and disposed of off site (Tetra Tech and ITSI 2005).

- **2005 to 2007:** Removal and disposal off site of about 11,200 cy of soil, metal slag, and debris from the Metal Debris Reef area of IR-02 Southeast and the metal slag area of Parcel E-2. Removal included LLRW, including 131 devices and button sources and 31 cy of metal debris (Tetra Tech EC 2007b).

- **2005 to 2007:** Removal and disposal off site of about 49,500 cy of soil from the IR-02 Northwest and Central areas. Removal included LLRW including 11,840 tons of soil, 2,342 devices and button sources, 420 tons of firebrick, 1,940 tons of metal debris, and 58 tons of miscellaneous debris (concrete, plastic, hoses, and rocks) (Tetra Tech EC 2007c).

- **April 2009 to March 2010:** Treatability study for groundwater at IR-12 and IR-36 using ZVI injection (Shaw 2011).

- **August 2010:** Radiological removals begin.

- **September to October 2011:** Site characterization and bench-scale treatability study for nonaqueous phase liquids (NAPL) at IR-03 (ITSI 2013).

3.3.6 Parcel E-2

In addition to the basewide actions, activities at Parcel E-2 included a variety of removal actions. The discussion below includes some activities conducted at the Parcel E-2 landfill before Parcel E-2 was formally established in 2004 when it was subdivided from Parcel E. Activities included:

- **1988 to 1989:** Solid waste air quality assessment test (HLA 1989).

- **1991 to 1995:** Sandblast waste collected and removed basewide (Battelle 1996).

- **1997 to 1998:** Sheet pile wall and groundwater extraction system constructed along the southeastern portion of Parcel E-2 to prevent the potential transport of PCBs in groundwater to the bay (IT Corporation 1999c).

- **2000 to 2001:** Interim landfill cap constructed. Cap consists of a multilayer system of sub-base soil, high-density polyethylene membrane, synthetic drainage layer, and topsoil and covers about 14.5 acres. The cap smothered any remaining subsurface smoldering areas following a brush fire on August 16, 2000, and also significantly reduces stormwater infiltration (Tetra Tech 2005).

- **2002:** Evaluations conducted to (1) delineate and characterize landfill gas, (2) identify the lateral extent of soil waste, and (3) assess the potential for subsurface layers to liquefy during an earthquake (Tetra Tech 2003f, 2004d; Tetra Tech and ITSI 2004b).

- **2002 to 2003:** Landfill gas control system constructed along the northern edge of Parcel E-2 to reduce concentrations of methane in the subsurface and to prevent landfill gas migration onto the nearby University of California, San Francisco (UCSF) property (Tetra Tech 2004a).

- **2004:** Characterization of debris and slag in the Metal Slag Area, suspected have originated from the metal foundry (Building 241 in Parcel C) and the smelter (Building 408 in Parcel D) when the shipyard was active (Tetra Tech FW 2005).

- **2005 to 2007:** Removal and disposal off site of about 11,200 cy of soil, metal slag, and debris from the Metal Debris Reef area of IR-02 Southeast and the metal slag area of Parcel E-2. Removal included LLRW, including 131 devices and button sources and 31 cy of metal debris (Tetra Tech EC 2007b).

- **2005 to 2007:** Removal and disposal off site of about 44,500 cy of soil and debris from the PCB hot spot area in the southern portion of Parcel E-2. Removal included LLRW, including 533 cy of soil and fire brick, 40 devices, and 78 cy of metal debris (Tetra Tech EC 2007a).

- **2010 to 2012:** Additional removal and disposal off site of about 42,200 cy of soil and debris from the PCB hot spot area, mainly bayward of the 2005 to 2007 removals. Removal included LLRW, including 5,800 cy of soil, concrete, fire brick, and metal wire and 56 devices (Shaw 2013).

- **May to October 2012:** Removal of the top 1 foot of soil from the 1.1-acre ship shielding range. Screening of 3,413 cy of excavated soil verified cobalt-60 was not detected above the release criterion.

Ongoing monitoring programs at Parcel E-2 include monthly gas monitoring and control, storm water discharge management, and landfill cap inspection and maintenance.

- **Monthly gas monitoring and control (2004 to present):** Landfill gas is being monitored on a monthly basis under the Interim Landfill Gas Monitoring and Control Plan (Tetra Tech and ITSI 2004c) to verify that hazardous levels of landfill gas are not migrating beyond the fence line of the landfill and onto the UCSF compound. In monthly monitoring performed since January 2004, all concentrations of monitored analytes were below action levels and regulatory requirements identified in the Interim Landfill Gas Monitoring and Control Plan. Methane concentrations have, in nearly all cases, remained below specified regulatory action levels; however, methane concentrations in excess of specified regulatory action levels have been detected in January 2004 and January 2006. In these instances, the Navy has notified the appropriate parties and implemented response measures to control landfill gas at the fence line of the landfill and at the gas monitoring probes (GMP) located on the UCSF property (ERRG and Shaw 2011). Current monitoring results indicate all methane and nonmethane organic compound (NMOC) detections remain below corresponding action levels (CKY 2012a, 2012b, 2013a, 2013b).

- **Storm water discharge management (2003 to present):** The Parcel E-2 storm water program involves quarterly visual observations of non-storm water discharge, sampling and analysis of storm water, monthly visual observations of storm water discharge, and an annual comprehensive site compliance evaluation (MARRS and MACTEC 2009b). Results of the Parcel E-2 storm water program are summarized on an annual basis (Tetra Tech 2004c; AFA Construction Group [AFA] and Eagle Environmental Construction [EEC] 2005; EEC 2006, 2007; MARRS and MACTEC 2008, 2009a, 2010; Accord MACTEC 2013). Results to date indicate no incidents of noncompliance at Parcel E-2, except in isolated locations where best management practices (BMP) require modification to better control erosion and sediment transport from neighboring properties (ERRG and Shaw 2011).

- **Landfill cap inspection and maintenance (2003 to present):** Inspection and maintenance of the interim landfill cap is conducted in accordance with a site-specific O&M plan (Tetra Tech 2003b). The plan addresses and provides guidance for inspecting and reporting activities that are required to ensure the integrity of the landfill cap. The plan also includes emergency response procedures, which are to be followed in the event of flood, major storm event, earthquake, or fire (Tetra Tech 2003b). Operations associated with the closed landfill include (1) an irrigation system to maintain the vegetative cover, and (2) mowing of the vegetative cover on and adjacent to the cap to reduce potential fire hazards and prevent the growth of large shrubs and trees whose root structure could penetrate the cap. The irrigation system, along with other components of the interim cap, is inspected on a quarterly basis to ensure that it is functioning properly and providing adequate water to the vegetative cover. The vegetative cover is inspected and mowed twice per year. Results of the inspection and maintenance are summarized on an annual basis (ITSI 2006, 2007, 2008, 2010a, 2010b, 2011b). Results to date confirm that the landfill cap is being properly maintained in accordance with the O&M plan (ERRG and Shaw 2011).

3.3.7 Parcel F

In addition to the basewide actions, activities at Parcel F included:

- **2002:** Shoreline characterization to evaluate whether contamination in Parcels E and E-2 had the potential to migrate, or had already migrated, to sediments in the adjacent offshore area of Parcel F (SulTech 2005).

- **2006 to 2007:** Treatability study for sediment in Parcel E tidal mudflat using activated carbon for field treatment of PCBs (Cho and others 2007).

- **January through September 2011:** Removal of wooden piers and remnants of wooden berths, quay walls, and wharves adjacent to Parcels B and C (ERS JV 2012).

- **2009 to 2012:** Radiological data gaps investigations (Battelle, Sea Engineering, Inc. and CH2M Hill 2011; Battelle and Sea Engineering, Inc. 2012).

3.3.8 Parcel G

In addition to the basewide actions and other activities at Parcel D (see Section 3.3.3), activities at Parcel G included:

- **July 2007 through June 2011:** Radiological removal actions completed at Parcel G. A total of 23,166 linear feet of trench and 50,688 cy of soil were excavated; approximately 2,828 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2011b).

- **October 2008 to April 2009:** Treatability study for groundwater at Parcels D-1 and G using ZVI injection (Alliance Compliance 2010). This study showed the effectiveness of ZVI in treating VOCs in groundwater at Parcels D-1 and G and resulted in large concentration reductions. All concentrations of VOCs in groundwater at Parcel G remain below remediation goals established in the ROD, except for two wells (IR09MW07A in the IR-09 plume and IR71MW03A in the IR-71 east plume) (see Section 6.4.2 for more detail).

- **September 2010:** Soil vapor survey completed for selected areas at Parcel G, including areas overlying VOC plumes in groundwater and other areas where VOCs were suspected based on previous soil or groundwater sample results (Sealaska 2013).

- **February to July 2011:** Soil excavation and stockpile removals (ERRG 2011). A total of 569 loose cy was removed and disposed of off site from nine locations on Parcels B, D-1, and G. Two of the removal areas were located at Parcel G. A total of 52 loose cy was removed and disposed of off site from two stockpiles at Parcel G.

- **January to July 2013:** Remedial action for covers substantially completed.

Refer to Section 4.8 for the remaining history of the remedial action at Parcel G.

3.3.9 Parcel UC-1

In addition to the basewide actions and other activities at Parcel D (see Section 3.3.3), activities at Parcel UC-1 included:

- **March 2009 through July 2010:** Radiological removal actions completed at Parcels UC-1 and UC-2. A total of 6,407 linear feet of trench and 20,680 cy of soil were excavated at both parcels; approximately 876 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2011a).

- **May to September 2012:** Remedial action completed for soil at Parcel UC-1 (ERRG 2013b). Asphalt covers constructed or repaired over the entire parcel (about 3.9 acres). Soil vapor survey to resize the area requiring institutional controls (ARIC) for VOC vapors remains to be completed.

Refer to Section 4.9 for the remaining history of the remedial action at Parcel UC-1.

3.3.10 Parcel UC-2

In addition to the basewide actions and other activities at Parcel C (see Section 3.3.2), activities at Parcel UC-2 included:

- **March 2009 through July 2010:** Radiological removal actions completed at Parcels UC-1 and UC-2. A total of 6,407 linear feet of trench and 20,680 cy of soil were excavated at both parcels; approximately 876 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2011a).

- **September 2010:** Soil gas survey completed for selected areas at Parcel UC-2, including areas overlying a VOC plume in groundwater and other areas where VOCs were suspected based on previous soil or groundwater sample results (Sealaska 2013).

- **May to September 2012:** Remedial action completed for soil at Parcel UC-2 (ERRG 2013b). Covers constructed over the entire parcel (about 3.9 acres). Asphalt covers constructed or repaired in roadways, parking lots, and other paved areas; soil covers constructed on hillside slopes. ARIC for VOC vapors to be resized in transfer documents. Groundwater monitoring to confirm natural attenuation of VOCs continues.

Refer to Section 4.10 for the remaining history of the remedial action at Parcel UC-2.

3.3.11 Parcel UC-3

In addition to the basewide actions and other activities at Parcel E (see Section 3.3.5), activities at Parcel UC-3 included:

- **March through October 2010:** Radiological removal actions completed at Parcel UC-3. A total of 18,363 linear feet of trench and 18,024 cy of soil were excavated; approximately 789 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2012b).

4.0 REMEDIAL ACTIONS

This section discusses the initial plans, implementation history, status of the remedies, and relevant site activities since the RODs were signed to the present. Remedy selection, remedy implementation, remedy performance, and any changes to or problems with the components of the remedy are discussed, by site, below. Table 2 lists the components of the remedy for each parcel and the status of the completion of each component.

4.1 PARCEL B

4.1.1 Amended Remedial Action Objectives for Parcel B

As discussed in Section 3.3.1, the original ROD for Parcel B (Navy 1997) was amended to address shortcomings in the original selected remedy recognized during implementation. The amended ROD for Parcel B was finalized in January 2009 (ChaduxTt 2009). Amended remedial action objectives (RAO) were established to allow selection of a remedy that protects human health and the environment and is consistent with anticipated future land use. The RAOs for Parcel B identified in the amended ROD are:

<u>Soil and sediment</u>

1. Prevent exposure to organic and inorganic compounds in soil at concentrations above remediation goals developed in the HHRA (see Table 8-1 of the amended ROD) for the following exposure pathways:
    (a) Ingestion of, outdoor inhalation of, and dermal exposure to soil
    (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 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 of the amended ROD).

Groundwater

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 of the amended ROD). This RAO for exposure to vapors from groundwater via vapor intrusion has been superseded by remediation goals established for soil vapor (ChaduxTt 2011d; Sealaska 2013). This change is based on the preference for use of directly measured VOC concentrations in active soil gas samples over modeled soil gas concentrations based on VOC concentrations measured in groundwater samples. The use of active soil gas data reduces the uncertainty associated with chemical transport models necessary to estimate partitioning of chemicals in groundwater or soil to the vapor phase. In addition, soil gas data represent vapors originating from sources in both groundwater and soil.

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

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

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 micrograms per liter (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.

Radiologically impacted soil and structures

1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals (see Table 8-4 of the amended ROD) for the ingestion or inhalation exposure pathways.

The selected remedy and its implementation are discussed in Sections 4.1.2 and 4.1.3.

4.1.2 Amended Selected Remedy for Parcel B

The selected remedy for Parcel B, as specified in the final amended ROD, consists of the following components:

Soil and sediment

- Excavate soil in select areas where concentrations of COCs exceed remediation goals. Transport the excavated contaminated soil and materials off site to an appropriate 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 at IR-07 (including a small segment in IR-23) and IR-26.

- Install an SVE system at IR-10 to remove VOCs from soil.

- Apply institutional controls for VOCs across most of Parcel B (the entire parcel except for Redevelopment Block 4 [essentially the area around Buildings 103, 104, and 117]). (Refer to Section 4.1.4.3 and Figure 4 for updated information about the ARIC for VOC vapors.) A soil gas survey may be conducted in the future for the following purposes:
  - To evaluate potential vapor intrusion risks,
  - To identify COCs for which risk-based numeric action levels for VOCs in soil gas would be established (based on a cumulative risk of 10^{-6}),
  - To identify where the initial ARICs for VOCs would be retained and where they would be released, and
  - To evaluate the need for additional remedial action to remove ARICs.

- 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” among DTSC, California Department of Public Health (CDPH), and the Navy will be implemented at the time of transfer of the property to establish land use and activity restrictions to limit exposure to contaminated soil and groundwater to achieve IC performance objectives. Activity restrictions may be further addressed in a risk management plan(s) (RMP) that may be prepared by the City and County of San Francisco and reviewed and approved by the FFA signatories and/or a land use control remedial design (LUC RD) report that will be reviewed and approved by the FFA signatories. The RMP(s) may specify soil and groundwater management procedures to allow certain activities that would otherwise be restricted or prohibited to be conducted without further approvals from the federal facility agreement signatories and CDPH, where applicable. Section 12.2.1.5 of the amended ROD contains more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

Groundwater

- Treat groundwater by injecting a biological amendment in the plume near IR-10 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 (as discussed under soil and sediment).

Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines and other areas, as necessary, throughout Parcel B. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility.

- Conduct a surface scan for radioactive materials over all of IR-07 and IR-18. Remove all radiological anomalies exceeding radiological remediation goals for residential soil (see Table 8-4 of the amended ROD) to a depth of 1 foot (the maximum effective depth of the surface scan). Add a 1-foot-thick layer of clean soil above the surveyed surface over the portion of IR-07 and IR-18 that is radiologically impacted. Install a demarcation layer on the new soil surface in the portion of IR-07 and IR-18 that is radiologically impacted. Install a new 2-foot-thick soil cover over all of IR-07 and IR-18. Transport radioactive anomalies and contaminated soil off site to an appropriate LLRW facility.

- Monitor groundwater at IR-07 and IR-18 for radionuclides of concern.

- Obtain unrestricted closure based on protocols in the Base-wide Radiological Work Plan - Revision 2 (Tetra Tech EC 2008b) (termed "free release") for all radiologically impacted areas and structures except for the radiologically impacted portion of IR-07 and IR-18. ICs for radionuclides would be necessary only for the radiologically impacted portion of IR-07 and IR-18.

- Implement ICs (as discussed under soil and sediment).

4.1.3 Remedy Implementation at Parcel B

The RD for Parcel B was completed in two parts: IR-07 and IR-18 as one part, and the remainder of Parcel B as the second part. The following sections discuss the steps to implement the remedy for Parcel B from the date of the amended ROD through the present.

4.1.3.1 IR-07/18

The RD for IR-07/18 was started in December 2008 and was completed in January 2010 (ChaduxTt 2010a). The BCT concurred with the completion of the remedy at IR-07/18 (DTSC 2012d; EPA 2012a; Water Board 2012). The major components of the remedy applicable to IR-07/18 and included in the RD were:

Soil and sediment

- 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 at IR-07.

- Monitor methane.

- Implement ICs.

Groundwater

- Implement a groundwater monitoring program.

- Implement ICs.

Radiologically impacted soil and structures

- Conduct a surface scan for radioactive materials over all of IR-07 and IR-18. Remove all radiological anomalies exceeding radiological remediation goals for residential soil to a depth of 1 foot. Add a 1-foot-thick layer of clean soil above the surveyed surface over the portion of IR-07 and IR-18 that is radiologically impacted. Install a demarcation layer on the new soil surface in the portion of IR-07 and IR-18 that is radiologically impacted. Install a new 2-foot-thick soil cover over all of IR-07 and IR-18. Transport radioactive anomalies and contaminated soil off site to an appropriate LLRW facility.

- Monitor groundwater at IR-07 and IR-18 for radionuclides of concern.

- Implement ICs.

Construction of the remedy at IR-07/18 began in June 2010 and was completed in September 2011 (ERRG 2012a). Tasks related to the construction included:

- Mobilization, site preparation, and existing conditions land survey

- Shoreline debris removal

- Shoreline revetment construction (photograph at right shows placement of riprap over crushed rock and geotextile)

- Site boundary excavations for soil cover tie-in

- Radiological screening and sampling of shoreline debris, shoreline sediment, and soil excavated along the site boundary

- Removal and off-site disposal of radiologically screened soil and sediment

- Radiological screening, sampling, and remediation of the surface of IR-07 and IR-18

- Installation of covers over soil (photograph at right shows construction of cover over orange fabric demarcation layer)

- Fence installation

- Waste disposal (all wastes were disposed of off site)

- Final survey
- Final inspection
- Demobilization

The Navy completed a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Class 1 survey of the entire surface of IR-07 and IR-18 and the top 1 foot was remediated to levels specified in the amended ROD to ensure a radiologically clean surface prior to the application of the cover remedy.

The shoreline revetment includes, from the bottom up: filter fabric, 6 to 12 inches of filter rock, and 2.5 to 3 feet of riprap. The filter fabric is designed to prevent migration of soil and sediment to San Francisco Bay; the filter rock and riprap layers protect the fabric from damage by wave action.

Most of the remaining surface of IR-07/18 was covered by a soil cover. In the area identified in the amended ROD as radiologically impacted, the cover includes, from the bottom up: 1 foot of clean, imported soil, a demarcation layer that includes an orange geotextile and metallic demarcation tape placed over the fabric in a 10- by 10-foot grid, and 2 feet of clean, imported soil. In areas not identified as radiologically impacted, the cover is composed of 2 feet of clean, imported soil. Monitoring points (groundwater monitoring wells and methane monitoring probes) were incorporated into the cover construction and drainage features were included in the construction to convey storm water off site.

A small area (about 60 by 130 feet) in the northeastern corner of IR-07 received an asphalt cover instead of the 2-foot-thick soil cover to allow for a more gradual transition to the final asphalt cover in the adjoining area of the remainder of Parcel B. The asphalt cover included 2 inches of asphalt over 4 inches of aggregate base course.

About 470 cubic yards of soil from inland areas plus additional sediment and debris (concrete, brick, and metal) from the shoreline were removed because cesium or radium concentrations exceeded the stringent release criteria or because the waste was unable to be scanned and as a result was assumed to be LLRW. No radiological releases were confirmed and no radiological devices were discovered during any of the radiological surveys. A total of 109 LLRW bins representing about 1,970 tons of waste were removed and disposed of off site as LLRW. In addition, about 5,390 tons of nonhazardous waste and 2,940 tons of non-RCRA hazardous waste were removed and disposed of off site. CDPH completed further surface scans at IR-07 and IR-18 both before and after the soil cover was installed. CDPH concluded that there was no evidence or indication of radiological health and safety concerns based on surface gamma radiation in the surveyed areas of IR-07/18 (CDPH 2013).

Methane was not detected in any gas monitoring probe in samples collected semiannually since the probes were installed in November 2008 (ITSI 2010c; ERRG 2012a). The methane probes were decommissioned in 2012 (ERRG 2012c).

4.1.3.2 Remainder of Parcel B

The RD for the remainder of Parcel B was started in December 2009 and was completed in December 2010 (ChaduxTt 2010d). Revisions to the design included a revision to the LUC RD completed in July 2011 (ChaduxTt 2011c), and an amendment in September 2012 to address revisions to the revetment design based on an updated stability analysis using new geotechnical data (ChaduxTt 2012). The major components of the remedy applicable to the remainder of Parcel B included in the RD were:

Soil and sediment

- Excavate soil in select areas where concentrations of COCs exceed remediation goals. Transport the excavated contaminated soil and materials off site to an appropriate 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 at IR-23 and IR-26.

- Install an SVE system at IR-10 to remove VOCs from soil.

- Implement ICs.

Groundwater

- Treat groundwater by injecting a biological amendment in the plume at IR-10 to break down VOCs. (The RD did not include treatment to immobilize metals [chromium VI, copper, lead, and mercury].)

- Implement a groundwater monitoring program.

- Implement ICs.

Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines and other areas, as necessary, throughout Parcel B. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility.

- Obtain unrestricted closure based on protocols in the Base-wide Radiological Work Plan - Revision 2 (Tetra Tech EC 2008b) for all radiologically impacted areas and structures.

Construction of the remedy at the remainder of Parcel B began in November 2012. At the time this report was prepared, the following portions of the remedy were completed or under way:

- Excavation of soil from three areas at Parcel B was completed in October 2010 (photograph of one hot spot area at right). A total of 569 loose cy was removed from nine locations on Parcels B, D-1, and G (ERRG 2011).

- Construction of the shoreline revetment at IR-23 and IR-26 has been completed, except for about 230 feet of shoreline at IR-26 (shown in photograph at right). The unforeseen discovery of TPH contamination along this 230-foot section of the shoreline—at the western end of the revetment for IR-26—has delayed completion of the revetment while the TPH contamination is addressed. Completion of the revetment is expected to be delayed about 6 months.

- Construction of covers over soil has been completed. Soil covers were constructed on the hillside portions of the parcel; asphalt covers were built over the remaining areas.

- Building foundations were repaired and access to soil under buildings (for example, crawl spaces) was blocked.

- Injection of 6,290 pounds of polylactate into 45 injection points was completed in March 2013.

- Startup operations for the SVE system began in March 2013.

- Radiological removals were completed in 2010. DTSC approved an unrestricted release for radionuclides in the remainder of Parcel B, excluding IR-07 and IR-18, in 2012 (DTSC 2012c). A total of 65,184 cy of soil was removed from 24,826 linear feet of sanitary sewer and storm drain lines; approximately 2,910 cy of soil was disposed of off site as LLRW. Six radiologically impacted buildings (Buildings 103, 113, 113A, 130, 140, and 146), three former building sites (114, 142, and 157), and the Building 140 discharge channel were screened and remediated (Tetra Tech EC 2012a).

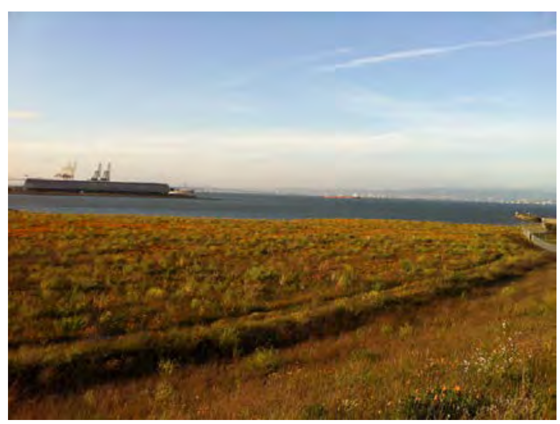
4.1.4 Long-Term Monitoring and Maintenance Activities at Parcel B

The following sections discuss long-term monitoring and maintenance activities conducted at IR-07 and IR-18 and groundwater monitoring at all of Parcel B.

4.1.4.1 Long-Term Monitoring and Maintenance at IR-07/18

Long-term maintenance requirements are detailed in the O&M plan for IR-07/18 (ERRG 2012d). Major inspection items include:

- **Security:** Condition of fencing and signs, evidence of vandalism or unauthorized access, condition of roads.
- **Soil cover:** Evidence of settlement, cracking, or erosion; evidence of slope failure; signs of burrowing pests; adequacy of vegetative cover; signs of excessive traffic; obstructions in drainage swales and evidence of overflow or erosion; demarcation layer not exposed.
- **Revetment:** Evidence of settlement, excessive traffic, or pests; evidence of vandalism or theft of armoring; evidence of wave overtopping; signs of scour or erosion at toe or flanks; filter fabric not exposed.
- **Asphalt cover:** Evidence of settlement, cracking, or holes; evidence of ponding; evidence of excessive traffic.
- **Groundwater monitoring wells:** Evidence of damage or vandalism, presence of obstructions, condition of locks and seals.
- **Institutional controls:** No construction of residences or enclosed structures, no use of groundwater, no growing edible items, no land-disturbing activity or disturbance of remedy components (including no excavation beneath demarcation layer), no damage to security features. (Some restricted activities may be conducted provided that the requirements of the LUC RD [ChaduxTt 2010a] are followed.)



Quarterly inspections were conducted in October 2011, January 2012, April 2012, and July 2012 during the first year of long-term monitoring and maintenance (ERRG 2012c). Inspections found all remedy components in good condition (photograph at right shows established vegetation on the cover in April 2012). A land survey of the two settlement monuments on the soil cover conducted in July 2012 found no settlement had occurred. Minor issues encountered included occasional vandalism of the fencing, a few shallow animal burrows, and minor areas where vegetation needed to be reseeded.

Animal burrows were checked for inhabitants, confirmed to be unoccupied, and filled in using a spade. The disturbed area was then reseeded.

Annual O&M cost was originally estimated to be $13,400 for activities excluding cover or revetment repairs (see Table D-5B in the Technical Memorandum in Support of a ROD Amendment [TMSRA], ChaduxTt 2007). Actual O&M cost for the first year was $62,645. Reasons for the variance in O&M costs include:

- Original estimate assumed a single annual inspection and report; actual costs reflect quarterly inspections and reports.

- Original estimate did not include costs for annual mowing, off-schedule repair events (two for fence vandalism and one for cover damage), or decommissioning of five methane monitoring probes.

4.1.4.2 Groundwater Monitoring at Parcel B

Groundwater monitoring is conducted throughout HPNS under the basewide groundwater monitoring program (BGMP) (CE2-Kleinfelder 2011b, 2012b, 2012c). Monitoring includes quarterly groundwater elevation monitoring to evaluate the direction and gradient of groundwater flow and sampling for various COCs at varying frequencies. The overall objectives of groundwater monitoring at Parcel B (ChaduxTt 2010a, 2010d) include:

1. Monitor the potential migration of COCs into previously uncontaminated areas and potential migration toward San Francisco Bay, including potential migration of metals from upgradient areas;

2. Monitor changes in concentrations within a plume, including the effects of remedial actions and previous treatability studies;

3. Monitor concentrations of COCs in groundwater in and near individual wells where the HHRA indicated potential risk.

IR-07/18

A total of 17 wells are measured quarterly for groundwater elevation. Two wells located near the bay margin are sampled semiannually for COCs that include metals and radionuclides to monitor for potential migration of COCs to the bay. Groundwater data at IR-07/18 do not indicate migration of COCs at levels that would pose a risk to human health or the environment. Monitoring results are discussed in more detail in Section 6.4.1.1.

Remainder of Parcel B

A total of 29 wells are measured quarterly for groundwater elevation and 12 wells are sampled for COCs that include VOCs, metals, and indicator chemicals for natural attenuation. The remedial action for Parcel B groundwater (injection of polylactate) is in progress and the ongoing monitoring under the BGMP will provide useful background information to evaluate the success of the remedial action. Monitoring results are discussed in more detail in Section 6.4.1.2.

4.1.4.3 Soil Gas Monitoring at Parcel B

An investigation of potential chemicals in soil vapor was conducted in September 2010 for areas within Parcels B, D-1, G, and UC-2 (Sealaska 2013). A total of 150 soil gas samples were collected from 110 locations encompassing 89 1-acre grid blocks. In addition, 29 soil samples were collected for geotechnical analysis to obtain physical parameters used for assessing the potential for vapor intrusion. Results from the investigation were evaluated for potential risk to human health using a basewide approach developed for HPNS (ChaduxTt 2011d). A total of 29 grid blocks were sampled at Parcel B in the area outside of IR-07 and IR-18. The area within IR-07/18 was not sampled because only open space (recreational) reuse is anticipated for that area. Soil gas results collected from eight blocks indicated a potential risk to a future residential receptor that exceeded 10^{-6}. Consequently, the ARIC for VOC vapors was recommended to be reduced from most of Parcel B (excluding IR-07/18) to the eight blocks where the potential risk exceeded 10^{-6} (see Figure 4).

4.2 PARCEL C

4.2.1 Remedial Action Objectives for Parcel C

The ROD for Parcel C was finalized in September 2010 (Navy 2010b). The RAOs for Parcel C identified in the ROD are:

Soil

1. Prevent or minimize exposure to organic and inorganic compounds in soil at concentrations above remediation goals developed in the HHRA for the following exposure pathways:
   (a) Ingestion of, outdoor inhalation of, and dermal exposure to surface and subsurface soil
   (b) Ingestion of homegrown produce in native soil

2. Prevent or minimize exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Table 7 of the final soil gas memorandum (ChaduxTt 2010b) lists the volatile chemicals. This list includes SVOCs (such as pesticides and PAHs). Remediation goals for VOCs to address exposure via indoor inhalation of vapors may be superseded based on COC identification information from future soil gas surveys. Future action levels would be established for soil gas, would account for vapors from both soil and groundwater, and would be calculated based on a cumulative excess cancer risk level of 10^{-6} using the accepted methodology for risk assessments at HPNS.

Groundwater

1. Prevent or minimize exposure to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. This RAO for exposure to vapors from groundwater via vapor intrusion has been superseded by remediation goals established for soil vapor (ChaduxTt 2011d; Sealaska 2013).

2. Prevent or minimize direct exposure to the groundwater that may contain COCs through the domestic use pathway in the B-aquifer, RU-C5 only (for example, drinking water or showering).

3. Prevent or minimize exposure of construction workers to metals and VOCs in the A-aquifer groundwater at concentrations above remediation goals from dermal exposure and inhalation of vapors from groundwater.

4. Prevent or minimize migration to the surface water of San Francisco Bay of chromium VI and zinc in A-aquifer groundwater that would result in concentrations of chromium VI above 50 µg/L and zinc above 81 µg/L at the point of discharge to the bay.

Radiologically impacted soil and structures

1. Prevent or minimize exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways (for example, external radiation, soil ingestion, and inhalation of resuspended radionuclides in soil or dust).

The selected remedy and its implementation are discussed in Sections 4.2.2 and 4.2.3.

4.2.2 Selected Remedy for Parcel C

The selected remedy for Parcel C consists of the following components:

Soil

- Excavate soil in select areas where COCs exceed remediation goals and dispose of excavated soil at an off-site facility. Backfill excavated areas with imported clean soil and apply an appropriate durable cover. The Navy is preparing an ESD to allow soil that poses very low risk to remain in place, protected by a durable cover.

- Implement SVE as a source reduction measure to address VOC-contaminated soil. SVE would not be used as the sole remedy in areas where VOCs are commingled with chemicals that do not readily volatilize.

- Install durable covers across all of Parcel C as physical barriers to cut off potential exposure to ubiquitous metals in soil.

- Implement ICs. 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 at the time of transfer of the property to establish land use and activity restrictions to limit exposure to contaminated soil and groundwater to achieve IC performance objectives. The initial ARIC for VOC vapors will include all of Parcel C. Refer to Section 2.9.2 of the ROD for more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

Groundwater

- Treat groundwater using ZVI or an injected biological substrate to destroy VOCs in groundwater plumes at RU-C1, RU-C2, RU-C4, and RU-C5 and minimize migration of metals toward the bay.

- Implement groundwater monitoring in and around remediation areas and in downgradient locations, as necessary.

- Conduct soil gas surveys after completion of groundwater remediation (after the areas have re-equilibrated). Use the results of the surveys to evaluate potential vapor intrusion risks and assess the need for additional remedial activities or ARICs.

- Implement ICs (as discussed under soil).

Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines while implementing appropriate dust control measures. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility. Obtain unrestricted release for all radiologically impacted soil and structures.

4.2.3 Remedy Implementation at Parcel C

The RD for Parcel C was started in 2011 and completed in October 2012 (CH2M Hill Kleinfelder Joint Venture [KCH] 2012). Remedial actions planned in the RD include:

- Excavate up to 26,300 cy of soil from 27 areas

- Implement SVE at eight areas

- Install a durable cover across the parcel

- Inject ZVI or a biological substrate to actively treat VOCs in groundwater. Use ZVI to target hot spot areas. Injections will also minimize migration of metals toward the bay. Follow active treatment with passive remediation through monitored natural attenuation (MNA).

- Complete remediation for radiologically impacted soil and structures through the ongoing basewide radiological removal program.

Remedial actions at Parcel C began in July 2013. Activities completed or under way include:

- Decommissioned monitoring wells in areas that conflict with remedial actions.

- Began excavation of contaminated soil.

- Completed the first round of biological substrate injections and began monitoring groundwater to evaluate the results.

- Began installing SVE monitoring points and extraction wells.

The radiological removals at Parcel C are being undertaken in two phases. Phase I is complete and included removal of 28,176 cy of soil from 16,119 linear feet of sanitary sewer and storm drain lines. Phase II began in November 2012. About 27,867 cy of soil had been removed from 13,000 linear feet of the total 14,300 linear feet of sanitary sewer and storm drain lines at the time this report was prepared. Radiological screening and removals are ongoing for Parcel C structures and sanitary sewer and storm drain lines.

4.2.4 Long-Term Monitoring for Groundwater at Parcel C

Groundwater monitoring is conducted throughout HPNS under the BGMP (CE2-Kleinfelder 2011b, 2012c). Monitoring includes quarterly groundwater elevation monitoring to evaluate the direction and gradient of groundwater flow and sampling for various COCs at varying frequencies.

A total of 56 wells are measured quarterly for groundwater elevation and 49 wells are sampled for COCs that include VOCs, SVOCs, TPH, metals, and indicator chemicals for natural attenuation. In addition, two wells are measured for presence of NAPLs. Although the remedial action for Parcel C groundwater (injection of ZVI and biological substrate) has not yet begun, the ongoing monitoring under the BGMP will provide useful background information to evaluate the success of the remedial action.

4.3 PARCEL D-1

4.3.1 Remedial Action Objectives for Parcel D-1

The ROD for Parcel D-1 was finalized in July 2009 (Navy 2009b). The RAOs for Parcel D-1 identified in the ROD are:

Soil

1. Prevent exposure to PAHs and metals in soil at concentrations above remediation goals developed in the HHRA for the following exposure pathways:
   (a) Ingestion of, outdoor inhalation of, and dermal exposure to surface and subsurface soil by industrial workers or construction workers

2. Prevent exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Remediation goals for VOCs to address exposure via indoor inhalation of vapors have been superseded based on COC identification information from soil gas surveys. Action levels have been established for soil gas, account for vapors from both soil and groundwater, and were calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at HPNS (ChaduxTt 2011d; Sealaska 2013).

Groundwater

1. Prevent exposure by industrial workers to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. This RAO for exposure to vapors from groundwater via vapor intrusion has been superseded by remediation goals established for soil vapor (ChaduxTt 2011d; Sealaska 2013).

2. Prevent or minimize exposure of construction workers to metals and VOCs in the A-aquifer groundwater at concentrations above remediation goals from dermal exposure and inhalation of vapors from groundwater.

Radiologically impacted soil and structures

1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways.

4.3.2 Selected Remedy for Parcel D-1

The selected remedy for Parcel D-1 consists of the following components:

Soil

- Excavate soil in select areas where COCs exceed remediation goals and remove select soil stockpiles; dispose of soil at an off-site facility. Backfill excavated areas with imported clean soil and apply an appropriate durable cover.

- Install durable covers across all of Parcel D-1 as physical barriers to cut off potential exposure to metals in soil.

- Implement ICs. 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 at the time of transfer of the property to establish land use and activity restrictions to limit exposure to contaminated soil and groundwater to achieve IC performance objectives. The initial ARIC for VOC vapors included all of Parcel D-1. The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.3.4.2). Refer to Section 2.9.2 of the ROD for more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

Groundwater

- Treat groundwater using ZVI or an injected biological substrate to destroy VOCs in the groundwater plume at IR-71 and minimize the possible migration of metals in the groundwater plume at IR-09 into Parcel UC-1 and toward the bay.

- Implement groundwater monitoring in and around remediation areas and in downgradient locations, as necessary.

- Conduct soil gas surveys. Use the results of the surveys to evaluate potential vapor intrusion risks and assess the need for additional remedial activities or ARICs.

- Implement ICs (as discussed under soil).

Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines while implementing appropriate dust control measures. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility. Obtain unrestricted release for all radiologically impacted soil and structures.

4.3.3 Remedy Implementation at Parcel D-1

The RD for Parcel D-1 was started in January 2010 and completed in February 2011 (ChaduxTt 2011b). Remedial actions completed include:

- Excavation of soil from four areas was completed in October 2010. A total of 569 loose cy was removed from nine locations on Parcels B, D-1, and G (ERRG 2011).

- Removal of one soil stockpile and disposal of the soil at an off-site facility (photograph at right). A total of 197 loose cy was removed and disposed of off site (ERRG 2011).

- Groundwater treatment using ZVI injection was completed as part of a treatability study conducted in 2008 (Alliance Compliance 2010).

The Navy has selected the remedial action contractor for Parcel D-1 for the remaining remedial actions. A remedial action work plan is being prepared for the remaining actions. Other remedial actions planned in the RD include:

- Excavate soil in two remaining areas where COCs exceed remediation goals and dispose of excavated soil at an off-site facility. Backfill excavated areas with imported clean soil and apply an appropriate durable cover. Remaining two areas were inaccessible in 2010 because they were beneath an active radiological screening yard.

- Install a durable cover across the parcel.

- Monitor the effectiveness of the ZVI injection conducted in 2008.

- Complete remediation for radiologically impacted soil and structures through the ongoing basewide radiological removal program.

The radiological removals at Parcel D-1 are being undertaken in two phases. Phase I included the Gun Mole Pier and the South Pier and nearby Buildings 274 and 383, former building sites 313/313A/322, and a portion of the storm drain and sanitary sewer system (see Figure 3 for pier and building locations). Phase II includes the remainder of Parcel D-1. Phase I is completed and included removal of 18,320 cy of soil from 12,957 linear feet of sanitary sewer and storm drain lines (Shaw 2013 removal action completion report in preparation). Phase II is planned to be completed in 2013. Radiological screening and removals are ongoing for remaining Parcel D-1 structures and sanitary sewer and storm drain lines.

4.3.4 Long-Term Monitoring at Parcel D-1

4.3.4.1 Groundwater Monitoring at Parcel D-1

Groundwater monitoring is conducted throughout HPNS under the BGMP (CE2-Kleinfelder 2011b, 2012c). Monitoring includes quarterly groundwater elevation monitoring to evaluate the direction and gradient of groundwater flow and sampling for various COCs at varying frequencies.

A total of 15 wells are measured quarterly for groundwater elevation and four wells are sampled for COCs that include VOCs and metals. Concentrations of COCs in groundwater at Parcel D-1 indicate concentrations less than remediation goals or declining trends. Monitoring results are discussed in more detail in Section 6.4.2.

4.3.4.2 Soil Gas Monitoring at Parcel D-1

An investigation of potential chemicals in soil vapor was conducted in September 2010 for areas within Parcels B, D-1, G, and UC-2 (Sealaska 2013). A total of 150 soil gas samples were collected from 110 locations encompassing 89 1-acre grid blocks. In addition, 29 soil samples were collected for geotechnical analysis to obtain physical parameters used for assessing the potential for vapor intrusion. Results from the investigation were evaluated for potential risk to human health using a basewide approach developed for HPNS (ChaduxTt 2011d). A total of 30 grid blocks were sampled at Parcel D-1. Soil gas results collected from eight blocks indicated a potential risk to a future residential receptor that exceeded 10^{-6}. Consequently, the ARIC for VOC vapors was recommended to be reduced from all of Parcel D-1 to the eight blocks where the potential risk exceeded 10^{-6} (see Figure 4).

4.4 PARCEL D-2

The ROD for Parcel D-2 was finalized in August 2010 (Navy 2010a). The ROD concluded that no further action was necessary for Parcel D-2. Radiological removals were completed in 2009 and DTSC approved an unrestricted release for radionuclides in Parcel D-2 in 2012 (DTSC 2012a). A total of 1,988 linear feet of trench and 1,434 cy of soil were excavated; approximately 45 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2011c). One radiologically impacted building (Building 813) was screened and remediated.

4.5 PARCEL E

The ROD for Parcel E is currently being prepared (Navy 2013a).

4.6 PARCEL E-2

4.6.1 Remedial Action Objectives for Parcel E-2

The ROD for Parcel E-2 was finalized in November 2012 (Navy 2012). The RAOs for Parcel E-2 identified in the ROD are:

Soil and sediment

1. Prevent human exposure to inorganic and organic chemicals at concentrations greater than remediation goals (see Table 5 of the ROD) for the following exposure pathways:
   (a) Ingestion of, outdoor inhalation of, and dermal exposure to solid waste, soil, or sediment from 0 to 2 feet bgs by recreational users throughout Parcel E-2.
   (b) Ingestion of, outdoor inhalation of, and dermal exposure to solid waste, soil, or sediment from 0 to 10 feet bgs by construction workers throughout Parcel E-2.
2. Prevent ecological exposure to concentrations of inorganic and organic chemicals in soil waste or soil greater than remediation goals (see Table 5 of the ROD) from 0 to 3 feet bgs by terrestrial wildlife throughout Parcel E-2.
3. Prevent ecological exposure to concentrations of inorganic and organic chemicals in intertidal sediment greater than remediation goals (see Table 5 of the ROD) from 0 to 2.5 feet bgs by aquatic wildlife throughout the shoreline area.
4. Prevent exposure to radionuclides of concern at activity levels that exceed remediation goals (see Table 6 of the ROD) for all potentially complete exposure pathways.

Landfill gas

1. Control methane concentrations to 5 percent (by volume in air) or less at subsurface points of compliance.
2. Control methane concentrations to 1.25 percent (by volume in air) or less in on-site structures (“on site” in the ROD is defined as any area within the subsurface points of compliance for landfill gas).
3. Prevent exposure to NMOCs at concentrations greater than 500 parts per million by volume (ppmv) at the subsurface points of compliance.
4. Prevent exposure to NMOCs at concentrations greater than 5 ppmv above background levels in the breathing zone of on-site workers and visitors.

Groundwater, domestic use

1. Prevent exposure to groundwater that may contain COCs at concentrations greater than remediation goals (see Table 7 of the ROD) through the domestic use pathway.
2. Prevent or minimize migration of B-aquifer groundwater that may contain COCs at concentrations greater than remediation goals (see Table 7 of the ROD) beyond the point of compliance (defined in the RI/FS report [ERRG and Shaw 2011] at the downgradient boundary of Parcel E-2).

Groundwater, construction worker

1. Prevent or minimize dermal exposure to and vapor inhalation from A-aquifer groundwater containing COCs at concentrations greater than remediation goals (see Table 7 of the ROD) by construction workers.

Groundwater, protection of wildlife

1. Prevent or minimize migration of chemicals of potential ecological concern (COPEC) to prevent discharge that would result in concentrations greater than the corresponding water quality criteria for aquatic wildlife.
2. Prevent or minimize migration of A-aquifer groundwater containing total TPH concentrations greater than the remediation goal (see Table 7 of the ROD) (where commingled with CERCLA substances) into San Francisco Bay.

Surface water

1. Prevent or minimize migration of COPECs to prevent discharge that would result in concentrations greater than the corresponding water quality criteria for aquatic wildlife.

4.6.2 Selected Remedy for Parcel E-2

The selected remedy for Parcel E-2 addresses soil, shoreline sediment, landfill gas, and groundwater and consists of the following components:

- Remove and dispose of contaminated soil in selected areas that contain high concentrations of non-radioactive chemicals, and separate and dispose of materials and soil with radiological contamination found in these areas.
- Perform radiological surveys throughout Parcel E-2 and separate and dispose of materials and soil with radiological contamination found during the surveys.
- Install a soil cover over all of Parcel E-2, with a protective liner (consisting of a geomembrane with an overlying geocomposite drainage layer) where needed to minimize water seeping into the contaminated material.
- Install below-ground barriers to limit groundwater flow from the landfill to San Francisco Bay, including a contingency action to hydraulically control groundwater (behind the barrier) if necessary to satisfy pertinent ARARs (see Section 2.9.4 of the ROD).
- Remove and treat landfill gas to prevent it from moving beyond the Parcel E-2 boundary.
- Build a shoreline revetment.

- Monitor and maintain the different parts of the selected remedy to ensure they are working properly.

- Use ICs to restrict specific land uses and activities on Parcel E-2. Refer to Section 2.9.2.3 of the ROD for more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

4.6.3 Remedy Implementation at Parcel E-2

The RD for Parcel E-2 was started in December 2012 (ERRG 2013e).

4.6.4 Long-Term Monitoring and Maintenance at Parcel E-2

The long-term monitoring and maintenance program will be detailed in the post-closure O&M plan for Parcel E-2, consistent with content requirements as provided in California Code of Regulations Title 27 § 21800(c), and submitted for review and approval by EPA, DTSC, and the Water Board in conjunction with the RD. Ongoing, existing monitoring programs are briefly described in the following sections.

4.6.4.1 Groundwater Monitoring

Groundwater monitoring is conducted throughout HPNS under the BGMP (CE2-Kleinfelder 2011b, 2012c). Monitoring includes quarterly groundwater elevation monitoring to evaluate the direction and gradient of groundwater flow and sampling for various COCs at varying frequencies.

A total of 30 wells are measured quarterly for groundwater elevation and 20 wells are sampled for COCs that include VOCs, SVOCs (including pesticides and PCBs), TPH, metals, and other chemicals including cyanide, ammonia, organotins, total Kjeldahl nitrogen, and total suspended solids.

4.6.4.2 Methane Gas Monitoring

Landfill gas is monitored on a monthly basis under the Interim Landfill Gas Monitoring and Control Plan (Tetra Tech and ITSI 2004c) to verify that hazardous levels of landfill gas are not migrating beyond the fence line of the landfill and onto the UCSF compound. Current monitoring results indicate all methane and NMOC detections remain below corresponding action levels (CKY 2012a, 2012b, 2013a, 2013b). A soil gas survey is under way at Parcel E-2 to address the following objectives to support the RD: (1) evaluate whether soil gas mitigation will be necessary in conjunction with installation of a soil cover and protective liner in select portions of the areas outside of the landfill cap, and (2) conduct a landfill generation study to estimate the gas generation rates from the Parcel E-2 landfill, determine the content of the landfill gas (to refine the design of the landfill gas treatment system), and estimate the radius of influence of future gas extraction wells (ERRG 2013e).

4.6.4.3 Landfill Cap Inspection and Maintenance

Inspection and maintenance of the interim landfill cap is conducted in accordance with a site-specific O&M plan (Tetra Tech 2003b). The plan addresses and provides guidance for inspecting and reporting that are required to ensure the integrity of the landfill cap. The plan also includes emergency response procedures, which are to be followed in the event of flood, major storm event, earthquake, or fire (Tetra Tech 2003b). Operations associated with the closed landfill include (1) an irrigation system to maintain the vegetative cover, and (2) mowing the vegetative cover on and adjacent to the cap to reduce potential fire hazards and prevent the growth of large shrubs and trees whose root structure could penetrate the cap. The irrigation system, along with other components of the interim cap, is inspected on a quarterly basis to ensure that it is functioning properly and providing adequate water to the vegetative cover. The vegetative cover is inspected and mowed twice per year. Results to date confirm that the landfill cap is being properly maintained in accordance with the O&M plan (ERRG and Shaw 2011).

4.6.4.4 Storm Water Discharge Monitoring

The Parcel E-2 storm water program involves quarterly visual observations of non-storm water discharge, sampling and analysis of storm water, monthly visual observations of storm water discharge, and an annual comprehensive site compliance evaluation (MARRS and MACTEC 2009b). Compared with the flat-lying terrain at most of the rest of HPNS, Parcel E-2 has more relief — ranging in elevation from about 30 feet above msl to sea level at the shoreline. Consequently, there is an increased potential for erosion and sediment transport by flowing storm water. Results from the storm water discharge monitoring to date (Accord MACTEC 2013) indicate no incidents of noncompliance at Parcel E-2, except in isolated locations where BMPs require modification to better control erosion and sediment transport from neighboring properties (ERRG and Shaw 2011).

4.7 PARCEL F

A ROD for Parcel F has not yet been prepared. Remedial action objectives from the ROD for Parcel F will be incorporated into a future five-year review report.

4.8 PARCEL G

4.8.1 Remedial Action Objectives for Parcel G

The ROD for Parcel G was finalized in February 2009 (Navy 2009a). The RAOs for Parcel G identified in the ROD are:

Soil

1. Prevent exposure to organic and inorganic chemicals in soil at concentrations above remediation goals developed in the HHRA for the following exposure pathways:

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

   (b) Ingestion of homegrown produce by residents in mixed-use blocks

2. Prevent exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Remediation goals for VOCs to address exposure via indoor inhalation of vapors have been superseded based on COC identification information from soil gas surveys. Action levels were established for soil gas, account for vapors from both soil and groundwater, and were calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at HPNS (ChaduxTt 2011d; Sealaska 2013).

Groundwater

1. Prevent exposure to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. This RAO for exposure to vapors from groundwater via vapor intrusion has been superseded by remediation goals established for soil vapor (ChaduxTt 2011d; Sealaska 2013).

2. Prevent direct exposure to the groundwater that may contain COCs through the domestic use pathway (for example, drinking water or showering).

3. Prevent or minimize exposure of construction workers to metals and VOCs in the A-aquifer groundwater at concentrations above remediation goals from dermal exposure and inhalation of vapors from groundwater.

4. Prevent or minimize migration to the surface water of San Francisco Bay of chromium VI and nickel in A-aquifer groundwater that would result in concentrations of chromium VI above 50 µg/L and nickel above 96.5 µg/L at the point of discharge to the bay.

Radiologically impacted soil and structures

1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways.

4.8.2 Selected Remedy for Parcel G

The selected remedy for Parcel G consists of the following components:

Soil

- Excavate soil in select areas where COCs exceed remediation goals and remove select soil stockpiles; dispose of soil at an off-site facility. Backfill excavated areas with imported clean soil and apply an appropriate durable cover.

- Install durable covers across all of Parcel G as physical barriers to cut off potential exposure to metals in soil.

- Implement ICs. 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 at the time of transfer of the property to establish land use and activity restrictions to limit exposure to contaminated soil and groundwater to achieve IC performance objectives. The initial ARIC for VOC vapors included all of Parcel G. The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.8.4.2). Refer to Section 2.9.2 of the ROD for more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

Groundwater

- Treat groundwater using ZVI or an injected biological substrate to destroy VOCs in the groundwater plumes at IR-09, IR-33, and IR-71. Minimize the possible migration of metals in the groundwater plumes at IR-09 and IR-33 toward the bay and discharge of metals to the bay.

- Implement groundwater monitoring in and around remediation areas and in downgradient locations, as necessary.

- Conduct soil gas surveys. Use the results of the surveys to evaluate potential vapor intrusion risks and assess the need for additional remedial activities or ARICs.

- Implement ICs (as discussed under soil).

Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines while implementing appropriate dust control measures. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility. Obtain unrestricted release for all radiologically impacted soil and structures.

4.8.3 Remedy Implementation at Parcel G

The RD for Parcel G was started in December 2009 and completed in October 2010 (ChaduxTt 2010c). The LUC RD for Parcel G was revised in January 2011 (ChaduxTt 2011a). Remedial actions completed include:

- Excavation of soil from two areas was completed in October 2010 (photograph of one area at right). A total of 569 loose cy was removed from nine locations on Parcels B, D-1, and G (ERRG 2011).

- Removal of two soil stockpiles and disposal of the soil at an off-site facility. A total of 52 loose cy was removed and disposed of off site (ERRG 2011).

- Groundwater treatment using ZVI injection was completed as part of a treatability study conducted in 2008 (Alliance Compliance 2010).

- Radiological removals were completed in 2011 and DTSC approved an unrestricted release for radionuclides in Parcel G in 2012 (DTSC 2012b). A total of 50,688 cy of soil was removed from 23,166 linear feet of sanitary sewer and storm drain lines; approximately 2,828 cy of soil was disposed of off site as LLRW. Nine radiologically impacted buildings (Buildings 351, 351A, 364, 365, 366, 401, 408, 411, and 439) and one former building site (317/364/365) were screened and remediated (Tetra Tech EC 2011b).

The work plan for construction of the durable cover at Parcel G was completed in December 2012 (Arcadis U.S., Inc. [Arcadis] 2012) and construction began in January 2013 and was substantially completed in July 2013.

4.8.4 Long-Term Monitoring at Parcel G

4.8.4.1 Groundwater Monitoring at Parcel G

Groundwater monitoring is conducted throughout HPNS under the BGMP (CE2-Kleinfelder 2011b, 2012c). Monitoring includes quarterly groundwater elevation monitoring to evaluate the direction and gradient of groundwater flow and sampling for various COCs at varying frequencies.

A total of 32 wells are measured quarterly for groundwater elevation and five wells are sampled for COCs that include VOCs and hexavalent chromium. Concentrations of COCs in groundwater at Parcel G indicate concentrations less than remediation goals or declining trends. Monitoring results are discussed in more detail in Section 6.4.2.

4.8.4.2 Soil Gas Monitoring at Parcel G

An investigation of potential chemicals in soil vapor was conducted in September 2010 for areas within Parcels B, D-1, G, and UC-2 (Sealaska 2013). A total of 150 soil gas samples were collected from 110 locations encompassing 89 1-acre grid blocks. In addition, 29 soil samples were collected for geotechnical analysis to obtain physical parameters used for assessing the potential for vapor intrusion. Results from the investigation were evaluated for potential risk to human health using a basewide approach developed for HPNS (ChaduxTt 2011d). A total of 26 grid blocks were sampled at Parcel G. Soil gas results collected from five blocks indicated a potential risk to a future residential receptor that exceeded 10^{-6}. Consequently, the ARIC for VOC vapors was recommended to be reduced from all of Parcel G to the five blocks where the potential risk exceeded 10^{-6} (see Figure 4).

4.9 PARCEL UC-1

4.9.1 Remedial Action Objectives for Parcel UC-1

The ROD for Parcel UC-1 was finalized in July 2009 (Navy 2009b). The RAOs for Parcel UC-1 identified in the ROD are:

Soil

1. Prevent exposure to metals in soil at concentrations above remediation goals developed in the HHRA for the following exposure pathways:

   (a) Ingestion of, outdoor inhalation of, and dermal exposure to surface and subsurface soil by industrial workers or construction workers

2. Prevent exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Remediation goals for VOCs to address exposure via indoor inhalation of vapors may be superseded based on COC identification information from future soil gas surveys. Future action levels would be established for soil gas, would account for vapors from both soil and groundwater, and would be calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at HPNS.

Groundwater

1. Prevent exposure by industrial workers to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. This RAO for exposure to vapors from groundwater via vapor intrusion has been superseded by remediation goals established for soil vapor (ChaduxTt 2011d; Sealaska 2013).

2. Prevent or minimize exposure of construction workers to metals and VOCs in the A-aquifer groundwater at concentrations above remediation goals from dermal exposure and inhalation of vapors from groundwater.

Radiologically impacted soil and structures

1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways.

4.9.2 Selected Remedy for Parcel UC-1

The selected remedy for Parcel UC-1 consists of the following components:

Soil

- Install durable covers across all of Parcel UC-1 as physical barriers to cut off potential exposure to metals in soil.

- Implement ICs. 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 at the time of transfer of the property to establish land use and activity restrictions to limit exposure to contaminated soil and groundwater to achieve IC performance objectives. The initial ARIC for VOC vapors will include all of Parcel UC-1. Refer to Section 2.9.2 of the ROD for more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

- Conduct soil gas surveys. Use the results of the surveys to evaluate potential vapor intrusion risks and assess the need for additional remedial activities or reduction in the ARIC for VOC vapors.

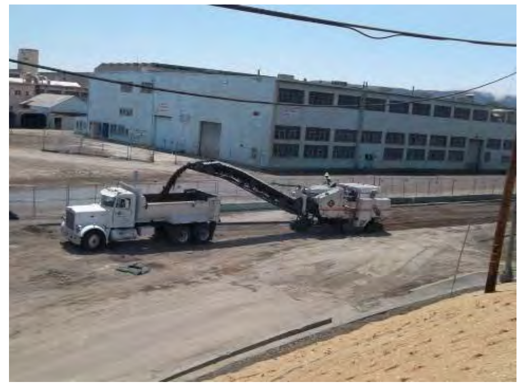
Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines while implementing appropriate dust control measures. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility. Obtain unrestricted release for all radiologically impacted soil and structures.

4.9.3 Remedy Implementation at Parcel UC-1

The RD for Parcels UC-1 and UC-2 was started in January 2010 and completed in December 2010 (ChaduxTt 2010e). Construction of the remedy for soil at Parcel UC-1 began in May 2012 and was completed in September 2012 (ERRG 2013b). Construction of the remedy at adjacent Parcel UC-2 occurred concurrently. Tasks related to construction included:

- Mobilization, site preparation, and existing conditions land survey
- Clearing, grubbing, and debris removal
- Soil excavations for soil cover



- Installation of soil covers, cover stabilization, and vegetation planting
- Asphalt cover (roadway) restoration and replacement (photograph at right)
- Fence installation
- Final survey
- Final inspection
- Demobilization

The remedy for Parcels UC-1 and UC-2 includes removal of the top 2 feet of soil from the sloped areas above Fisher and Spear Avenues and replacement with clean, imported soil, followed by stabilization and planting with native species. Removal of this soil was solely for the purpose of installing the new soil cover based on the topographical constraints at the site. (That is, the arrangement of paving and retaining walls did not allow construction of the cover over the existing soil.) Roadways and other paved areas were repaired or replaced to meet the specifications in the RD. Drainage features were included in the construction to convey storm water off site.

A soil gas survey at Parcel UC-1 is scheduled for 2013. Results from the survey will be used to evaluate potential risk to human health via vapor intrusion and to assess the need for ARICs for VOC vapors.

Radiological removals were completed in 2010 and DTSC approved an unrestricted release for radionuclides in Parcels UC-1 and UC-2 in 2011 (DTSC 2011). A total of 20,680 cy of soil was removed from 6,407 linear feet of sanitary sewer and storm drain lines; approximately 876 cy of soil was disposed of off site as LLRW. One radiologically impacted building (Building 819 on Parcel UC-1) was screened and remediated (Tetra Tech EC 2011a).

4.9.4 Long-Term Monitoring and Maintenance Activities at Parcel UC-1

Long-term maintenance requirements are detailed in the O&M plan for Parcels UC-1 and UC-2 (ERRG 2013c). Major inspection items include:

- **Security:** Condition of fencing and signs, evidence of vandalism or unauthorized access, condition of roads.

- **Soil cover:** Evidence of settlement, cracking, or erosion; evidence of slope failure; signs of burrowing pests; adequacy of vegetative cover; signs of excessive traffic.

- **Asphalt cover:** Evidence of settlement, cracking, or holes; evidence of ponding; evidence of excessive traffic.

- **Institutional controls:** No construction of residences or enclosed structures, no use of groundwater, no growing edible items, no land-disturbing activity or disturbance of remedy components, no damage to security features. (Some restricted activities may be conducted provided that the requirements of the LUC RD [ChaduxTt 2010e] are followed.)

Quarterly inspections of the covers for Parcels UC-1 and UC-2 began in September 2012. Repairs made during the quarterly inspections in January and April 2013 included minor maintenance items such as adding vegetation (hand planting) to poor growth areas, weed removal in sidewalk seams, and minor asphalt repairs (ERRG 2013a, 2013d).

There are no groundwater monitoring wells at Parcel UC-1; consequently, there is no monitoring at Parcel UC-1 under the BGMP.

4.10 PARCEL UC-2

4.10.1 Remedial Action Objectives for Parcel UC-2

The ROD for Parcel UC-2 was finalized in December 2009 (Navy 2009c). The RAOs for Parcel UC-2 identified in the ROD are:

Soil

1. Prevent or minimize exposure to inorganic chemicals in soil at concentrations above remediation goals developed in the HHRA for the following exposure pathways:
   (a) Ingestion of, outdoor inhalation of, and dermal exposure to surface and subsurface soil
   (b) Ingestion of homegrown produce by residents in mixed-use and research and development blocks

2. Prevent or minimize exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Remediation goals for VOCs to address exposure via indoor inhalation of vapors have been superseded based on COC identification information from soil gas surveys. Action levels have been established for soil gas, account for vapors from both soil and groundwater, and were calculated based on a cumulative risk level of 10^{-6} using

the accepted methodology for risk assessments at HPNS (ChaduxTt 2011d; Sealaska 2013).

Groundwater

1. Prevent or minimize exposure to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. This RAO for exposure to vapors from groundwater via vapor intrusion has been superseded by remediation goals established for soil vapor (ChaduxTt 2011d; Sealaska 2013).
2. Prevent or minimize direct exposure to the groundwater that may contain COCs through the domestic use pathway (for example, drinking water or showering).
3. Prevent or minimize exposure of construction workers to VOCs in the A-aquifer groundwater at concentrations above remediation goals from dermal exposure and inhalation of vapors from groundwater.

Radiologically impacted soil and structures

1. Prevent or minimize exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways (for example, external radiation, soil ingestion, and inhalation of resuspended radionuclides in soil or dust).

4.10.2 Selected Remedy for Parcel UC-2

The selected remedy for Parcel UC-2 consists of the following components:

Soil

- Install durable covers across all of Parcel UC-2 as physical barriers to cut off potential exposure to metals in soil.

- Implement ICs. 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 at the time of transfer of the property to establish land use and activity restrictions to limit exposure to contaminated soil and groundwater to achieve IC performance objectives. The initial ARIC for VOC vapors included the portion of Redevelopment Block 10 on Parcel UC-2 (a portion of Robinson Street and the parking lot northeast of Building 101). The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.10.4.3). Refer to Section 2.9.2 of the ROD for more details on ICs. The IC performance objectives will be met by access controls until the time of transfer of ownership of the property.

Groundwater

- Implement MNA in and around the VOC plume. Conduct groundwater monitoring in and around the plume and in downgradient locations, as necessary.
- Conduct soil gas surveys. Use the results of the surveys to evaluate potential vapor intrusion risks and assess the need for additional remedial activities or ARICs.
- Implement ICs (as discussed under soil).

Radiologically impacted soil and structures

- Decontaminate radiologically impacted structures and dismantle them if necessary. Excavate radiologically impacted storm drain and sanitary sewer lines while implementing appropriate dust control measures. Survey buildings and former building sites. Screen removed materials and transport contaminated material off site to an appropriate disposal facility. Obtain unrestricted release for all radiologically impacted soil and structures.

4.10.3 Remedy Implementation at Parcel UC-2

The RD for Parcels UC-1 and UC-2 was started in January 2010 and completed in December 2010 (ChaduxTt 2010e). Construction of the remedy for soil at Parcel UC-2 began in May 2012 and was completed in September 2012 (ERRG 2013b). Construction of the remedy at adjacent Parcel UC-1 occurred concurrently. Tasks related to construction included:

- Mobilization, site preparation, and existing conditions land survey
- Clearing, grubbing, and debris removal
- Soil excavations for soil cover
- Installation of soil covers, cover stabilization, and vegetation planting (photograph at right)

- Asphalt cover (roadway) restoration and replacement
- Fence installation
- Final survey
- Final inspection
- Waste disposal
- Demobilization

The remedy for Parcels UC-1 and UC-2 includes removal of the top 2 feet of soil and replacement with clean, imported soil, followed by stabilization and planting with native species. Roadways and other paved areas were repaired or replaced to meet the specifications in the RD. Groundwater monitoring wells at Parcel UC-2 were incorporated into the cover construction, and drainage features were included in the construction to convey storm water off site.

Radiological removals were completed in 2010 and DTSC approved an unrestricted release for radionuclides in Parcels UC-1 and UC-2 in 2011 (DTSC 2011). A total of 20,680 cy of soil was removed from 6,407 linear feet of sanitary sewer and storm drain lines; approximately 876 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2011a).

4.10.4 Long-Term Monitoring and Maintenance Activities at Parcel UC-2

The following sections discuss long-term monitoring and maintenance activities conducted at Parcel UC-2, including monitoring for groundwater and soil gas.

4.10.4.1 Long-Term Monitoring and Maintenance at Parcel UC-2

Long-term maintenance requirements are detailed in the O&M plan for Parcels UC-1 and UC-2 (ERRG 2013b). Major inspection items include:

- **Security:** Condition of fencing and signs, evidence of vandalism or unauthorized access, condition of roads.
- **Soil cover:** Evidence of settlement, cracking, or erosion; evidence of slope failure; signs of burrowing pests; adequacy of vegetative cover; signs of excessive traffic.
- **Asphalt cover:** Evidence of settlement, cracking, or holes; evidence of ponding; evidence of excessive traffic.
- **Groundwater monitoring wells:** Evidence of damage or vandalism, presence of obstructions, condition of locks and seals.
- **Institutional controls:** No construction of residences or enclosed structures, no use of groundwater, no growing edible items, no land-disturbing activity or disturbance of remedy components, no damage to security features. (Some restricted activities may be conducted provided that the requirements of the LUC RD [ChaduxTt 2010e] are followed.)

Quarterly inspections of the covers for Parcels UC-1 and UC-2 began in September 2012. Repairs made during the quarterly inspections in January and April 2013 included minor maintenance items such as adding vegetation (hand planting) to poor growth areas, weed removal in sidewalk seams, and minor asphalt repairs (ERRG 2013a, 2013d).

4.10.4.2 Groundwater Monitoring at Parcel UC-2

Groundwater monitoring is conducted throughout HPNS under the BGMP (CE2-Kleinfelder 2011b, 2012c). Monitoring includes quarterly groundwater elevation monitoring to evaluate the direction and gradient of groundwater flow and sampling for various COCs at varying frequencies.

A total of three wells are measured quarterly for groundwater elevation and three wells are sampled for analysis of COCs that include VOCs, metals, and indicator chemicals for natural attenuation. Concentrations of COCs in groundwater at Parcel UC-2 indicate concentrations less than remediation goals or declining trends. Monitoring results are discussed in more detail in Section 6.4.3.

4.10.4.3 Soil Gas Monitoring at Parcel UC-2

An investigation of potential chemicals in soil vapor was conducted in September 2010 for areas within Parcels B, D-1, G, and UC-2 (Sealaska 2013). A total of 150 soil gas samples were collected from 110 locations encompassing 89 1-acre grid blocks. In addition, 29 soil samples were collected for geotechnical analysis to obtain physical parameters used for assessing the potential for vapor intrusion. Results from the investigation were evaluated for potential risk to human health using a basewide approach developed for HPNS (ChaduxTt 2011d). A total of four grid blocks were sampled at Parcel UC-2. Soil gas results collected from one block indicated a potential risk to a future residential receptor that exceeded 10^{-6}. Consequently, the ARIC for VOC vapors was recommended to be reduced at Parcel UC-2 to the one block where the potential risk exceeded 10^{-6} (see Figure 4).

4.11 PARCEL UC-3

The ROD for Parcel UC-3 is currently being prepared (Navy 2013b).

Radiological removals were completed in 2010 and DTSC approved an unrestricted release for radionuclides in Parcel UC-3 in 2012 (DTSC 2012e). A total of 18,024 cy of soil was removed from 18,363 linear feet of sanitary sewer and storm drain lines; approximately 789 cy of soil was disposed of off site as LLRW (Tetra Tech EC 2012b).

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

The previous five-year review report (Jonas and Associates 2008) focused on Parcel B which, at that time, was the only parcel at HPNS that had an approved ROD and where remedial actions had been started. The protectiveness statements from the previous five-year review report are listed below.

Protectiveness statement for Parcel B soil and radiological contamination remedy:

> The soil remedy selected in the 1997 ROD at Parcel B is currently protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled through contaminated soil excavation and disposal; the use of fencing, locked gates, and warning signs; and secured buildings that limit access to remaining contaminated areas. However, updated information about the site that became available during the remedial action indicates that modifications to selected soil and groundwater remedies should be considered to ensure long-term protectiveness. Updated information includes items such as the ubiquitous nature of metals in soil across Parcel B, the presence of methane and mercury, the findings of a screening-level ecological risk assessment (SLERA), and findings from removal actions to address radiological contaminants.

Protectiveness statement for Parcel B groundwater:

> The groundwater remedy at Parcel B selected in the 1997 ROD is not currently protective of human health and the environment because (1) the remedy would not be considered protective of VOCs in groundwater that pose an unacceptable risk from vapor intrusion into buildings, and (2) the remedy includes only groundwater monitoring and does not contain any treatment component and, therefore, would rank as poor for reduction of toxicity and mobility. New information became available after the remedial action was implemented, which indicates that for long-term protectiveness, the groundwater remedy, the HHRA, and groundwater trigger levels need to be updated; potential ecological risk to aquatic receptors should be evaluated; the selected remedy needs to be modified to address VOC contamination; a point-of-compliance well and other characterization wells need to be installed at IR-07; a flexible groundwater monitoring plan to include radionuclides of concern must be implemented; and appropriate responses to incidences where trigger levels are exceeded must continue to be implemented.

The following sections describe progress made toward accomplishing recommendations identified in the last five-year review.

5.1 PROGRESS ON SOIL ISSUES FOR PARCEL B

Issues identified for soil in the previous five-year review and follow-up actions taken since the last five-year review include:

- **Issue:** Subsurface conditions at IR-07 and a portion of IR-18 differ from the conceptual model developed for the RI/FS. **Follow-up:** Subsurface conditions were re-evaluated in the TMSRA (ChaduxTt 2007) and a revised remedy (soil covers and shoreline revetment) was selected in the amended ROD (ChaduxTt 2009). The revised remedy at IR-07/18 was constructed from June to September 2011 (ERRG 2012a); construction of the remainder of the remedy for Parcel B is under way. The covers and revetment effectively prevent exposure to COCs remaining in soil and sediment.

- **Issue:** The proximity of some excavations to the San Francisco Bay shoreline delayed complete characterization and prevented excavation of the soil. **Follow-up:** The revised selected remedy incorporated a shoreline revetment to prevent migration of contaminants to the bay. The revised remedy at IR-07/18 was constructed from June to September 2011; construction of the remainder of the revetment to cover all of the rest of the shoreline where there is no seawall at Parcel B is in progress.

- **Issue:** Potential ecological risk to aquatic receptors from Parcel B contaminants near the shoreline has not been evaluated. **Follow-up:** A SLERA was included in the TMSRA and the revised selected remedy incorporated a shoreline revetment to prevent migration of contaminants to the bay. The revised remedy at IR-07/18 was constructed from June to September 2011; construction of the remainder of the revetment to cover all of the rest of the shoreline where there is no seawall at Parcel B is in progress.

- **Issue:** Portions of IR-10 have not been excavated because an SVE treatability study is being implemented. **Follow-up:** Results of the treatability study were incorporated into the evaluation in the TMSRA, and the revised selected remedy included expansion and continued operation of the SVE system at IR-10. Operation of the SVE system began in March 2013 (ERRG 2012e).

- **Issue:** Background levels of ambient metals in soil are higher and more variable than originally estimated. **Follow-up:** This issue was addressed in the TMSRA and was the basis for expanding the remedy for soil from excavation and off-site disposal to also include parcel-wide covers. The revised remedy for all of Parcel B includes durable covers over the entire parcel. The covers have been constructed for IR-07/18 (ERRG 2012a) and construction is in progress for the remainder of Parcel B (ERRG 2012e).

- **Issue:** Toxicity data used at the time of remedy selection have been updated, and cumulative risk was not estimated. **Follow-up:** The revised HHRA included in the TMSRA contained updated toxicity values and included a presentation of cumulative risk. Changes in risk assessment methodology and toxicity criteria were also considered during this five-year review (see Section 7.2.3).

5.2 PROGRESS ON RADIOLOGICAL ISSUES FOR PARCEL B

- **Issue:** Removal of potential radiological contamination addressed in the action memorandum for the basewide radiological removal action (Navy 2006) is not referenced by the current (1997) ROD. **Follow-up:** The revised remedy selected in the amended ROD (ChaduxTt 2009) incorporated RAOs and remedies to address radiological contamination. A MARSSIM Class 1 survey was completed for the entire surface of IR-07 and IR-18 and the top 1 foot was remediated to levels specified in the amended ROD to ensure a radiologically clean surface before the cover remedy was applied. The constructed cover over the portion of IR-07/18 potentially impacted by radionuclides prevents exposure. Radiological removals were completed in 2010. CDPH completed further surface scans at IR-07 and IR-18 after the remedial actions were completed and DTSC approved an unrestricted release for radionuclides in the remainder of Parcel B, excluding IR-07 and IR-18, in 2012 (DTSC 2012c).

5.3 PROGRESS ON GROUNDWATER ISSUES FOR PARCEL B

- **Issue:** The existing remedial action monitoring plan should be improved to better focus groundwater monitoring at Parcel B. **Follow-up:** The plan for groundwater monitoring at Parcel B was revised during the RD to focus the monitoring on contaminated areas and at sentinel locations along the bay margin (ChaduxTt 2010a, 2010d). Groundwater conditions continue to be evaluated and monitoring plans continue to be refined by the BGMP with concurrence from the regulatory agencies (CE2-Kleinfelder 2011b, 2012b, 2012c). Changes to the plans for groundwater monitoring have effectively optimized the monitoring program.

- **Issue:** Trigger levels may not reflect current guidance. **Follow-up:** Trigger levels for evaluation of groundwater were re-evaluated and updated as part of the TMSRA (ChaduxTt 2007). These trigger levels were incorporated into the amended ROD and are used in the current monitoring of groundwater at Parcel B.

- **Issue:** Concentrations of metals in groundwater are affected by background levels of ambient metals in soil, which are higher and more variable than originally estimated. **Follow-up:** Potential risk of metals in groundwater to human health and ecological receptors was evaluated in the TMSRA, and the remedy for groundwater in the amended ROD was selected to address those potential risks.

- **Issue:** Toxicity data used at the time of remedy selection have been updated, and cumulative risk was not estimated. **Follow-up:** The revised HHRA included in the TMSRA contained updated toxicity values and included a presentation of cumulative risk.

- **Issue:** Potential ecological risk to aquatic receptors from Parcel B contaminants has not been evaluated. **Follow-up:** A SLERA was included in the TMSRA and the revised selected remedy considered potential risk to ecological receptors from discharge of groundwater to the bay.

- **Issue:** A point-of-compliance well and other characterization wells were destroyed during excavation activities at IR-07. **Follow-up:** Wells needed for long-term monitoring of groundwater at IR-07 were replaced. Groundwater at IR-07 continues to be monitored in accordance with the amended ROD and RD. Groundwater samples are collected from wells IR07MW24A and IR07MW26A (see Figure 5) semiannually to monitor for potential migration of COCs toward the bay.

6.0 FIVE-YEAR REVIEW PROCESS

This section describes activities during the five-year review process for HPNS and provides a summary of each step in the process.

6.1 ADMINISTRATIVE COMPONENTS

The five-year review process was initiated in September 2012. The process consisted of:

- Community notification and involvement
- Document review
- Data review
- Site inspection
- Five-year review report preparation
- Interviews with key personnel

Members of the BRAC Cleanup Team were notified of the initiation of the five-year review during a meeting on December 5, 2012.

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

Community involvement was initiated by announcements of the five-year review process at community meetings held on December 5, 2012, and February 28, 2013. Community members were interviewed on December 4 and 5, 2012, as part of the five-year review process. Appendix A contains summaries of the interviews. A public notice was published in the *San Francisco Examiner* on May 12, 2013 announcing the five-year review process and the availability of the draft five-year review report for public comment. The draft third five-year review report was made available to the public at the two information repositories: the San Francisco Main Public Library (at 100 Larkin Street), and the Hunters Point site trailer (just before the guard station on Galvez Avenue). No comments were received from members of the community during the public comment period that extended from May 20 to June 20, 2013. The Navy presented a summary of the draft five-year review to the public at a community meeting on June 26, 2013 (see Appendix G).

Appendix B provides responses to comments received from members of the BCT and the San Francisco Department of Public Health on the draft report. The final third five-year review report was placed in the information repositories. A public notice announcing the completion of the five-year review and the availability of the final report was published in the *San Francisco Examiner* on [planned for late November 2013]. A fact sheet summarizing the results of the five-year review will be submitted to the public in [planned for December 2013].

6.3 DOCUMENT REVIEW

This five-year review included a review of relevant documents listed in Appendix C. RAOs, ARARs, and remediation goals are documented in the RODs. RAOs and remediation goals are used in the five-year review process to evaluate the effectiveness of the installed remedies.

6.4 GROUNDWATER DATA REVIEW

The following sections discuss groundwater monitoring data reviewed for parcels where groundwater monitoring was identified as part of the remedy and where the remedy is in place and operating. Parcels B, D-1, G, and UC-2 are included in the review. The data review builds on previous data reviews and recommendations of the BGMP optimization conducted for the same parcels in 2012 (CE2-Kleinfelder 2012b). Data collected since 2008 are available in reports published by the BGMP (CE2-Kleinfelder 2009, 2010a, 2010b, 2011a, 2011c, 2012a, 2012d, 2013). Appendix D contains concentration trend graphs that support the review.

6.4.1 Parcel B

The following sections discuss trends in groundwater concentrations at IR-07/18 and for the remainder of Parcel B. Refer to Figure 5 for well locations and Appendix D for concentration trend graphs. Plumes of VOCs in groundwater (defined as areas where concentrations exceed groundwater remediation goals) are shown on Figure 5 only to illustrate the approximate extent of VOCs in groundwater. ARICs for VOC vapors (as identified on Figure 4) are based on concentrations measured in soil gas and may not be co-located with groundwater VOC plumes.

6.4.1.1 IR-07/18

Two wells, **IR07MW24A** and **IR07MW26A**, located near the bay margin at IR-07 are sampled for analysis of metals and radionuclides to monitor for potential migration of chemicals to the bay. The COCs identified in the amended ROD monitored at IR-07/18 include metals (chromium VI, copper, lead, mercury, nickel, and selenium) and radionuclides (cesium-137, plutonium-239, radium-226, and strontium-90). Data reviewed include 11 sampling events for metals from March 2008 to February 2013. Only selenium exceeded its trigger level for potential impact to the bay (14.5 µg/L) and only in the samples collected in July 2008. Selenium was detected at 52 µg/L in the sample from well IR07MW24A and at 46.9 µg/L in the sample collected from well IR07MW26A. Selenium was not detected in the succeeding eight samples collected from well IR07MW24A after July 2008. Selenium was detected only once (4.5 µg/L in February 2010) in the eight samples collected from well IR07MW26A after July 2008. All other metals were either not detected or were detected erratically at concentrations less than their trigger levels.

Likewise, all radionuclides were either not detected or were detected at concentrations less than their remediation goals in samples collected for analysis of radionuclides from July 2008 to February 2013. The infrequently observed detections of radionuclides were one to two orders of magnitude less than remediation goals. The following table summarizes the radionuclides detected.

Radionuclide	Frequency of Detection	Concentration Range for Detections (pCi/L)	Groundwater Remediation Goal (pCi/L)
Cesium-137	1/19	0.494	119
Plutonium-239	1/19	0.035	15
Radium-226	2/19	0.377 – 0.427	5.0
Strontium-90	2/19	0.562 – 0.692	8.0

Note:

pCi/L picoCuries per liter

Summary for IR-07/18

Groundwater data at IR-07/18 do not indicate migration of COCs at levels that would pose a risk to human health or the environment.

6.4.1.2 Remainder of Parcel B

Groundwater at the remainder of Parcel B is monitored for a variety of concerns, including (1) VOC plume at IR-10, (2) VOCs at individual wells, (3) metals at individual wells, and (4) metals at bay margin wells.

VOC plume at IR-10

Graphs of VOC concentrations in wells **IR10MW13A1, IR10MW59A, IR10MW61A**, and **IR10MW71A** in Appendix D show the trends in VOC concentrations before implementation of the amended remedy (lactate injection). Monitoring will be optimized in conjunction with the remedial action. Treatment of groundwater is in progress at IR-10.

VOCs at individual wells

Various VOCs are monitored at three individual wells: IR20MW17A, IR24MW07A, and IR26MW41A.

IR20MW17A is monitored for vinyl chloride. Vinyl chloride concentrations in seven samples collected from July 2008 to February 2013 show a downward trend from 18 to 1.5 µg/L (compared with the remediation goal of 0.5 µg/L) (see graph in Appendix D).

IR24MW07A is monitored for potential migration of VOCs toward the bay. A broad suite of 23 VOCs identified as COCs for groundwater in the amended ROD is monitored at this well. Refer to the remedial action monitoring plans (RAMP) for Parcel B (ChaduxTt 2010d) for specific COCs at this well. Almost no detections of VOCs have been observed in six samples collected from September 2010 to February 2013. Low levels (less than 1 µg/L) of five VOCs (1,2,4-trichlorobenzene; 1,2-dichlorobenzene; 1,4-dichlorobenzene; trichlorofluoromethane, and dichlorodifluoromethane) were observed in the sample collected in January 2011; these levels were much lower than remediation goals. No other detections of VOCs were observed, including in the four subsequent samples, except a single detection of 2-methylnaphthalene in February 2013 (11 µg/L compared with the reporting limit of 10 µg/L).

IR26MW41A is monitored for dichlorodifluoromethane; 15 samples have been collected from December 2005 to February 2013. Dichlorodifluoromethane concentrations in five samples collected since September 2010 show a slight decreasing trend, with the three most recent samples (13, 21, and 17 µg/L) varying in the range of the remediation goal of 14 µg/L (see graph in Appendix D).

Metals at individual wells

Selenium is monitored at wells IR10MW81A and IR26MW49A. Mercury is monitored at wells IR26MW49A, IR26MW51A, and PA50MW02A.

Selenium. Six samples have been collected at well **IR10MW81A** and nine samples have been collected at well **IR26MW49A** for analysis of selenium since July 2008 (see graphs in Appendix D). None of the samples collected at well IR10MW81A exceeded the trigger level of 58 µg/L for selenium at this inland location. After an initial detection of 26.9 µg/L in July 2008, selenium was not detected in the succeeding five samples. Only the sample collected in July 2008 (19.4 µg/L) at well IR26MW49A exceeded the trigger level of 14.5 µg/L for selenium at the bay margin. All seven succeeding samples collected at well IR26MW49A were less than the trigger level and indicated a decreasing trend; selenium was not detected in seven of the eight samples, including the five most recent samples. The BGMP optimization evaluation recommended eliminating well IR10MW81A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation. Groundwater data for selenium do not indicate levels that would pose a risk to the environment.

Mercury. Three samples have been collected at well **PA50MW02A** for mercury since September 2010. All were less than the trigger level for mercury (0.6 µg/L); mercury was not detected in two of the samples. Samples from this well do not indicate a well-defined trend but appear to fluctuate near the reporting limit (see graph in Appendix D).

Wells **IR26MW49A** and **IR26MW51A** are located close to each other near the eastern end of IR-26 along the bay margin (see Figure 5). Well IR26MW49A replaced nearby well IR26MW47A that was decommissioned in 2008 during the TCRA for mercury. Sampling records extend to March 2002 considering both wells (see graph in Appendix D). Mercury concentrations at this location have generally ranged between 1 and 3 µg/L; the most recent sample was 1.7 µg/L in March 2013. Mercury concentrations show a stable, variable trend over the 11 years of measurements.

Similarly, concentrations of mercury in 11 samples collected at well IR26MW51A since May 2009 vary from about 0.5 to 1.5 µg/L (see graph in Appendix D). Mercury concentrations show a stable trend in this well, with concentrations fluctuating around an average value of about 1 µg/L.

Mercury was one of the COCs during the original remedial action at Parcel B; about 5,077 cy of soil was removed to a total depth of 10 feet bgs during 2000 to 2001. A TCRA specifically for mercury was conducted in 2008 in the same and surrounding area (Insight 2008). Further investigation of mercury in the area included collection of 98 soil samples and 19 groundwater samples from 21 borings advanced to bedrock to delineate mercury source areas. None of the groundwater samples indicated a mercury concentration exceeding the trigger level (0.6 µg/L), with concentrations ranging from 0.085 to 0.3 µg/L. An additional 6,000 cy of soil was removed to a maximum depth of 18 feet bgs to bedrock and disposed of off site. The maximum mercury concentration measured during the TCRA was 300 mg/kg in a sample (subsequently removed) collected at 3 feet bgs. Confirmation soil samples collected from excavation sidewalls all indicated mercury concentrations less than the remediation goal (2.3 mg/kg, the Hunters Point ambient level [HPAL] for mercury). However, five of 23 samples collected from bedrock at the base of two of the excavations during the TCRA found mercury concentrations greater than the HPAL, as high as 15 mg/kg. A concrete plug was set in the excavations from the base of the excavations to the top of the water table to further inhibit mercury migration. The five bedrock samples with high mercury concentrations may indicate that highly localized mercury anomalies are present within the native bedrock in the area of IR-26 that could continue to act as sources for mercury in groundwater.

Concentrations of mercury measured in samples from three other nearby wells IR26MW46A, IR26MW48A,and IR26MW50A all indicate either no detections or low concentrations (less than 0.1 µg/L) that are less than the trigger level with no discernible trend.

<u>Metals at bay margin wells</u>

Metals, including chromium VI, copper, lead, mercury, nickel, and selenium, are monitored at bay margin wells IR24MW07A, IR26MW49A, and IR46MW43A.

Five samples collected at well **IR24MW07A** from January 2011 to February 2013 indicated no detections of any of these six metals at concentrations exceeding the trigger level. All samples indicated no detections, except for one detection of nickel (at 0.63 µg/L compared with the trigger level of 96.5 µg/L).

The discussion of mercury and selenium at well **IR26MW49A** is included above. No concentrations of chromium VI, copper, lead, or nickel were observed to exceed trigger levels in samples collected at well IR26MW49A. Detections of chromium VI, copper, and lead were sporadic with no discernible trends. Concentrations of nickel exhibited a stable trend, ranging from about 5 to 12 µg/L.

Two to seven samples have been collected at well **IR46MW43A** from July 2008 to February 2013 (the number varies by metal); no detections of any of the six metals exceeded the trigger levels. Detections of copper, mercury, and selenium were sporadic with no discernible trends. Detections of chromium VI indicated a stable trend, ranging from 1.7 to 5.4 µg/L (compared with the trigger level of 50 µg/L). Likewise, concentrations of nickel exhibited a stable trend, ranging from about 2 to 8 µg/L. Lead was not detected in all seven samples.

Summary for Remainder of Parcel B

VOCs. Treatment of VOCs in groundwater and soil gas is in progress at IR-10. Groundwater monitoring will be optimized in conjunction with the remedial action. Data from individual wells do not indicate migration of COCs at levels that would pose a risk to human health or the environment although some concentrations remain above the remediation goal. Risk from all VOCs in groundwater, however, is from inhalation via vapor intrusion into residential structures. This risk is addressed by ICs that prohibit residential construction without appropriate soil vapor controls in specific areas identified during the soil vapor investigation conducted in 2010 (Sealaska 2013). In addition, active treatment of soil gas at IR-10 using SVE is expected to further reduce potential risk from exposure to VOCs via vapor intrusion.

Metals. Except for mercury at wells IR26MW49A and IR26MW51A, groundwater data from wells at the bay margin and interior locations do not indicate migration of chromium VI, copper, lead, mercury, nickel, or selenium at levels that would pose a risk to the environment. Mercury concentrations at wells IR26MW49A and IR26MW51A remain greater than the trigger level and additional semiannual monitoring is recommended to observe concentration trends.

6.4.2 Parcels D-1 and G

Groundwater at Parcels D-1 and G is monitored for a variety of concerns, including (1) VOCs at IR-71 East, (2) VOCs at IR-71 West, (3) VOCs at IR-33, (4) metals and VOCs at IR-09, and (5) metals at bay margin wells. Parcels D-1 and G are discussed together because two areas of concern for groundwater (IR-71 East and IR-71 West) overlap the boundary between the parcels. The designations for the areas of concern follow those used in the BGMP optimization evaluation (CE2-Kleinfelder 2012b). The following sections discuss trends in groundwater concentrations. Refer to Figure 6 for well locations and Appendix D for concentration trend graphs. Plumes of VOCs in groundwater are shown on Figure 6 only to illustrate the approximate extent of VOCs in groundwater. ARICs for VOC vapors (as identified on Figure 4) are based on concentrations measured in soil gas and may not be co-located with groundwater VOC plumes.

VOCs at IR-71 East

Samples collected at wells IR71MW03A and IR71MW04A at Parcel G and IR71MW20A and IR70MW07A at Parcel D-1 are used to monitor concentrations of VOCs in groundwater at IR-71. The primary COCs in groundwater include chloroform, tetrachloroethene (PCE), and trichloroethene (TCE), although one well (IR71MW20A) is monitored for a broader list of VOCs. The wells are discussed below, in sequence from upgradient to downgradient.

IR71MW04A. A total of 19 samples have been collected from this well from January 2006 to February 2013. Concentrations of chloroform, PCE, and TCE were all less than remediation goals; no detections were observed in most of the samples, with no discernible trends (see graphs in Appendix D).

IR71MW03A. A total of 24 samples have been collected from this well from January 2006 to February 2013 for analysis of chloroform, PCE, and TCE. Concentrations of chloroform rose above the remediation goal (1.0 µg/L) briefly in 2009, but have remained below the remediation goal in the six subsequent samples and exhibit a decreasing trend. All samples analyzed for PCE indicated concentrations greater than the remediation goal (0.54 µg/L); the nine samples collected since July 2009 indicate a decreasing trend. Likewise, TCE concentrations were mostly greater than the remediation goal (2.9 µg/L), and samples collected since September 2010 indicate a decreasing trend. The most recent sample for TCE is slightly less than the remediation goal (see graphs in Appendix D).

IR71MW20A. Five samples have been collected from this well from October 2009 to February 2013. In addition to chloroform, PCE, and TCE, samples from IR71MW20A were also analyzed for benzene, carbon tetrachloride, naphthalene, and xylenes. No detections of any VOCs were observed in any of the samples.

IR70MW07A. A total of 17 samples have been collected from this well from January 2006 to August 2012. Concentrations of chloroform, PCE, and TCE were all less than remediation goals; no detections were observed in most of the samples, with no discernible trends (see graphs for chloroform and TCE in Appendix D).

VOCs at IR-71 West

Samples collected at a group of nine wells are used to monitor concentrations of VOCs in groundwater in the IR-71 West area. This area was one of two treated by ZVI injection in December 2008 (Alliance Compliance 2010). The primary COCs in groundwater include chloroform, PCE, and TCE, although one well (IR70MW11A) is monitored for a broader list of VOCs, and well IR33MW121B is monitored for vinyl chloride. The wells are discussed below, in approximate sequence from upgradient to downgradient areas.

IR33MW121B. This well was selected for monitoring in the RD based on an estimated detection of vinyl chloride (0.064 µg/L) observed in a post-treatment monitoring sample collected in November 2008 after the ZVI injection in the overlying A-aquifer. No detections of vinyl chloride were observed in six subsequent samples collected from October 2009 to February 2012. The BGMP optimization evaluation recommended eliminating well IR33MW121B from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR44MW08A. A total of 23 samples have been collected from this well from January 2006 to August 2012 for analysis of chloroform and TCE. Chloroform concentrations have been less than the remediation goal (1.0 µg/L) in 10 samples collected since the ZVI injection in December 2008. No detections were observed in the four most recent samples. Concentrations of TCE have remained below the remediation goal in all samples collected (see graphs in Appendix D). Concentrations of both chloroform and TCE indicate stable trends since December 2008.

IR33MW63A. Seven samples have been collected from this well from August 2008 to February 2012 for analysis of chloroform. A sample collected before the ZVI injection indicated a concentration of 24 µg/L (August 2008), but no concentrations exceeding the remediation goal (1.0 µg/L) were observed in the six samples collected post-treatment. Concentrations observed post-treatment were erratic and included three samples with no detections. The BGMP optimization evaluation recommended eliminating well IR33MW63A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

PA50MW06A. This well is located in Parcel E, directly adjacent to Parcels D-1 and G (see Figure 6). Four samples have been collected from this well from October 2009 to January 2011 for analysis of chloroform. A sample collected in April 2010 indicated a chloroform concentration greater than the remediation goal (1.6 versus the 1.0 µg/L goal); however, no detections were observed in the two subsequent samples. The BGMP optimization evaluation recommended eliminating well PA50MW06A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR71MW24A. Four samples have been collected from this well from October 2009 to February 2012 for analysis of chloroform. All samples were collected after the ZVI injection, and no concentrations exceeding the remediation goal (1.0 µg/L) were observed. Concentrations exhibited a stable trend. The BGMP optimization evaluation recommended eliminating well IR71MW24A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR71MW22A. Five samples have been collected from this well from October 2009 to July 2012 for analysis of chloroform, PCE, and TCE. All samples were collected after the ZVI injection, and no concentrations exceeding the remediation goals were observed. Detections were erratic and no detections were observed in most of the samples, including the three most recent samples.

IR70MW04A. A total of 23 samples have been collected from this well from January 2006 to July 2012 for analysis of chloroform, PCE, and TCE. Chloroform concentrations have been less than the remediation goal (1.0 µg/L) in 10 samples collected since the ZVI injection in December 2008. No detections were observed in the seven most recent samples. Concentrations of PCE and TCE have remained below the remediation goals in all samples collected (see graphs in Appendix D). Concentrations of chloroform and PCE have exhibited stable trends since December 2008; TCE concentrations have indicated a slight decreasing trend.

IR71MW28A. Seven samples have been collected from this well from October 2009 to July 2012 for analysis of TCE. All samples were collected after the ZVI injection, and no concentrations exceeding the remediation goals were observed. No detections were observed in most of the samples, including the five most recent samples.

IR70MW11A. Seven samples have been collected from this well from June 2008 to February 2012. In addition to chloroform, PCE, and TCE, samples from IR70MW11A were also analyzed for benzene, carbon tetrachloride, naphthalene, and xylenes. No detections of any VOCs were observed in any of the samples. The BGMP optimization evaluation recommended eliminating well IR70MW11A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

VOCs at IR-33

Samples collected at wells IR33MW64A, IR33MW65A, and IR34MW36A at Parcel G are used to monitor concentrations of VOCs in groundwater at the IR-33 area. The primary COC in groundwater is chloroform, although one well (IR33MW64A) is also monitored for carbon tetrachloride. These three wells are all approximately cross-gradient and are discussed below in numerical order.

IR33MW64A. Nine samples have been collected from this well from June 2008 to February 2013 for analysis of chloroform and carbon tetrachloride. Chloroform concentrations indicate an erratic trend, with concentrations ranging from about 3 to 0.5 μg/L compared with the remediation goal of 1.0 μg/L. Carbon tetrachloride was observed in the initial sample at a concentration greater than the remediation goal (0.95 versus the 0.5 μg/L goal), and concentrations observed in the seven subsequent samples were below the goal and indicated a stable trend. However, the most recent sample (0.76 μg/L in February 2013) showed an increased concentration (see graphs in Appendix D).

IR33MW65A. Seven samples have been collected from this well from June 2008 to February 2012 for analysis of chloroform. The initial sample indicated a concentration of 6.4 μg/L, above the remediation goal of 1.0 μg/L, but no concentrations exceeding the remediation goal were observed in the six subsequent samples (see graph in Appendix D). These six samples indicated a stable trend. The BGMP optimization evaluation recommended eliminating well IR33MW65A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR34MW36A. Twelve samples have been collected from this well from June 2008 to February 2012 for analysis of chloroform. The sample collected in November 2008 indicated a concentration of 2.0 μg/L, above the remediation goal of 1.0 μg/L, but no detections were observed in the nine subsequent samples (see graph in Appendix D). The BGMP optimization evaluation recommended eliminating well IR34MW36A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

Metals and VOCs at IR-09

Samples collected at a group of seven wells are used to monitor concentrations of chromium VI and VOCs in groundwater in the IR-09 area at Parcel G. The area near wells IR09MW07A and IR09MW51F was the second of two areas treated by ZVI injection in December 2008 (Alliance Compliance 2010). The primary COCs in groundwater include chromium VI, chloroform, and

TCE, although one well (IR09MW51F) is also monitored for benzene. The wells are discussed below, in approximate sequence from upgradient to downgradient areas.

IR09MW63A. A total of 19 samples have been collected from this well from January 2006 to February 2012 for analysis of chromium VI. Concentrations of chromium VI show a stable trend, ranging from about 35 to 80 µg/L. No detections of chromium VI were observed in any of the samples above the trigger level of 600 µg/L. The BGMP optimization evaluation recommended eliminating well IR09MW63A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR09MW07A. Six samples have been collected from this well from October 2009 to February 2013 for analysis of chromium VI, chloroform, and TCE. All concentrations of chromium VI were much less than the trigger level, ranging from 0.2 to 47 µg/L in a decreasing trend. All concentrations of chloroform were less than the remediation goal, including no detections in the five most recent samples. The concentration of TCE was 23 µg/L in a sample collected before the ZVI injection in December 2008. After the injection, concentrations ranged from 7.4 to 1.6 µg/L in the most recent sample, below the remediation goal of 2.9 µg/L (see graph in Appendix D). TCE concentrations indicate a decreasing trend. Well IR09MW07A is screened across a deeper zone within the A-aquifer (25 to 35 feet bgs); nearby well IR09MW51F monitors groundwater in the shallower portion of the A-aquifer (screened 6 to 21 feet bgs).

IR09MW51F. A total of 20 samples have been collected from this well from January 2006 to August 2012 for analysis of chromium VI, benzene, and TCE. Concentrations of chromium VI ranged from about 15 to 50 µg/L before the ZVI injection in December 2008. After the injection, eight of nine samples indicated no detections of chromium VI. Concentrations of benzene were not detected before the injection, rose sporadically to a range of about 0.5 to 1.0 µg/L from March 2009 to September 2010, and then stabilized at 0.2 to 0.4 µg/L over the four most recent samples collected from January 2011 to August 2012. Concentrations of TCE ranged from about 5 to 40 µg/L before the injection and have remained less than 1.0 µg/L in a stable trend in the 10 samples collected after the injection. Concentrations of chromium VI, benzene, and TCE in (at least) the four most recent samples are all less than trigger levels or remediation goals (see graphs in Appendix D).

IR09MW64A and former IR09PPY1. A total of 23 samples have been collected from well IR09PPY1 from April 1990 to April 2010 for analysis of chromium VI. Concentrations of chromium VI mostly ranged erratically from about 100 to 600 µg/L before the well was decommissioned during removal of the adjacent pickling vault in May 2010. About 31,000 pounds of ZVI was added to the excavation between 6 and 15 feet bgs to further treat chromium VI in the vault area (Tetra Tech EC 2010). Well IR09MW64A was installed to replace well IR09PPY1 and has been sampled five times for analysis of chromium VI from December 2010 to February 2013. Concentrations of chromium VI have all been less than 20 µg/L and indicate a decreasing trend (see graph in Appendix D).

IR09MW37A. A total of 20 samples have been collected from this well from January 2006 to February 2012 for analysis of chromium VI. Concentrations of chromium VI indicated a stable trend, ranging from about 3 to 45 µg/L. No detections chromium VI of were observed in any of the samples above the trigger level of 600 µg/L. The BGMP optimization evaluation recommended eliminating well IR09MW37A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR09MW38A. A total of 15 samples have been collected from this well from January 2006 to February 2012 for analysis of chromium VI. Concentrations of chromium VI were erratic, ranging from about 1 to 55 µg/L. No detections of chromium VI were observed in any of the samples above the trigger level of 600 µg/L. The BGMP optimization evaluation recommended eliminating well IR09MW38A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

IR09P040A. A total of 12 samples have been collected from this well from June 2008 to February 2012 for analysis of chloroform. Concentrations of chloroform exceeded the remediation goal of 1.0 µg/L in two samples (8.2 µg/L in November 2008 and 1.7 µg/L in March 2009). Concentrations of chloroform in the subsequent eight samples were less than the remediation goal and indicated a stable trend. No detections of chloroform were observed in the four most recent samples (see graph in Appendix D). The BGMP optimization evaluation recommended eliminating well IR09P040A from further sampling (CE2-Kleinfelder 2012b); the BCT representatives concurred with this recommendation.

Metals at bay margin wells

Metals, including chromium VI, copper, lead, mercury, nickel, and selenium, are monitored at bay margin wells IR17MW13A, IR22MW16A, and IR55MW02A at Parcel D-1. Silver is also monitored at well IR22MW16A.

Four samples collected at well **IR17MW13A** from January 2011 to August 2012 indicated no detections of any of these six metals (excluding silver).

Five to six samples have been collected at well **IR22MW16A** from July 2008 to February 2013 (the number varies by metal) for analysis of chromium VI, copper, mercury, and selenium; no detections were observed for any of the four metals. A total of 18 samples were collected from January 2006 to February 2013 for analysis of lead; no detections of lead exceeded the trigger level. Lead was detected erratically in three samples, ranging from 1.6 to 3.5 µg/L. Silver was detected once (23.4 µg/L in July 2008) at a concentration greater than the trigger level of 7.4 µg/L. The concentrations of silver observed in the subsequent seven samples collected from March 2009 to February 2013 did not exceed the trigger level; the three most recent samples indicated a stable trend with detections of silver ranging from 1.2 to 1.7 µg/L.

Five samples collected at well **IR55MW02A** from January 2011 to February 2013 indicated no detections of chromium VI, copper, lead, mercury, or selenium. Concentrations of nickel ranged from 1.3 to 2.5 µg/L in three samples, less than the trigger level of 96.5 µg/L.

Summary for Parcels D-1 and G

VOCs. Concentrations of VOCs in the groundwater at IR-71 East, IR-71 West, IR-33, and IR-09 are well defined and either indicate a decreasing trend or are less than remediation goals. Risk from VOCs in groundwater, however, is from inhalation via vapor intrusion into residential structures. This risk is addressed by ICs that prohibit residential construction without appropriate soil vapor controls in specific areas identified during the soil vapor investigation conducted in 2010 (Sealaska 2013).

Metals. Groundwater data from wells at the bay margin and interior locations do not indicate migration of chromium VI, copper, lead, mercury, nickel, selenium, or silver at levels that would pose a risk to the environment.

6.4.3 Parcel UC-2

Three wells, IR06MW54F, IR06MW55F, and IR06MW56F, exist at Parcel UC-2 (see Figure 5) and all are monitored for VOCs and natural attenuation parameters as part of the MNA remedy selected in the ROD. Carbon tetrachloride and chloroform are the COCs.

IR06MW54F. A total of 19 samples have been collected from this well from December 2005 to February 2013. Carbon tetrachloride concentrations ranged from about 4 to 9 µg/L, compared with the remediation goal of 0.5 µg/L. Chloroform concentrations ranged from about 1.5 to 2.5 µg/L, compared with the remediation goal of 1.0 µg/L. Concentrations of chloroform show a slightly decreasing trend in the eight samples collected since October 2009 (see graph in Appendix D). Concentrations of carbon tetrachloride indicate a generally increasing trend since 2005.

IR06MW55F. A total of 19 samples have been collected from this well from December 2005 to February 2013. Carbon tetrachloride concentrations ranged from about 0.1 to 0.9 µg/L, compared with the remediation goal of 0.5 µg/L. Chloroform concentrations ranged from about 0.12 to 0.54 µg/L, all below the remediation goal of 1.0 µg/L. Concentrations of both VOCs were all below remediation goals in the seven samples collected since October 2009 (see graph in Appendix D). Concentrations of both VOCs indicate overall decreasing trends since 2005, but exhibit slightly increasing trends in samples collected since 2009.

IR06MW56F. Three samples have been collected from this well (January 2011, February 2012, and February 2013). Carbon tetrachloride and chloroform were not detected in any of the samples.

Summary for Parcel UC-2

VOCs. Concentrations of COCs in groundwater at Parcel UC-2 are well defined, and data indicate overall decreasing trends or levels less than remediation goals. Furthermore, the soil vapor investigation conducted in 2010 did not identify any risk from inhalation via vapor intrusion in the area of the identified groundwater plume (Sealaska 2013).

6.5 SITE INSPECTIONS

The Navy conducted a site inspection for this review on March 1, 2013. Staff from EPA, DTSC, and the Water Board attended the inspection, in addition to staff from the Navy and Navy contractors ERRG and Tetra Tech. The purpose of the site inspection was to review and document current site conditions and evaluate visual evidence on the protectiveness of the remedial systems. Site access and general site conditions were also evaluated during the inspection. Appendix E contains the site inspection checklist, and Appendix F contains the photographic log, which documents observations made during the inspection.

The inspection focused on the completed cover remedies at IR-07/18 at Parcel B and at Parcels UC-1 and UC-2. On-going construction operations for the remedies for Parcel G and the remainder of Parcel B were also observed. The inspection also included confirmation of the condition of groundwater monitoring wells across HPNS, although those observations were made during the semiannual groundwater sampling event conducted from February 21 to March 21, 2013. Observations were made by groundwater sampling staff from Navy contractor CE2-Kleinfelder. Photographs illustrating current conditions of monitoring wells are also included in Appendix F.

Observations made during the site inspection indicated that the remedies at IR-07/18 at Parcel B and Parcels UC-1 and UC-2 were operating properly and successfully.

6.5.1 Covers

IR-07/18

The soil cover at IR-07/18 was observed to be in good condition with no evidence of settlement, erosion, bulges, or cracks. Minor holes, typically 1 to 2 inches in diameter, and not appearing to extend far below surface were observed. These holes would not endanger the effectiveness of the soil cover, which is at least 2 feet thick (and is as much as 7 feet thick near the northern edge abutting the revetment). All slopes appeared stable and the cover vegetation was well established. The shoreline revetment was observed to be in good condition with some sand refilling the bayward areas of the revetment toe. The small asphalt cover at the northeastern corner of IR-07 was observed to be in good condition.

Parcels UC-1 and UC-2

The hillside soil cover at Parcels UC-1 and UC-2 was observed to be in good condition with no evidence of settlement, erosion, bulges, cracks, or holes. The hillside slope appeared stable and cover vegetation was moderately well established, even considering that the vegetation had been planted in July 2012. The asphalt covers on the roadways and parking lots were observed to be in good condition. Evidence of minor ponding was observed on the north side of the roadway near the border of Parcels UC-1 and UC-2, but no damage to the cover was observed.

6.5.2 Groundwater Monitoring Wells

Monitoring wells visited during the site inspection were observed to be in good condition. Monitoring wells visited during the semiannual groundwater sampling event were generally observed to be in good condition. Some wells had water inside the well vaults or well heads were partially covered by gravel or soil. Both of these conditions are expected to be remedied as new covers are installed in the areas surrounding the wells as remedial actions are completed.

6.6 INTERVIEWS

Various HPNS stakeholders were interviewed, including EPA, DTSC, Water Board, San Francisco Department of Public Health, O&M contractor ERRG, tenants, and local community members. Appendix A contains a list of individuals interviewed and records of the interviews. In general, all individuals interviewed stated that they were well informed of site activities and were generally satisfied with the overall cleanup progress. Concerns raised during the interviews included:

- Noise and dust from ongoing activities
- Vandalism, especially trespassing and theft of copper wiring
- Opportunities for employment on remediation activities for local businesses and community members
- Need for independent oversight of Navy activities and decisions
- Opportunities for community involvement in cleanup decisions
- Excessively conservative and cautious approaches to cleanups

7.0 TECHNICAL ASSESSMENT

Three questions will be examined in the technical assessment to evaluate whether the remedy at HPNS is protective of human health and the environment:

- *Question A:* Is the remedy functioning as intended by the decision documents?
- *Question B:* Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?
- *Question C:* Has any other information come to light that could call into question the protectiveness of the remedy?

Each of these questions is addressed in the following subsections, building on the information and data summaries presented previously. The discussion presented here is a framework for the protectiveness determination that explains the conclusions of the review.

7.1 QUESTION A

Is the remedy functioning as intended by the decision documents? Yes, for Parcels B, C, D-1, G, UC-1, and UC-2 where remedies have been undertaken.

EPA's guidance document for five-year reviews identifies several areas to be considered in evaluating whether the remedy selected in the RODs is functioning as designed (EPA 2001). Areas of consideration include:

- Remedial action performance – Is the remedy operating as designed? Does the current monitoring provide adequate information to assess the protectiveness and effectiveness of the remedy implemented?
- System O&M – Will the system and current O&M activities maintain the effectiveness of the response actions? Are there large variances between current annual costs and original cost estimates that might indicate potential remedy problems?
- Implementation of ICs and other measures – Are these elements functioning as planned?
- Optimization opportunities – Are there any areas for improvement?
- Early indications of potential issues – Are there problems that could indicate that the remedy may not be protective or suggest protectiveness is at risk unless changes are made?

These considerations are discussed below, by parcel where remedial actions have been undertaken. Parcels B, C, D-1, G, UC-1, and UC-2 are discussed. Table 2 lists the components of the remedy for each parcel and the status of the completion of each component.

7.1.1 Parcel B

7.1.1.1 Remedial Action Performance

The remedy for Parcel B was implemented in two parts: IR-07/18 as one part, and the remainder of Parcel B as the second part.

IR-07/18

A review of documents, site inspections, and interviews with personnel knowledgeable about the site indicates that all components of the remedy as outlined in the amended ROD have been implemented and are functioning as intended. Durable covers on upland areas and along the shoreline have achieved the RAO of preventing exposure to contaminants in soil and sediment. Soil gas monitoring demonstrated that the TCRA for the methane source successfully removed the source, which was likely naturally occurring organic matter contained in the Bay Mud. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and covenants to restrict use of property (CRUP) at the time of transfer will effectively prevent exposure to any other VOCs in soil vapor and exposure to groundwater following transfer of the property. The IC performance objectives will be met by access controls until the time of transfer. Data collected during ongoing groundwater monitoring along the bay margin do not indicate migration of COCs at levels that would pose a risk to human health or the environment.

Remainder of Parcel B

Some of the components of the remedy outlined in the amended ROD have been implemented. The excavation and off-site disposal of soil have been completed. Likewise, the radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in the remainder of Parcel B (that is, excluding IR-07/18) in 2012. Construction of the remaining components of the remedy — including covers and revetment, operation of the SVE system at IR-10, and treatment of groundwater at IR-10 — are under way. Potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions.

7.1.1.2 System Operations and O&M

O&M activities apply only to IR-07/18 where the remedy has been constructed. Inspections at IR-07/18 found all remedy components in good condition and that O&M of the covers has been effective. Minor issues encountered included a few shallow animal burrows. Animal burrows were checked for inhabitants, confirmed to be unoccupied, and filled in using a spade. The disturbed area was then reseeded.

Annual O&M cost was originally estimated to be $13,400 for activities excluding cover or revetment repairs (see Table D-5B in TMSRA, ChaduxTt 2007). Actual O&M cost for the first year was $62,645. Reasons for the variance in O&M costs include:

- Original estimate assumed a single annual inspection and report; actual costs reflect quarterly inspections and reports.

- Original estimate did not include costs for annual mowing, off-schedule repair events (two for fence vandalism and one for cover damage), or decommissioning of five methane monitoring probes.

The higher actual O&M costs do not indicate any potential problems with the remedy, but instead reflect more frequent monitoring conducted by the Navy as a conservative approach. Future O&M costs are expected to decrease as the frequency of inspections is reduced.

7.1.1.3 Institutional Controls and Other Measures

The IC performance objectives specified in the amended ROD are being met by access controls until the time of transfer to prevent potential exposure at all of Parcel B. No activities were observed that would have violated the ICs. In addition, access to IR-07/18 is controlled and fencing and signs at the site are in good condition. Overall access to HPNS is restricted by manned, restricted-access checkpoints. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.1.4 Optimization and Early Indicators of Potential Problems

No opportunities for optimization or early indicators of potential problems were identified for the covers at IR-07/18 during this review. The network of groundwater monitoring wells provides sufficient data to assess the condition of groundwater at all of Parcel B. Opportunities to optimize the groundwater monitoring plan for the remainder of Parcel B were identified during the 2012 optimization evaluation (CE2-Kleinfelder 2012b), and the data analysis conducted during this five-year review confirmed those recommendations. Additional revisions to the groundwater monitoring plan will continue to be proposed under the BGMP as additional data are collected and evaluated. Monitoring of the IR-10 area will be optimized in conjunction with the remedial action (lactate injection) undertaken for the VOC plume there.

7.1.2 Parcel C

7.1.2.1 Remedial Action Performance

Some of the components of the remedy outlined in the ROD have begun to be implemented. Groundwater treatment and radiological removals are under way. Excavation of soil and implementation of SVE are also under way. Construction of the remaining components of the remedy (covers and soil gas survey) will proceed after the radiological removals, excavations, and groundwater treatment have been completed. Potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.2.2 System Operations and O&M

O&M activities have not yet begun at Parcel C.

7.1.2.3 Institutional Controls and Other Measures

Overall access to HPNS is restricted by manned, restricted-access checkpoints. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.2.4 Optimization and Early Indicators of Potential Problems

The network of groundwater monitoring wells provides sufficient data to assess the condition of groundwater at Parcel C. Additional revisions to the groundwater monitoring plan will continue to be proposed under the BGMP as additional data are collected and evaluated.

7.1.3 Parcel D-1

7.1.3.1 Remedial Action Performance

Some of the components of the remedy outlined in the ROD have been implemented. The excavation and off-site disposal of soil from four areas and removal of soil stockpiles have been completed. Groundwater treatment using ZVI injection was completed in 2008. Radiological removals are under way. Construction of the remaining components of the remedy (removal of two remaining areas and covers) will proceed after the radiological removals have been completed. Potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.3.2 System Operations and O&M

The only O&M activities applicable at Parcel D-1 are related to groundwater monitoring, which is discussed below in Section 7.1.3.4.

7.1.3.3 Institutional Controls and Other Measures

Overall access to HPNS is restricted by manned, restricted-access checkpoints. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.3.4 Optimization and Early Indicators of Potential Problems

The network of groundwater monitoring wells provides sufficient data to assess the condition of groundwater at Parcel D-1. Opportunities to optimize the groundwater monitoring plan for Parcel D-1 were identified during the 2012 optimization evaluation (CE2-Kleinfelder 2012b), and the data analysis conducted during this five-year review confirmed those recommendations. Additional revisions to the groundwater monitoring plan will continue to be proposed under the BGMP as additional data are collected and evaluated.

7.1.4 Parcel G

7.1.4.1 Remedial Action Performance

Most of the components of the remedy outlined in the ROD have been implemented. The excavation and off-site disposal of soil and removal soil stockpiles have been completed. Groundwater treatment using ZVI injection was completed at IR-09 and IR-71 in 2008. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel G in 2012. Construction of the remaining component of the remedy (covers) is under way. Potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.4.2 System Operations and O&M

The only O&M activities applicable at Parcel G are related to groundwater monitoring, which is discussed below in Section 7.1.4.4.

7.1.4.3 Institutional Controls and Other Measures

Overall access to HPNS is restricted by manned, restricted access checkpoints. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.4.4 Optimization and Early Indicators of Potential Problems

The network of groundwater monitoring wells provides sufficient data to assess the condition of groundwater at Parcel G. Opportunities to optimize the groundwater monitoring plan for Parcel G were identified during the 2012 optimization evaluation (CE2-Kleinfelder 2012b), and the data analysis conducted during this five-year review confirmed those recommendations. Additional revisions to the groundwater monitoring plan will continue to be proposed under the BGMP as additional data are collected and evaluated.

7.1.5 Parcel UC-1

7.1.5.1 Remedial Action Performance

A review of documents, site inspections, and interviews with personnel knowledgeable about the site indicates that all components of the remedy as outlined in the ROD, except the soil gas survey, have been implemented and are functioning as intended. Durable covers have achieved the RAO of preventing exposure to contaminants in soil. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel UC-1 in 2011. Plans for a soil vapor survey at Parcel UC-1 are in progress. Potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.5.2 System Operations and O&M

Inspections at Parcel UC-1 found all remedy components in good condition and O&M of the covers has been effective. Minor issues encountered included evidence of storm water ponding at the border of Parcels UC-1 and UC-2 observed during an inspection in January 2013 (ERRG 2013a). A small amount of accumulated sediment was removed from this location; no damage to the asphalt cover was observed. No evidence of ponding was observed in the subsequent inspection in April 2013 (ERRG 2013d).

7.1.5.3 Institutional Controls and Other Measures

The IC performance objectives specified in the ROD are being met by access controls until the time of transfer to prevent potential exposure at Parcel UC-1. No activities were observed that would have violated the ICs. In addition, access to Parcel UC-1 is controlled and fencing and signs at the site are in good condition. Overall access to HPNS is restricted by manned, restricted access checkpoints. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.5.4 Optimization and Early Indicators of Potential Problems

No opportunities for optimization or early indicators of potential problems were identified for the covers at Parcel UC-1 during this review.

7.1.6 Parcel UC-2

7.1.6.1 Remedial Action Performance

A review of documents, site inspections, and interviews with personnel knowledgeable about the site indicates that all components of the remedy as outlined in the ROD have been implemented and are functioning as intended. Durable covers have achieved the RAO of preventing exposure to contaminants in soil. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel UC-2 in 2011. Concentrations of VOCs in groundwater are less than remediation goals or are decreasing. Potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.6.2 System Operations and O&M

Inspections at Parcel UC-2 found all remedy components in good condition and O&M of the covers has been effective. Minor issues encountered included evidence of storm water ponding at the border of Parcels UC-1 and UC-2.

7.1.6.3 Institutional Controls and Other Measures

The IC performance objectives specified in the ROD are being met by access controls until the time of transfer to prevent potential exposure at Parcel UC-2. No activities were observed that would have violated the ICs. In addition, access to Parcel UC-2 is controlled and fencing and signs at the site are in good condition. Overall access to HPNS is restricted by manned, restricted access checkpoints. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs following transfer of the property.

7.1.6.4 Optimization and Early Indicators of Potential Problems

No opportunities for optimization or early indicators of potential problems were identified for the covers at Parcel UC-2 during this review. The network of groundwater monitoring wells provides sufficient data to assess the condition of groundwater at Parcel UC-2. No opportunities to optimize the groundwater monitoring plan for Parcel UC-2 were identified during the 2012 optimization evaluation (CE2-Kleinfelder 2012b), and the data analysis conducted during this five-year review confirmed those recommendations. Additional revisions to the groundwater monitoring plan will continue to be proposed under the BGMP as additional data are collected and evaluated.

7.2 QUESTION B

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes.

EPA’s guidance document for five-year reviews identifies several areas to be considered in evaluating whether the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid (EPA 2001). Areas of consideration include changes in standards and “to be considered (TBC)” criteria, changes in exposure pathways, changes in toxicity and other contaminant characteristics, changes in risk assessment methods, and expected progress toward meeting RAOs.

7.2.1 Changes in Standards and TBCs

No changes to chemical-specific, location-specific, or action-specific ARARs established in the RODs were identified that would bear on the protectiveness of the remedy. The RODs for all parcels contain remediation goals for selected COCs that incorporate the use of the risk management range of 10^{-6} to 10^{-4}. In keeping with this approach, the Navy is preparing an ESD for Parcel C to allow a few COCs at select locations to remain in soil at levels above the ROD remediation goals, where the overall risk will still be within the risk management range. This change will not, however, affect the protectiveness of the remedy.

7.2.2 Changes in Exposure Pathways

Physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedies. Land use at HPNS has not changed since the RODs were signed; however, land use is expected to change as parcels are transferred and the land is redeveloped. Exposure assumptions developed in the HHRA considered the potential future exposures based on the expected reuses. The future redevelopment plan was updated in 2010 (SFRA 2010). Examples of changes in the expected reuse include changing the reuse options at IR-18 at Parcel B from options that allow residential use to only open space use and expanding potential reuse options at Parcel G to include residential use options. However, the plan did not introduce any new exposure scenarios that were not already taken into account by the HHRAs and RODs.

No new human health or ecological routes of exposure that could affect the protectiveness of the remedies have been identified. No changes to site conditions that could result in increased exposure have been identified. No significant changes to the risk assessment methodology have occurred that would affect the protectiveness of the remedy. The vapor intrusion exposure pathway was considered during the risk assessments that were used to support remedy selection.

No new contaminants or contaminant sources originating from the sites have been identified or detected during monitoring. No unanticipated toxic byproducts have been generated as a result of remedy implementation.

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid.

7.2.3 Changes in Toxicity and Other Contaminant Characteristics

There have been no changes to toxicity or other contaminant characteristics that would affect the protectiveness of the remedy. Although some changes to the toxicity criteria for some COCs have occurred, these changes will not affect the protectiveness of the remediation goals or RAOs.

For example, EPA has incorporated the mutagenicity of some chemicals into risk calculations for exposure to soil for non-adult receptors. This change to the risk assessment process would affect risks calculated for several PAHs for the future resident exposure scenario. The incorporation of mutagenicity plus revisions to toxicity criteria could increase the calculated risk by as much as 4-fold, depending on the chemical and exposure pathway. However, remediation goals were established at a risk level of 1×10^{-6}. Accounting for changes to the risk calculations would, therefore, result in a maximum risk level of 4×10^{-6} which is still well within EPA's risk management range of 10^{-6} to 10^{-4}. Furthermore, exposure to COCs in soil is prevented by the soil covers that have been or will be constructed.

7.2.4 Expected Progress toward Meeting RAOs

The remedies are progressing as expected. Concentrations of COCs in groundwater at parcels where the remedy for groundwater has been implemented (Parcels D-1, G, and UC-2) indicate concentrations less than remediation goals or declining trends.

7.3 QUESTION C

Has any other information come to light that could call into question the protectiveness of the remedy? No.

No new ecological risks have been identified. No weather-related incidents, earthquakes, or other natural disasters have affected the protectiveness of the remedies.

Emerging chemicals (perchlorate; n-nitrosodimethylamine [NDMA]; 1,4-dioxane; 1,2,3-trichloropropane, chromium VI, and polybrominated diphenyl ether) were routinely included in analytical suites for groundwater sampling activities at HPNS starting in 2004 although data for some chemicals exist as early as 1992. Table 3 presents a summary of groundwater sampling information for emerging chemicals. The resultant data were evaluated in human health and ecological risk assessments prepared to support RI/FSs, and ultimately RODs, at HPNS. Only 1,2,3-trichloropropane and chromium VI posed potentially unacceptable risks to human health or the environment and plans for remediation of these chemicals were included in the appropriate RODs. Concerns regarding emerging chemicals do not call into question the protectiveness of the remedies.

No other information has been identified to suggest that the remedies may not be protective of human health and the environment.

8.0 ISSUES, RECOMMENDATIONS, AND FOLLOW-UP ACTIONS

The table below presents issues, recommendations, and follow-up actions for HPNS.

Site	Issue	Recommendation and Follow-up Actions	Party Responsible	Affects Protectiveness (Yes / No)	
				Current	Future
Parcel B, IR-26	Concentrations of mercury in groundwater in two wells at Parcel B (IR26MW49A and IR26MW51A) remain above trigger levels even after removal and stabilization of mercury in soil and bedrock in the area.	Groundwater at wells IR26MW49A and IR26MW51A should continue to be monitored semiannually for mercury to evaluate the trend in mercury concentrations. The mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A should be evaluated.	Navy	No	Yes

9.0 PROTECTIVENESS STATEMENT

The following sections list the protectiveness statements for each parcel. Protectiveness statements are presented for parcels where some or all of the remedy has been or is in the process of being constructed.

9.1 PARCEL B

IR-07/18. The remedy for the portion of Parcel B at IR-07/18 is protective of human health and the environment.

Previous soil removals and durable covers on upland areas and the revetment along the shoreline have achieved the RAO of preventing exposure to contaminants, including radionuclides, in soil and sediment. Removal of the methane source has achieved the RAO for methane. Data collected during ongoing groundwater monitoring along the bay margin do not indicate migration of COCs at levels that would pose a risk to human health or the environment. The IC performance objectives specified in the amended ROD are being met by access controls until the time of transfer to prevent potential exposure. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

Remainder of Parcel B. The remedy for the remainder of Parcel B is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

The excavation and off-site disposal of soil was completed in 2010. Likewise, the radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in the remainder of Parcel B (that is, excluding IR-07/18). Construction of the remaining components of the remedy, including covers and revetment, operation of the SVE system at IR-10, and treatment of groundwater at IR-10 are under way. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

9.2 PARCEL C

The remedy for Parcel C is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Soil excavation, groundwater treatment using lactate injection and SVE are under way. Radiological removals are also under way. Construction of the remaining components of the remedy (durable covers) will proceed after the radiological removals and excavations have been completed. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

9.3 PARCEL D-1

The remedy for Parcel D-1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

The excavation and off-site disposal of soil was partially completed in 2010. Groundwater treatment using ZVI injection was completed in 2008. Radiological removals are under way. Construction of the remaining components of the remedy (removal of two remaining areas and covers) will proceed after the radiological removals have been completed. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

9.4 PARCEL G

The remedy for Parcel G is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

The excavation and off-site disposal of soil and removal of soil stockpiles were completed in 2010. Groundwater treatment using ZVI injection was completed at IR-09 and IR-71 in 2008. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel G. Construction of the remaining component of the remedy (covers) is substantially completed. During construction, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

9.5 PARCEL UC-1

The remedy for Parcel UC-1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Previous soil removals and durable covers have achieved the RAO of preventing exposure to contaminants in soil. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel UC-1. Plans for a soil vapor survey at Parcel UC-1 are in progress. The IC performance objectives specified in the ROD are being met by access controls until the time of transfer to prevent potential exposure. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

9.6 PARCEL UC-2

The remedy for Parcel UC-2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Previous soil removals and durable covers have achieved the RAO of preventing exposure to contaminants in soil. The radiologically related portions of the remedy have been completed, and DTSC approved an unrestricted release for radionuclides in Parcel UC-2. Concentrations of VOCs in groundwater are less than remediation goals or are decreasing. During monitoring of natural attenuation, potential risk posed by exposure to contaminants in soil, soil vapor, or groundwater is controlled by access restrictions. The effective implementation of IC performance objectives through land use and activity restrictions incorporated into deeds and CRUPs at the time of transfer will effectively prevent exposure to COCs and prevent activities that could damage the integrity of the remedy following transfer of the property.

10.0 NEXT REVIEW

The next five-year review will be completed in 2018, 5 years from the date of this five-year review report.

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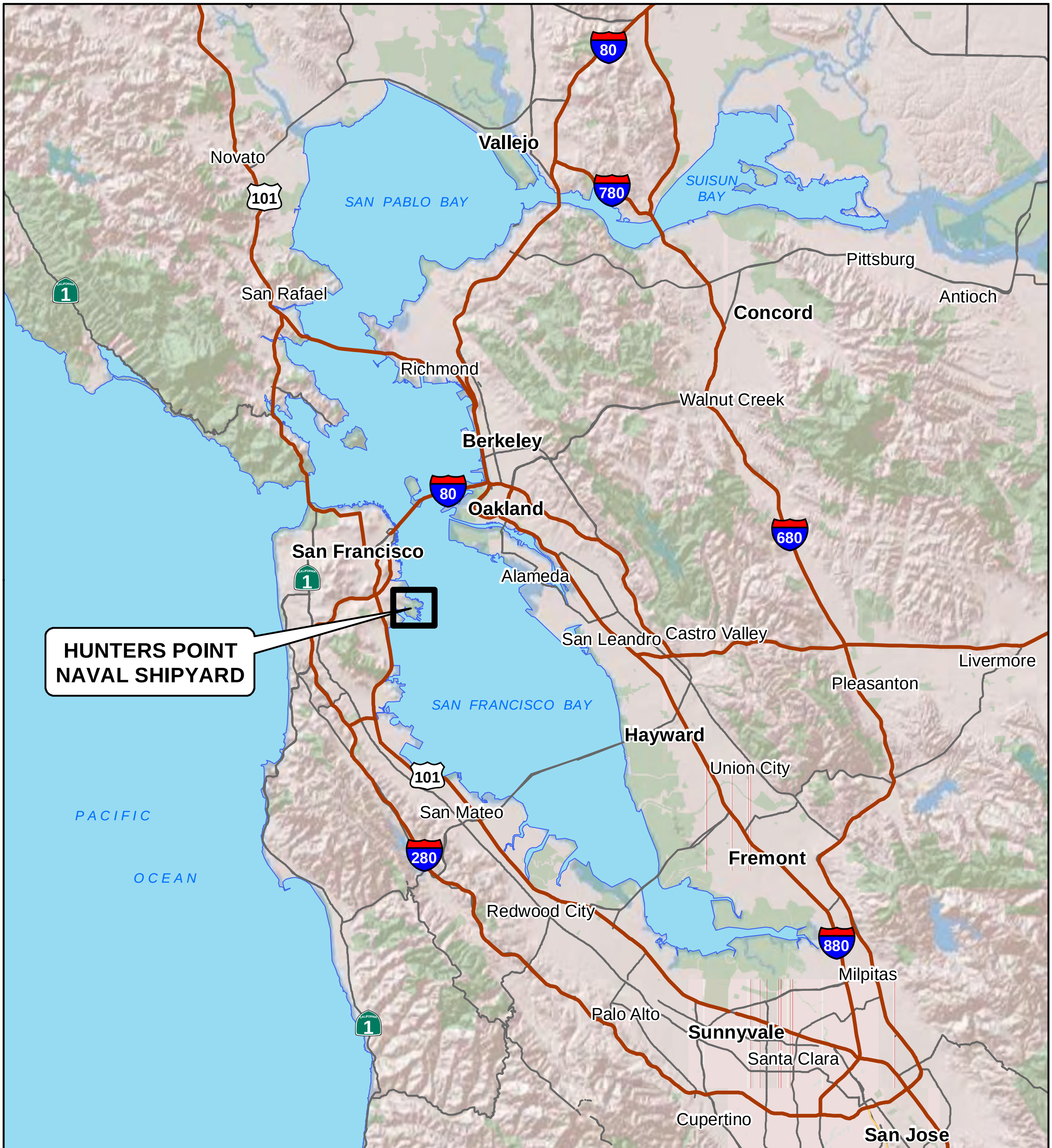
FIGURES



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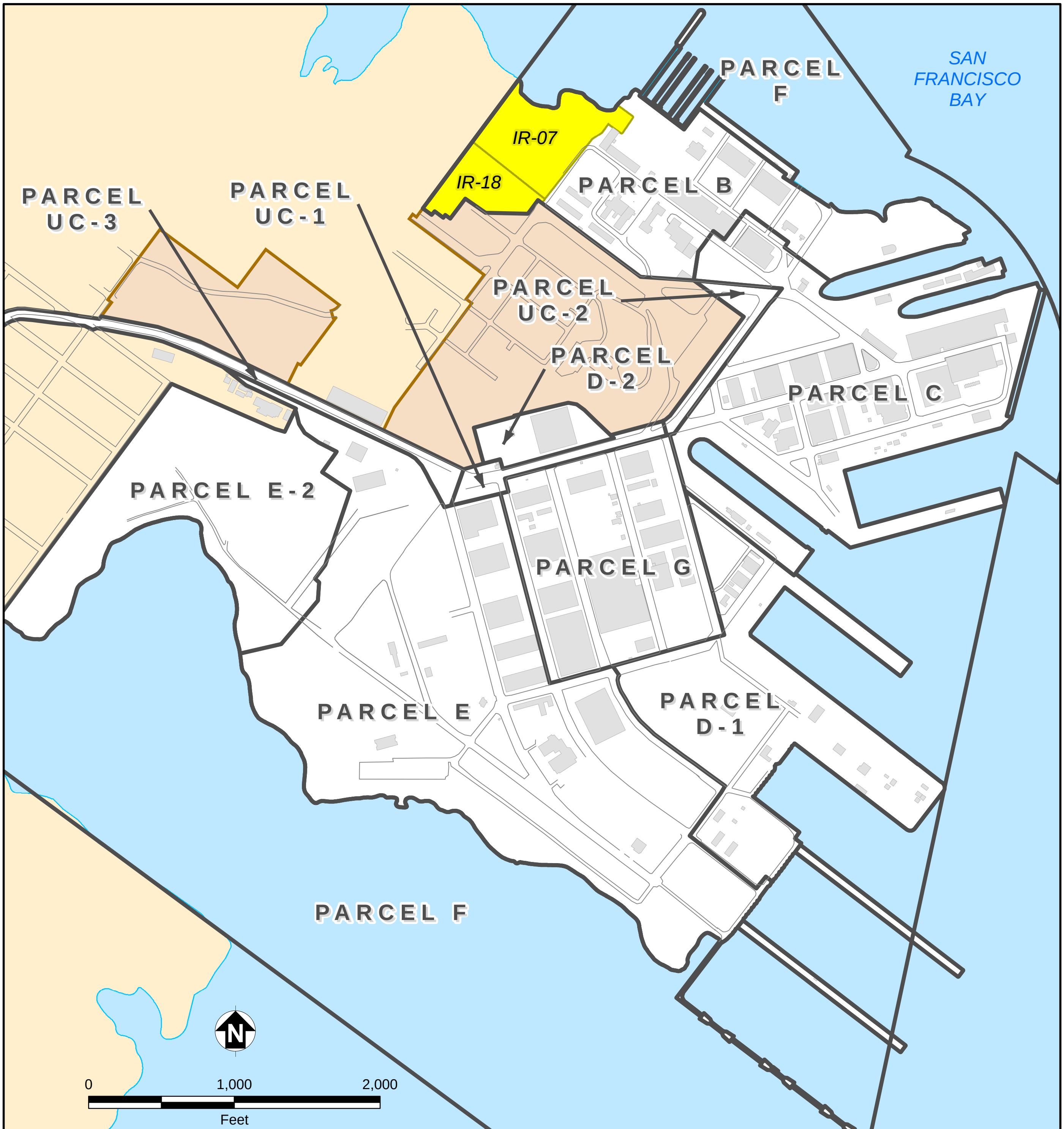
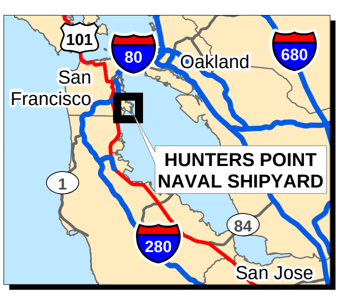
Hunters Point Naval Shipyard, San Francisco, California
Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 1
HUNTERS POINT NAVAL SHIPYARD
REGIONAL LOCATION

Third Five-Year Review





Location of
Hunters Point Naval Shipyard

IR Sites 7 and 18
Parcel Boundary
Former Navy Property - Parcel A
Non-Navy Property
Building
Road Edge

IR Installation Restoration

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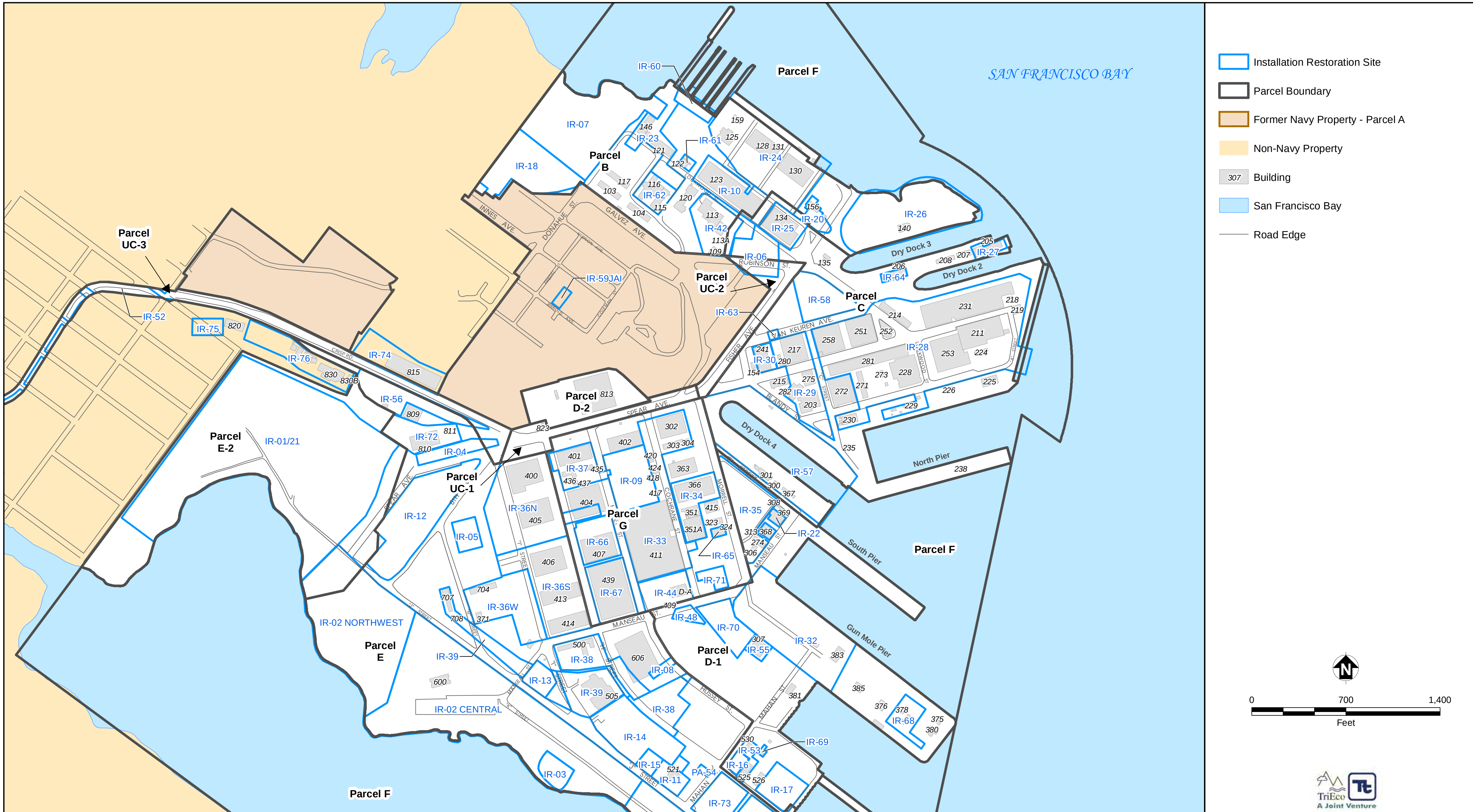
Hunters Point Naval Shipyard, San Francisco, California
Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 2

FACILITY OVERVIEW

Third Five-Year Review

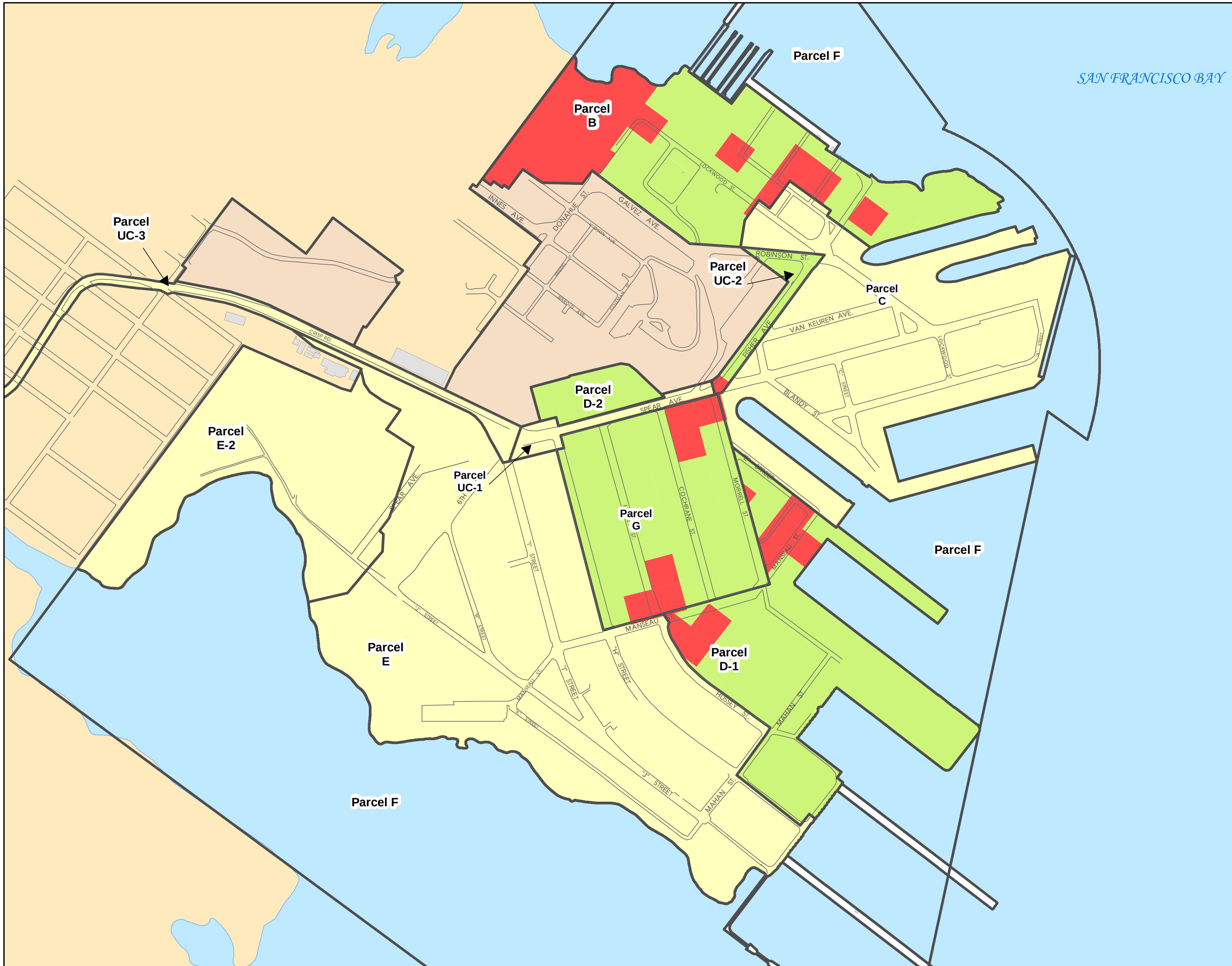


Hunters Point Naval Shipyard, San Francisco, California

Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 3
INSTALLATION RESTORATION SITES

Third Five-Year Review



Area Evaluated; ARIC for VOC Vapors Required

Area Evaluated; ARIC for VOC Vapors Not Required

Area Not Evaluated

Parcel Boundary

Former Navy Property - Parcel A

Non-Navy Property

Building

San Francisco Bay

Road Edge

ARIC - Area Requiring Institutional Controls
VOC - Volatile Organic Compound

Sources:
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Hunters Point Naval Shipyard, San Francisco, California
Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 4
AREAS REQUIRING INSTITUTIONAL CONTROLS FOR VOC VAPORS

Third Five-Year Review

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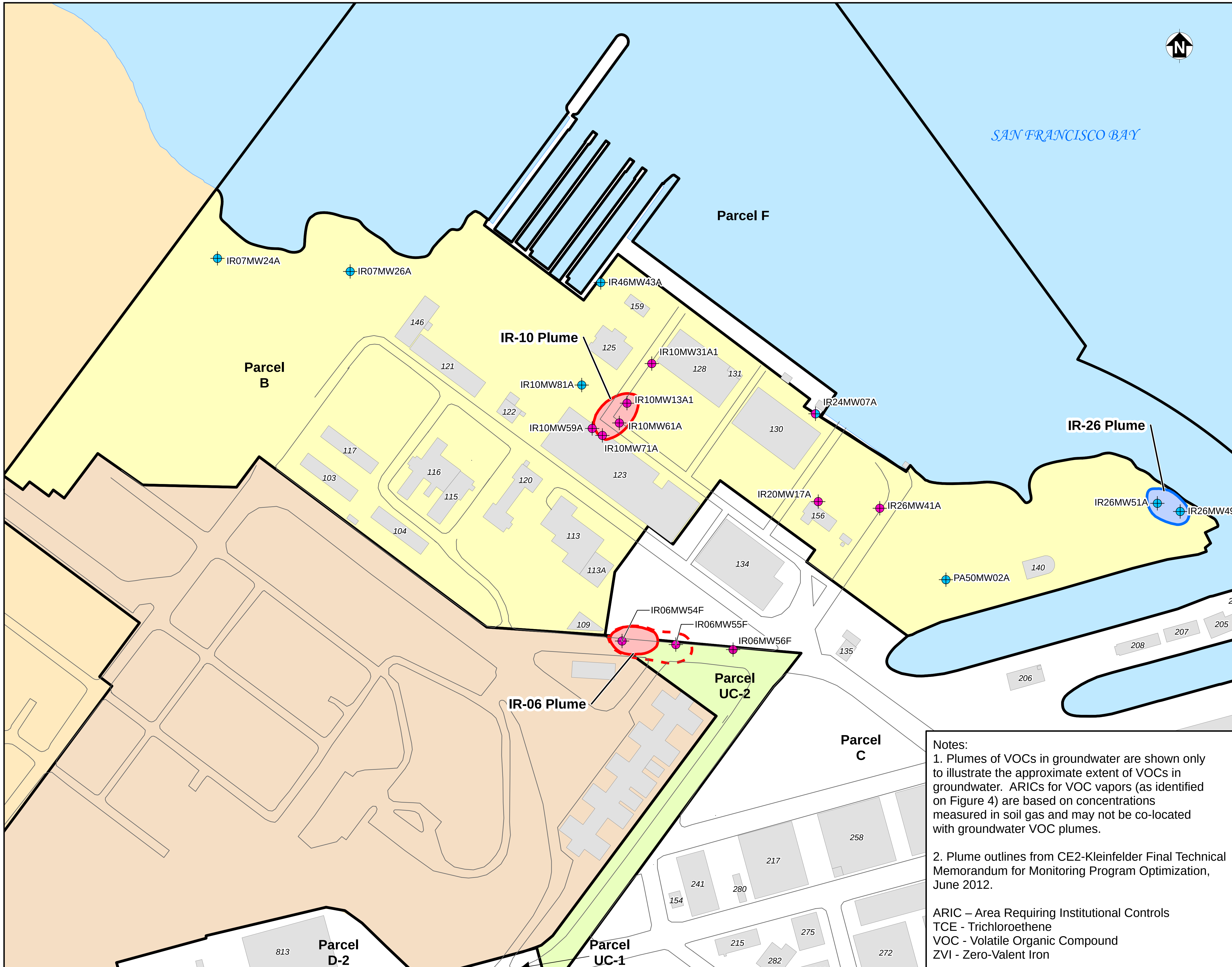

Hunters Point Naval Shipyard Parcels

F
B
UC-2
UC-1
D-2
C
E-2
G
E
D-1
F

Well for Chemical Concentration Monitoring (Metals)
Well for Chemical Concentration Monitoring (VOCs)
Well for Chemical Concentration Monitoring (VOCs and Metals)
Current Extent of Mercury Exceeding Trigger Level
Current Extent of VOCs Exceeding Remediation Goal
Former Extent of VOC Plume in Groundwater
Parcel B
Parcel UC-2
Other Parcels
Former Navy Property - Parcel A
Non-Navy Property
307 Building
San Francisco Bay
Road Edge

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Notes:
1. Plumes of VOCs in groundwater are shown only to illustrate the approximate extent of VOCs in groundwater. ARICs for VOC vapors (as identified on Figure 4) are based on concentrations measured in soil gas and may not be co-located with groundwater VOC plumes.

2. Plume outlines from CE2-Kleinfelder Final Technical Memorandum for Monitoring Program Optimization, June 2012.

ARIC – Area Requiring Institutional Controls
TCE - Trichloroethene
VOC - Volatile Organic Compound
ZVI - Zero-Valent Iron

Hunters Point Naval Shipyard, San Francisco, California
Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 5
GROUNDWATER MONITORING WELL LOCATIONS, PARCELS B AND UC-2

Third Five-Year Review

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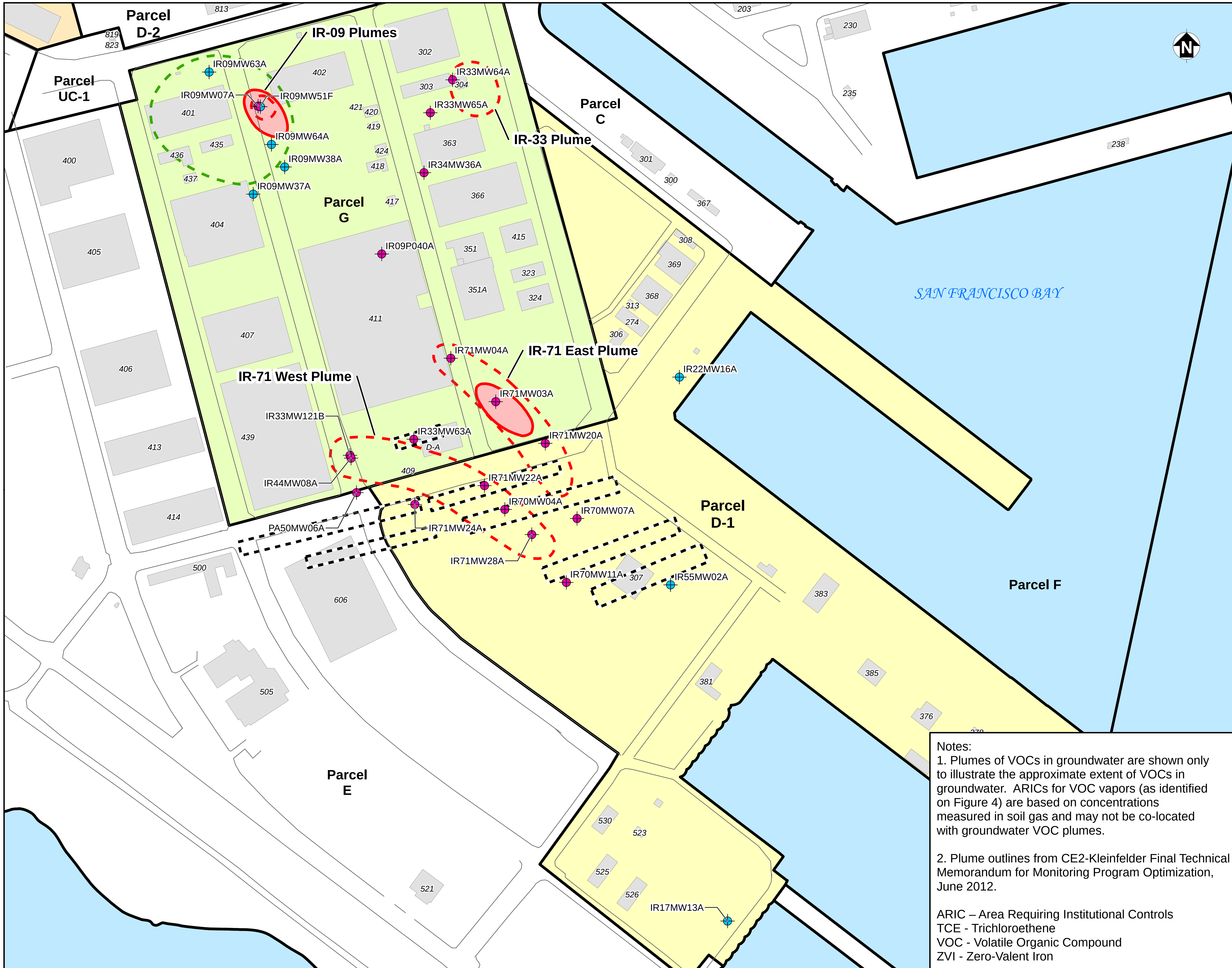

Notes:

1. Plumes of VOCs in groundwater are shown only to illustrate the approximate extent of VOCs in groundwater. ARICs for VOC vapors (as identified on Figure 4) are based on concentrations measured in soil gas and may not be co-located with groundwater VOC plumes.

2. Plume outlines from CE2-Kleinfelder Final Technical Memorandum for Monitoring Program Optimization, June 2012.

ARIC – Area Requiring Institutional Controls
TCE - Trichloroethene
VOC - Volatile Organic Compound
ZVI - Zero-Valent Iron

- Well for Chemical Concentration Monitoring (Metals)
- Well for Chemical Concentration Monitoring (VOCs)
- Well for Chemical Concentration Monitoring (VOCs and Metals)
- Current Extent of TCE Exceeding Remediation Goal
- Former Extent of Chromium VI Plume in Groundwater
- Former Extent of VOC Plume in Groundwater
- 2008 ZVI Injection Area
- Parcel D-1
- Parcel G
- Parcel Boundary
- 307 Building
- Non-Navy Property
- San Francisco Bay
- Road Edge

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Hunters Point Naval Shipyard, San Francisco, California
Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 6
GROUNDWATER MONITORING WELL LOCATIONS, PARCELS D-1 AND G

Third Five-Year Review

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TABLES

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA
Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

Chemical	B: Soil	B: Sediment	B: Groundwater, vapor intrusion	B: Groundwater, domestic use	B: Groundwater, ecological	B: Soil and structures, radionuclides	C: Soil	C: Groundwater, vapor intrusion	C: Groundwater, domestic use	C: Groundwater, ecological	C: Soil and structures, radionuclides	D-1: Soil	D-1: Groundwater, vapor intrusion	D-1: Groundwater, ecological	D-1: Soil and structures, radionuclides	D-2: Soil and structures, radionuclides	E: Soil	E: Sediment	E: Groundwater, domestic use	E: Soil and structures, radionuclides	E-2: Soil, human health and terrestrial wildlife	E-2: Sediment	E-2: Groundwater, domestic use	E-2: Soil and structures, radionuclides	F: Sediment	G: Soil	G: Groundwater, vapor intrusion	G: Groundwater, ecological	G: Soil and structures, radionuclides	UC-1: Soil and structures, radionuclides	UC-2: Groundwater, vapor intrusion	UC-2: Soil and structures, radionuclides	UC-3: Soil	UC-3: Soil and structures, radionuclides
1,1,2,2-Tetrachloroethane								x																										
1,1,2-Trichloroethane								x																										
1,1-Dichloroethane								x	x														x											
1,2,3-Trichloropropane								x															x											
1,2,4-Trichlorobenzene			x						x																									
1,2,4-Trimethylbenzene			x					x																										
1,2-Dichlorobenzene			x					x	x																									
1,2-Dichloroethane			x				x		x																									
1,2-Dichloroethene (total)			x					x	x																									
1,2-Dichloropropane			x					x	x																									
1,3,5-Trimethylbenzene			x					x	x																									
1,3-Dichlorobenzene									x																									
1,4-Dichlorobenzene			x	x			x		x										x				x											
2,4-Dimethylphenol									x																									
2,4-Dinitrotoluene									x																									
2-Methylnaphthalene			x				x		x																									
2-Methylphenol									x																									
3,3'-Dichlorobenzidine							x										x																	
4-Methylphenol									x																									
4-Nitrophenol																	x						x											
4,4'-DDD																	x																	
4,4'-DDE																	x																	
Aldrin									x								x																	
alpha-BHC									x								x																	
Aluminum		x																																
Americium-241																				x														
Antimony	x			x			x		x								x				x	x												
Aroclor-1016																							x											
Aroclor-1242																					x		x											

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA

Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

Parcel	B						C					D-1				D-2	E				E-2				F	G				UC-1	UC-2		UC-3	
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
Aroclor-1248																					x													
Aroclor-1254	x						x										x				x		x											
Aroclor-1260	x						x										x				x		x											
Arsenic	x			x			x		x			x					x		x		x					x								
Benzene			x	x			x	x	x				x				x						x				x							
Benzo(a)anthracene	x						x		x								x				x		x										x	
Benzo(a)pyrene	x						x		x			x					x				x		x			x							x	
Benzo(b)fluoranthene	x						x					x					x				x		x										x	
Benzo(k)fluoranthene	x						x										x				x		x										x	
beta-BHC	x																						x											
bis(2-Ethylhexyl)phthalate	x						x		x								x						x											
Bromodichloromethane			x					x	x																									
Cadmium	x						x										x	x			x													
Carbazole									x								x																	
Carbon Tetrachloride								x					x										x				x				x			
Cesium-137						x					x				x	x				x				x	x				x	x		x		x
Chlorobenzene			x					x	x																									
Chloroethane			x	x				x	x																									
Chloroform			x						x				x										x				x				x			
Chromium VI					x				x	x				x														x						
Chrysene							x		x								x						x											
cis-1,2-Dichloroethene			x					x	x																									
cis-1,3-Dichloropropene								x																										
Cobalt-60						x					x				x					x				x	x				x	x				
Copper	x	x			x		x										x	x			x	x			x								x	
Dibromochloromethane								x																										
Dichlorodifluoromethane			x																															
Dibenz(a,h)anthracene	x	x					x										x						x										x	
Dibenzofuran									x																									

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA

Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

	Parcel B						Parcel C					Parcel D-1				Parcel D-2	Parcel E				Parcel E-2				Parcel F	Parcel G				Parcel UC-1	Parcel UC-2		Parcel UC-3	
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
Dieldrin	x	x					x		x								x				x	x	x											
Endrin																						x												
gamma-BHC (Lindane)							x										x																	
Heptachlor																							x											
Heptachlor epoxide	x						x		x								x				x		x											
Heptachlor epoxide A																							x											
Heptachlor epoxide B																							x											
Hexachlorobenzene							x																											
Hexachloroethane									x																									
Hydrogen-3															x														x	x				
Indeno(1,2,3-cd)pyrene	x						x										x				x		x										x	
Iron	x						x		x								x						x											
Isopropylbenzene								x																										
Lead	x	x			x		x										x	x			x	x	x			x							x	
Manganese	x			x			x		x			x					x		x		x					x								
Mercury	x		x		x		x										x	x			x	x			x									
Methylene Chloride			x					x	x														x				x							
Methoxychlor		x																																
Molybdenum																		x																
Naphthalene	x		x				x	x	x				x				x						x				x							
Nickel					x		x							x							x	x						x						
n-Nitroso-di-n-propylamine							x										x																	
n-Nitrosophenylamine																	x																	
Organic Lead							x																											
Pentachlorophenol				x					x								x																	
Plutonium-239						x					x				x					x					x				x	x				
Potassium-40											x																							
Radium-226						x					x				x	x				x				x	x				x	x		x		x
Selenium					x																													

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA

Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

Parcel	B						C					D-1				D-2	E				E-2				F	G				UC-1	UC-2		UC-3	
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
Strontium-90						x					x				x	x				x				x	x				x	x		x		x
Tetrachloroethene	x		x				x	x	x				x						x				x				x							
Thallium				x			x		x								x		x				x											
Thorium-232											x				x														x	x				
Total Aroclors		x																x			x	x			x									
Total DDT		x																x			x	x												
Total HMW PAHs																					x													
trans-1,2-Dichloroethene			x					x	x																									
trans-1,3-Dichloropropene								x																										
Trichloroethene	x			x			x						x				x		x				x				x				x			
Trichlorofluoromethane			x					x	x																									
Uranium-235															x					x					x				x	x				
Vanadium	x						x										x				x													
Vinyl Chloride			x				x	x	x										x				x											
Xylene (total)													x				x										x							
Zinc	x	x					x			x							x	x			x													

BHC	Benzene hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
HMW	High molecular weight
PAH	Polycyclic aromatic hydrocarbon

TABLE 2: STATUS OF REMEDIAL ACTIONS
Third Five-Year Review
Hunters Point Naval Shipyard, San Francisco, California

Parcel	Remedy Component	ROD	RD	RA in progress	RA complete
B (IR-07/18)					
	Cover				
	Shoreline revetment				
	Methane monitoring				
	Groundwater monitoring				
	Radiological surface scan and removals				
	Implement ICs				
B (remainder)					
	Excavate soil				
	Cover				
	Shoreline revetment				
	SVE at IR-10				
	Groundwater treatment				
	Groundwater monitoring				
	Radiological removals				
	Implement ICs				
C					
	Excavate soil				
	SVE for source reduction				
	Cover				
	Groundwater treatment				
	Groundwater monitoring				
	Soil gas survey				
	Radiological removals				
	Implement ICs				
D-1					
	Excavate soil; remove stockpiles				
	Cover				
	Groundwater treatment				
	Groundwater monitoring				
	Soil gas survey				
	Radiological removals				
	Implement ICs				
D-2					
	Radiological removals				
E					
	ROD in preparation				
	Radiological removals				

TABLE 2: STATUS OF REMEDIAL ACTIONS

Third Five-Year Review
Hunters Point Naval Shipyard, San Francisco, California

Parcel	Remedy Component	ROD	RD	RA in progress	RA complete
E-2					
	Excavate soil				
	Radiological removals				
	Cover and liner				
	Subsurface hydraulic controls				
	Landfill gas treatment				
	Shoreline revetment				
	Monitoring and maintenance				
	Implement ICs				
F					
	ROD not yet started				
G					
	Excavate soil; remove stockpiles				
	Cover				
	Groundwater treatment				
	Groundwater monitoring				
	Soil gas survey				
	Radiological removals				
	Implement ICs				
UC-1					
	Cover				
	Soil gas survey				
	Radiological removals				
	Implement ICs				
UC-2					
	Cover				
	Groundwater monitoring				
	Soil gas survey				
	Radiological removals				
	Implement ICs				
UC-3					
	ROD in preparation				
	Radiological removals				

Notes:

IC Institutional control
IR Installation Restoration
RA Remedial action
RD Remedial design
ROD Record of decision
SVE Soil vapor extraction

TABLE 3. SUMMARY OF GROUNDWATER SAMPLING DATA FOR EMERGENT CHEMICALS
Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

	Parcel B					Parcel C					Parcel D-1				
Chemical	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates
1,2,3-Trichloropropane	1	10	0/10	ND (1)	12/05 - 4/08	93	27	0/1142	ND (1)	12/05 - 3/13	12	19	0/62	ND (1)	1/06 - 4/10
1,4-Dioxane	0	--	--	--	--	6	11	0/64	0.53 - 1.2	12/05 - 4/08	0	--	--	--	--
4-Bromophenyl Phenyl Ether	1	10	0/10	ND (10)	12/05 - 4/08	10	11	0/74	ND (10)	12/05 - 4/08	0	--	--	--	--
Chromium VI	28	25	94/251	0.11 - 680	12/05 - 3/13	9	20	53/76	0.15 - 245	12/05 - 3/13	2	6	1/15	1	5/07 - 3/13
n-Nitrosodimethylamine	2	11	0/21	ND (10)	12/05 - 4/08	9	11	0/63	ND (10)	12/05 - 4/08	0	--	--	--	--
Perchlorate	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--

	Parcel E					Parcel E-2					Parcel G				
Chemical	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates
1,2,3-Trichloropropane	42	19	0/378	ND (1)	1/06 - 4/10	26	27	0/478	ND (1)	1/06 - 3/13	45	19	0/221	ND (1)	1/06 - 4/10
1,4-Dioxane	2	11	8/12	2.1 - 4.2	1/06 - 6/08	0	--	--	--	--	1	11	0/11	ND (1)	1/06 - 6/08
4-Bromophenyl Phenyl Ether	10	11	0/101	ND (10)	1/06 - 6/08	24	27	0/452	ND (10)	1/06 - 3/13	0	--	--	--	--
Chromium VI	6	11	12/49	0.19 - 19	1/06 - 4/08	6	7	12/30	0.89 - 3	11/06 - 3/13	35	25	189/226	0.12 - 601	1/06 - 3/13
n-Nitrosodimethylamine	10	11	0/101	ND (10)	1/06 - 6/08	24	27	0/452	ND (10)	1/06 - 3/13	0	--	--	--	--
Perchlorate	0	--	--	--	--	4	2	0/8	ND (0.6)	7/08 - 3/09	0	--	--	--	--

	Parcel UC-2				
Chemical	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates
1,2,3-Trichloropropane	2	12	0/24	ND (1)	12/05 - 4/10
1,4-Dioxane	0	--	--	--	--
4-Bromophenyl Phenyl Ether	0	--	--	--	--
Chromium VI	1	13	13/13	57 - 83	12/05 - 3/09
n-Nitrosodimethylamine	0	--	--	--	--
Perchlorate	0	--	--	--	--

Data summarized from basewide groundwater monitoring program from December 2005 through March 2013. Earlier data also are available in NIRIS for samples collected as early as 1992.

ND Not detected; detection limit in parentheses
NIRIS Naval Installation Restoration Information Solution
ug/L Micrograms per liter
-- Not applicable

APPENDIX A
INTERVIEW FORMS

Interview Record

SITE IDENTIFICATION			
Site Name: **Hunters Point Naval Shipyard**		EPA ID: **CA1170090087**	
Subject: **Five-year Review of Remedial Actions**		Time: 11:30am	Date: 12/19/12
Type: ☐ Telephone ☐ Visit ☐**X Email** ☐ Other			
Location of Visit: N/A			

CONTACT MADE BY:		
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt
Name:	Title:	Organization:

INDIVIDUAL CONTACTED			
Name: Craig Cooper	Title: Superfund Site Project Manager	Organization: U.S. EPA	
Telephone: (415) 947-4148		Address: 75 Hawthorne Street	
Fax: (415) 947-3520	City: San Francisco	State: CA	Zip: 94105
E-mail address: cooper.craig@epa.gov			

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)? *I have been working on HPNS since October 2011. My overall impression of the cleanup work at HPNS is that the Navy has made this cleanup project a high priority and a great deal of Navy resources and effort is going into the cleanup. The cleanup work has reached a stage where the Navy's final remedial cleanup actions are beginning to occur. A significant amount of cleanup work was completed in 2012 and the next several years will require even more important cleanup work to be completed. EPA looks forward to the Navy maintaining its current pace of timely, high-quality cleanup work over the next five years.*

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results. *Yes, over the past year, U.S. EPA conducts regular, generally monthly, onsite inspections of the Navy's cleanup work at HPNS. EPA prepares a short memo and photo log for each inspection. In addition, in September 2012, EPA conducted an independent study of landfill gas at the Parcel E-2 landfill. The results of our landfill gas study will be released in early 2013. EPA also attends regular monthly BRAC Cleanup Team (e.g. Navy, EPA, State) meetings where we review the status of ongoing cleanup actions and provide input. EPA staff also participate in frequent Navy community outreach events (community meetings, public meetings, bus tours, etc) to ensure the community is getting the information they need on the cleanup and are able to express their concerns. EPA also provides input to the Navy on how to make these events most effective.*

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses. *In 2009-2010, in response to community health concerns related to fugitive dust from both Navy cleanup actions and from private development activities on the former Navy Parcel A, EPA evaluated air dust samples and dust suppression protocols to ensure the activities were not creating unacceptable risks to nearby residents or workers.*

4. Do you feel well informed about the site's activities and progress? *Yes, as indicated above, the BRAC Cleanup Team meets monthly and the Navy project managers provide detailed updates on each cleanup project at HPNS.* The *Navy also provides regular updates to the comprehensive project schedule under the HPNS Federal Facility Agreement (FFA) which identifies major milestones in each parcel. In addition to the technical deliverables required under the FFA, Navy project managers email me (and my State counterparts) with project updates and uses technical TRIAD meetings to solve more complex issues concerning a cleanup project area.*

5. Do you have any comments, suggestions, or recommendations regarding the site? *EPA recommends that the Navy continue to make HPNS cleanup a high priority and strive to achieve all major project milestones in the current, effective FFA schedule. In addition, as the Navy updates its Community Involvement Plan (CIP) in 2013, the Navy should continue to explore and implement multiple ways to share HPNS cleanup data and information for the entire Bayview-Hunters Point community in ways that promotes community understanding of the cleanup work and encourages a respectful dialogue on key cleanup issues.*

TriEco Tt
A Joint Venture

Interview Record

SITE IDENTIFICATION			
Site Name: Hunters Point Naval Shipyard		EPA ID: CA1170090087	
Subject: Five-year Review of Remedial Actions		Time: 14:05	Date: 12/5/12
Type: ☐ Telephone ☐ Visit ☐ Email ☒ Other			
Location of Visit: DTSC Berkeley			
CONTACT MADE BY:			
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy	
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt	
Name:	Title:	Organization:	
INDIVIDUAL CONTACTED			
Name: Ryan Miya	Title: Project Manager	Organization: DTSC-Cal EPA	
Telephone: (510) 540-3775	Address: 700 Heinz Avenue		
Fax:	City: Berkeley	State: CA	Zip: 94710
E-mail address: Ryan.Miya@DTSC.ca.gov			

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)?

My particular involvement has been since March 2009 and my overall impression of the cleanup work at HPNS is that the cleanup team has accomplished a great deal of work during this time. Completed work has included removals, cover/revetment installations, radiological clearances, combined with significant outreach to the surrounding community.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Yes. Site visits and inspections conducted on the order of every other month are for the purpose of regulatory oversight for investigation and cleanup at HPNS. Overseeing implementation of approved work plans and decision documents as well as participating in community bus tours have been the core components of these activities.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

The only complaint that I formally received was with respect to a truck, reportedly uncovered, and full with soil that reportedly ventured off of the designated offsite transportation route through some of the streets in the Hunters Point neighborhood. Follow-up visits were made with the community member and Navy and the complaint was immediately addressed. No additional complaints regarding this matter have been received subsequently.

4. Do you feel well informed about the site's activities and progress?

Very well informed and involved. As a BRAC Cleanup Team member, monthly meetings and nearly daily correspondences with the Navy and other BCT members allow us to oversee/regulate the project effectively.

5. Do you have any comments, suggestions, or recommendations regarding the site?

The dedicated Community Involvement Coordinator has made a big difference in serving as an additional point of contact for the project and the community these past years. The State of California appreciates the significant time, energy, and resources that the Navy has provided in order to help ensure that the environmental characterization and cleanup that has, and will continue to occur, at HPNS is accomplished with ongoing protection of public health and the environment at the forefront.

TriEco
A Joint Venture

Interview Record

SITE IDENTIFICATION			
Site Name: **Hunters Point Naval Shipyard**		EPA ID: **CA1170090087**	
Subject: **Five-year Review of Remedial Actions**		Time: 0900	Date: 12/6/12
Type: ☐ Telephone ☒ Visit ☐ Email ☐ Other			
Location of Visit: BRAC Cleanup Team meeting			

CONTACT MADE BY:		
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt
Name:	Title:	Organization:

INDIVIDUAL CONTACTED			
Name: Ross Steenson	Title: Project Manager	Organization: RWQCB	
Telephone: 510-622-2445		Address: 1515 Clay St Ste 1400	
Fax:	City: Oakland	State: CA	Zip: 94612
E-mail address: rsteenson@waterboards.ca.gov	Dec. 6, 2012		

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)?

The Navy has made significant progress in completing CERCLA Program and Radiological Program cleanup actions over the 5-year period as well as achieving closures for over 30 sites in the Petroleum Program for Parcels B, G, D-1, and D-2. For the CERCLA Program, the Navy has developed remedial designs for Parcels B, C, D-1, and G and either completed or mostly completed the associated remedial actions. The Record of Decision (ROD) was recently signed for Parcel E-2, and the Navy is moving towards the ROD for Parcel E, although the path forward for IR-03 remains unclear. Regarding land use controls and post-transfer risk management issues, some progress has been made, but there are several outstanding issues that remain to be resolved prior to receiving final regulatory agency concurrences prior to transfer (e.g., currently inaccessible contamination that likely will become accessible during the course of redevelopment activities).

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

We currently have two project managers assigned to HPNS (Tina Low and me) and divide the workload by parcel. We both routinely receive and review Navy technical reports and attend monthly BRAC cleanup team meetings and bimonthly Community Involvement Program meetings. In addition, about two to four times per year, we conduct site inspections and also participate in focused working meetings for specific sites or technical issues.

We consider that we have a good, collaborative working relationship with the Navy team and its contractors. The outcome of these interactions is that we consider ourselves well informed about the cleanup activities at the site.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

During this period, we have had communications with members of the public that raised concerns regarding the lack of natural shorelines as part of the Navy's CERCLA remedy at Parcel B IR 7/18 (aka Buck's Beach) and concern about leaving the landfill in Parcel E-2 in place. In the former situation, I researched the administrative record and then responded to the person. Ultimately, this contributed to recognition of the issue and very positive discussions amongst the Navy, regulatory agencies, City, Lennar, and other interested members of the public. For Parcel E, the Navy has embraced the concept of implementing shoreline remedies that would not preclude development of natural shorelines along portions of Parcel E during redevelopment. In the case of the landfill, this issue has been addressed through significant outreach efforts on the part of the Navy and US EPA during preparation of the Proposed Plan and ROD for Parcel E-2.

4. Do you feel well informed about the site's activities and progress?

Yes, both Tina and I, and our office, are well informed about activities at the site and progress.

5. Do you have any comments, suggestions, or recommendations regarding the site?

Although we hold a favorable impression of the Navy's overall cleanup work at HPNS, we are concerned about the slow progress in moving forward at the Parcel B Petroleum Combined Sites AOC. In spring 2010, we identified concerns about the site conceptual model and proximity of significant petroleum source material to San Francisco Bay. The requested additional investigation has only just been completed, and there are several issues that remain to be resolved before identifying the path forward towards closure. We are uncertain whether there is sufficient time to resolve these issues prior to transfer. We recommend that a higher priority be placed on resolving these issues.

Interview Record

SITE IDENTIFICATION		
Site Name: **Hunters Point Naval Shipyard**	EPA ID: **CA1170090087**	
Subject: **Five-year Review of Remedial Actions**	Time:	Date:
Type: ☐ Telephone ☐ Visit X Email ☐ Other		
Location of Visit:		

CONTACT MADE BY:		
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt
Name:	Title:	Organization:

INDIVIDUAL CONTACTED			
Name: Amy Brownell	Title: Environmental Engineer	Organization: SF Health Department	
Telephone: 415-252-3967	Address: 1390 Market St, Suite 410		
Fax:	City: San Francisco	State: CA	Zip: 94102
E-mail address: amy.brownell@sfdph.org			

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)?

Navy has made incredible progress and cleaned up significant contamination. The Navy team and their contractors have worked really hard to move all issues forward and get decisions made. The Regulatory Agencies have worked equally hard to ensure that human health and the environment has been and will be protected as part of the process.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Our office plays two roles in the HPNS cleanup. We are both the independent Health Agency for the City and County of San Francisco and we also serve as the technical representative advising the Successor Agency to the San Francisco Redevelopment Agency and the City about the Navy's cleanup. In these unique roles we can assist the Navy in verifying that their cleanup will fit with the Redevelopment and ensure that the cleanup protects human health and the environment. We communicate on a daily basis with the Navy and Regulatory Agencies and participate in the Base Closure Team. We also keep the Successor Agency and other City Departments informed about the Navy's work and we provide information to the Mayor's Citizens Advisory Committee. We have our own independent technical consultants who review the Navy's information and assist in providing independent comments on the Navy’s work.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

We do not have an independent regulatory oversight role of the Navy’s cleanup activities. As described above we work closely with the Navy and Regulatory Agencies. However, we do not directly respond to incidents related to the Navy activities. That responsibility rests with the Navy and the Regulatory Oversight Agencies.

4. Do you feel well informed about the site’s activities and progress?

I am very well informed.

5. Do you have any comments, suggestions, or recommendations regarding the site?

Keep up the good work

Interview Record

SITE IDENTIFICATION			
Site Name: **Hunters Point Naval Shipyard**		EPA ID: **CA1170090087**	
Subject: **Five-year Review of Remedial Actions**		Time: 1645-1710	Date: 12-4-12
Type: ☐ Telephone ☒ Visit ☐ Email ☐ Other			
Location of Visit: Office in Building 101			

CONTACT MADE BY:		
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt

INDIVIDUAL CONTACTED			
Name: Deborah Carroll	Title: Artist and building manager	Organization:	
Telephone:		Address: Building 101 HPNS	
Fax:	City: San Francisco	State: CA	Zip:
E-mail address:			

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)?

Very good. A favorable impression. Understand that the Navy works hard to keep the site clean and safe (for example, keeping dust down).

2. What effects have site operations had on the surrounding community?

Most recently, Navy improved the area around Building 101 by improving the road and parking lot. Sad to see trees removed, but feel that overall the work made the area more open and made the property look more appealing. Overall, the property is getting safer because of the remediation.

3. Are you aware of any community concerns regarding the site or its operation and maintenance? If so, please give details.

Yes. One artist was concerned about bringing toxics from below the ground to the surface. (This was the soil vapor extraction system at Building 123.) There is sometimes worry about exposure to toxics but the Navy's process to protect residents can usually be explained. There is always a concern about dust but artists are tolerant because they know that earth cannot be moved without some generation of dust. Artists appreciate Navy trucks using back roads at HPNS to minimize disturbing the artists.

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as vandalism, trespassing, or anything that required emergency response from local authorities? If so, please give details.

Yes, one incident. One tenant stored a truck tire that was subsequently stolen. Don't know of any other issues.

5. Do you feel well informed about the site's activities and progress?

Yes, to the extent I am interested. Meetings posted to the artist Yahoo group to let others know that more information is available. Aware that information is available and that the Navy is also available to talk.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Artist suggestions on planned construction activities for Parcel B were well received and the construction contractor for Parcel B has worked well with the artists to coordinate the upcoming remediation work. No complaints.

Interview Record

SITE IDENTIFICATION			
Site Name: **Hunters Point Naval Shipyard**		EPA ID: **CA1170090087**	
Subject: **Five-year Review of Remedial Actions**		Time: 1020-1145	Date: 12-4-12
Type: ☐ Telephone ☒ Visit ☐ Email ☐ Other			
Location of Visit: Michael Hamman's home			

CONTACT MADE BY:		
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt

INDIVIDUAL CONTACTED			
Name: Michael Hamman	Title: Lead	Organization: India Basin Neighborhood Association	
Telephone:		Address: Earl Street	
Fax:	City: San Francisco	State: CA	Zip: 94124
E-mail address:			

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)?

Excessively meticulous. Thorough to the point of absurdity. Inordinately cautious.

2. What effects have site operations had on the surrounding community?

Minimal effects. Mostly noise, especially the back-up alarms on equipment. Addition of wildflowers to the cover at IR-07/18 was a great benefit and should be an example for other Navy facilities.

3. Are you aware of any community concerns regarding the site or its operation and maintenance? If so, please give details.

Yes. Concern about the accuracy of studies done for the shoreline at IR-07 that supported construction of the revetment. The studies were incorrect in determining the amount of predicted wave action on the shoreline of Parcel B and the obliteration of the former sandy beach at IR-07 by the placement of riprap was unnecessary. The studies neglected the underwater topography offshore from IR-07 in evaluating the predicted wave height at the beach and used an unnecessarily conservative design wave height. Mr. Hamman has never observed waves greater than 12 inches; even during January 2012 when had a 100-year tide and a 100-year wave, the largest waves were 12-16 inches. Underwater topography is an important consideration—for example, the waves with the same fetch and size impact the Pacific coast but create 50-foot waves at Maverick but much smaller waves along the nearby shoreline. Although riprap was unnecessary, the sandy beach seems to be re-accreting on the riprap and may be re-established in the future.

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as vandalism, trespassing, or anything that required emergency response from local authorities? If so, please give details.

Yes. Theft of copper, especially wire, is common. Aware of recent "sting" arrests by San Francisco Police Department of thieves at HPNS. Theft of metals is a common problem in the Bay View area. A recently passed law to require a contractor's license to sell reclaimed structural metal (including pipes and wiring) may help.

5. Do you feel well informed about the site's activities and progress?

Yes, absolutely. After a hiatus following the disbanding of the Restoration Advisory Board, there has been a good flow of information. Format of the current community meetings is good.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Suggest that the time constraints on community meetings be more flexible so that everyone has an opportunity to ask questions. The Southeast Community Facility on Oakdale has the ability to extend meetings beyond the planned end time and so recommend using that venue for meetings. Also the Opera House.

Bus tours of HPNS are fantastic. Civilians are always overwhelmed by the potential of the site and its beauty. Would like the tours to be more widely advertised outside the Bay View community among the rest of the city. Tours are a great mechanism for informing the community and Keith Forman is an outstanding tour guide and excels in explaining what visitors are seeing (for example, how dry docks and keel blocks work). Suggest that a film of the tour would be useful to post on the Internet (for example, YouTube) to reach a wider audience. Nevertheless, would like to also maintain community meetings to allow detailed discussion of documents and decisions. More tours would be useful; suggest more flexibility on tour times—weekday as well as weekend because visitors' availability vary.

Noted a small area of standing water at the corner of the fenceline (boundary between former Parcel A and IR-07/18) and expressed concern whether the water could adversely affect the cover.

Interested in having Navy support to further the development of a bike trail around the bay from ATT Park to Candlestick Point. The trail could cross IR-07 and follow Lockwood and other surface streets on HPNS and exit at Crisp Avenue. Trail would bring people into the area and generate support for improvements. Goal for trail completion is 7/4/14.

Concern over the necessity for such strict security measures (restrictions on base access). Keith Forman noted that while Navy provides access controls (mainly fences) around its work areas, the base security is provided by the City Office of Economic Development.

Interview Record

SITE IDENTIFICATION			
Site Name: **Hunters Point Naval Shipyard**		EPA ID: **CA1170090087**	
Subject: **Five-year Review of Remedial Actions**		Time: 1130-1220	Date: 12-5-12
Type: ☐ Telephone ☒ Visit ☐ Email ☐ Other			
Location of Visit: Tiffany's Café at Third and Evans			

CONTACT MADE BY:		
Name: Keith Forman	Title: BRAC Environmental Coordinator	Organization: Navy
Name: Tim Mower	Title: Project Manager	Organization: TriEco-Tt

INDIVIDUAL CONTACTED			
Name: Su Deep Rao	Title: Community member; former RAB member	Organization:	
Telephone:		Address:	
Fax:	City:	State: CA	Zip:
E-mail address:			

SUMMARY OF CONVERSATION

1. What is your overall impression of the cleanup work conducted at Hunters Point Naval Shipyard (HPNS) over the period of the third five-year review (2008 to present)?

Cleanup is a complicated process; a significant effort with a large scope. Decades of contamination and a range of contaminated media make it a complex cleanup. Know this first hand as a restoration advisory board (RAB) member (2006 to 2009); involved for about 6 years. Cleanup process is complicated and expensive with many details. An urban environment but unique because near residential areas; large percentage of minority residents and low income creates a heightened sensitivity to government actions. Cleanup at Parcel E-2 landfill is a good example of complex site. Review of proposed cleanup by independent, third-party experts was valuable; they commented where changes were needed but also noted areas of agreement with the Navy even if the community didn't necessarily agree. Pleased that the effort to clean and remove wooden piers was executed rapidly because they created navigation hazards when pieces detached. Appreciate bus tours; community access is essential. Would like to see other ways to involve the community beyond trucking and demolition jobs, especially engineering and design jobs. Inform the community of which companies are doing design work so community members can talk to them about potential jobs.

2. What effects have site operations had on the surrounding community?

Feel educated about environmental contamination and stewardship of the area and informed about the cleanup process. Concern in the community that illnesses may be caused by HPNS but doesn't think the evidence supports that contention. Acknowledged additional truck traffic and community has brought up issues related to dust. Understand that trucks and some amount of dust is a necessary part of cleanup but doesn't live near the haul route so not as concerned as might be if lived close. Concerns on dust could be partially addressed by movement of material over water by barges, or by barge to a rail terminal. Use of piers and barges should be more fully explored.

3. Are you aware of any community concerns regarding the site or its operation and maintenance? If so, please give details.

Aware of discussion of radiation and hazardous waste on site and concerns about dust, jobs, and work force development. Concern that are following a legitimate process with no collusion—that is, are the regulators being truly objective and independent versus "rubber stamping" Navy proposals. City may be too trusting of the Navy and should not just accept statements made by the Navy.

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as vandalism, trespassing, or anything that required emergency response from local authorities? If so, please give details.

Aware of thefts of copper wire and aware of trespassing. Beyond Morgan Heights can see holes in the fence and a clear path. Understand that can't keep the fences intact continuously.

5. Do you feel well informed about the site's activities and progress?

Fairly well informed. Attend community meetings plus served on the RAB. There is a lot going on and so can't keep up with everything. Community meetings once every 2 months may not be adequate; monthly reviews could be better and provide more continuity. Email is not enough; need personal contact. Having documents available is important. Would like to see technical meetings that occurred with the RAB to get into details of a document; that level of technical review is missing now.

6. Do you have any comments, suggestions, or recommendations regarding the site?

The community knows of activities and meetings but it would be useful to also have a community bulletin board to post Navy progress reports. Perhaps a panel at the opera house or in windows of community businesses. A quarterly progress report posted locally would show a more continuous presence and be another avenue to distribute information. Community representation on oversight committees would be good; diligent members with continuity are needed to review documents and decisions on a regular basis. However, the oversight body cannot be hijacked as the RAB was. The community lost its voice with the loss of the RAB; some of this is the community's own fault for not adequately policing the community members. The community is wiser now and knows better how to prevent misinformation and being derailed by personal prejudices. There needs to be adequate dialogue with the community; a monthly meeting of a body with responsibility and technical and legal expertise is needed. Independent oversight is key. A website may not be a good fit for this community. There is at least 5 more years of cleanup work at HPNS and there is an opportunity for local colleges to train local residents as future engineers, project managers, scientists, and regulators to complete this work at HPNS.

APPENDIX B
RESPONSES TO COMMENTS ON THE DRAFT FIVE-YEAR REVIEW

RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013

The table below contains the responses to comments received from the regulatory agencies on the "Draft Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California," dated May 13, 2013. The comments addressed below were received from the U.S. Environmental Protection Agency (EPA), the California Department of Toxic Substances Control (DTSC), the San Francisco Bay Regional Water Quality Control Board (Water Board), and the City and County of San Francisco Department of Public Health (city). Throughout this table, *italicized* text represents additions to the document and ~~strikeout~~ text indicates deletions. Also throughout this table, references to page, section, table, and figure numbers pertain to the new document unless otherwise indicated.

Comment Number	Section/Page	Comment	Response to Comment
Responses to Comments from U.S. Environmental Protection Agency (Craig Cooper, dated June 24, 2013)			
General Comment			
---	Introductory Text	EPA has completed its review of the Navy's Draft "Third Five-Year Review of the Remedial Actions" Hunters Point Naval Shipyard; San Francisco, California, dated May 13, 2013 (FYR). Based on the extensive amount of information presented in the "Chronology of Sites", "Background", and "Remedial Actions" sections (i.e. Sections 2, 3, and 4 of the FYR), the Navy has clearly completed a thorough evaluation and summary of past Navy CERCLA response actions at the Hunters Point Shipyard (Shipyard). In addition, EPA find this FYR to be consistent with EPA's Comprehensive Five-Year Review Guidance, June 2001, EPA 540-R-01-007. EPA hopes that the Navy will consider our comments below as suggestions regarding how to improve the clarity of the FYR. Based on our initial evaluation of the draft FYR, EPA will be in a position to concur on the Navy's protectiveness determination upon finalization of this document. Please let me know if you have any questions or concerns with EPA comments listed below.	Comment noted.

RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1.	---	Next Steps on Mercury in Groundwater in Parcel B. EPA understands that the Navy recommends continued groundwater monitoring for the elevated mercury groundwater levels in IR-26/Parcel B. However, because of the location of the mercury groundwater plume and apparent increasing mercury levels in groundwater, EPA believes that mercury is an identified constituent of concern that is likely being released to the San Francisco Bay (Bay). However, we do not know at this time if this release to the Bay is at a protective or non-protective level. To make this determination, EPA suggests that the Navy undertake a formal evaluation of the Navy's compliance with Groundwater Remedial Action Objective (RAO) #4 as listed in Section 8.2 of the Amended Record of Decision (ROD) for Parcel B. As appropriate in the FYR, please begin to outline the Navy's plan and schedule to undertake this evaluation. For example, at a past BCT Meeting, it was discussed that perhaps the Navy should undertake a mass flux and mass discharge analysis to assess the strength of the mercury plume by means other than just groundwater concentrations in two monitoring wells. In addition, in order to access compliance with Groundwater RAO #4, this evaluation should estimate a resultant range of potential Bay surface water mercury concentrations at the shoreline.	The cited remedial action objective (RAO) is "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 micrograms per liter (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." The Navy has made its best effort to minimize the potential for migration of mercury into the bay in implementing the time-critical removal action (TCRA) for mercury in 2008 (Insight 2009). The Navy does not agree that mercury concentrations in groundwater at IR-26 are increasing. Evaluation of data collected after July 2009 from wells IR26MW49A and IR26MW51A indicate essentially flat trends in mercury concentrations. Samples of bedrock collected during the TCRA indicate that highly localized mercury anomalies may be present within the native bedrock in the area of IR-26 that could continue to act as sources for mercury in groundwater. (response continues below)

RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	Continuation of response	Nevertheless, the Navy agrees that evaluation of the mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A would be prudent and plans to conduct this evaluation in fiscal year 2014. Section 8.0 and the Executive Summary have been revised accordingly. Please also refer to the responses to Water Board comment 1 and city comment 22.
2.	---	Emergent Chemical Evaluation and Testing. EPA is interested in reviewing the Navy's response to the Water Board's June 18, 2003, "Request for a Technical Report on Emergent Chemical Sources and Sampling, Hunters Point Naval Shipyard". At Superfund sites nationwide, discovery of emergent chemicals (such as 1,4 dioxane and others) have undermined efforts to achieve protectiveness required under CERCLA. We hope the Navy is able to find its response to the above-referenced Water Board request so we can check if emergent chemicals present a risk to human health and the environment at the Shipyard. If the Navy's response cannot be found, then the Shipyard BCT members should meet and scope out appropriate next steps in this matter. Once the emergent chemical evaluation report is reviewed and accepted by the Water Board, EPA recommends that the Navy's response be referenced in future Navy FYR's and brief summary be included in each future Navy semi-annual groundwater monitoring report.	Please refer to the response to Water Board comment 2.

Comment Number	Section/Page	Comment	Response to Comment
Specific Comments			
1.	Section 1.0, Introduction, Page 1	The last sentence of the first paragraph should identify the source of the issues and recommendations as it is unclear if the reference is to issues identified during the third five-year review or during a previous review. For example, the sentence could be revised to state "issues found during the previous review" or "issues found during the second five-year review." Please revise the last sentence of the first paragraph of Section 1 to identify the source of the issues and recommendations.	The text has been revised as follows. "This third five-year review report also identifies issues found during ~~the~~ *this third five-year* review and recommendations to address them."
2.	Section 1.0, Introduction, Page 1	The Introduction should identify who conducted the five-year review (e.g., the Navy and list of specific support contractors), per page E-20 of the Comprehensive Five-Year Review Guidance, June 2001, EPA 540-R-01-007 (the Guidance). Please revise Section 1 to identify who conducted the five-year review.	The text has been expanded as follows. "*The Navy, through a contract with TriEco-Tt, conducted a five-year review of the remedial actions implemented at HPNS in San Francisco, California*."

Comment Number	Section/Page	Comment	Response to Comment
3.	Section 1.0, Introduction, Page 1	The introduction should identify which portions of the Hunters Point Shipyard (HPS) are covered by the Review and explain where the other Parcels are in the CERCLA process, per page E-21 of the Guidance. Please revise Section 1 to identify which portions of HPS are covered by the Review and explain where the other Parcels are in the CERCLA process.	The text has been expanded as follows. "*This third five-year review includes all the parcels at HPNS. The following list provides the status of parcels within the CERCLA process.* • *Remedial actions have been completed or are under way: Parcels B, C, D-1, D-2, G, UC-1, and UC-2* • *Remedial design in process: Parcel E-2* • *Record of decision (ROD) in process: Parcels E and UC-3* • *Final feasibility study (FS) in process: Parcel F*"
4.	Section 2.0, Chronology of Sites	The large table in this section is very useful. However, EPA does not agree with use of the term "Hot Spot Removal" to describe the soil remedial action in Parcels C, D-1 and G. EPA understands that the term "hot spot excavation" may be appropriate for various past CERCLA removal actions and the Parcel E-2 soil remedial action but not for any other soil remedial action at the Shipyard. Please re-check the use of the term "hot spot excavation" in this table and throughout the FYR and ensure its appropriate usage.	The text throughout the document has been revised to remove the term "hot spot" where it was used in association with soil excavation as a remedial action.

RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
5.	Section 3.0, Background, Page 9	Section 3.0 should include a discussion of the basis for taking action, such as text describing the contaminants found in each area by media, contaminated media and structures, and resources that have been or could be affected, as well as the results of risk assessments, per page E-23 of the Guidance. Please revise Section 3.0 to discuss the basis for taking action, including the contaminants found in each area by media, contaminated media and structures, and resources that have been or could have be affected, as well as the results of risk assessments.	Section 3.0 has been expanded to incorporate a new Subsection 3.1.4 describing the basis for taking remedial action including contaminated media and the results of risk assessments. A new table has been added to provide details of the chemicals and contaminated media. This table is included at the end of this document and will be Table 1 in the report. Section 3.2 already describes land and resources that could be affected by chemicals at Hunters Point Naval Shipyard (HPNS).
6.	Section 3.1, Physical Characteristics, Page 9	Section 3.1 should discuss whether the site is located in or near an environmentally sensitive area per Guidance page E-22, Background Checklist, Physical Characteristics, item 3. Please revise Section 3.1 to include a discussion of all environmentally sensitive areas on or near HPS.	Section 3.1.2 has been expanded as follows. "***Environmentally sensitive areas**. Shoreline and offshore areas at HPNS are considered environmentally sensitive areas, and effects to ecological receptors in these areas are considered during risk assessments. The small wetland areas that exist within the intertidal zone and in limited inland portions of Parcel E-2 are also environmentally sensitive areas.*"

Comment Number	Section/Page	Comment	Response to Comment
7.	Section 3.3.6, Parcel E-2, Bottom of Page 22	(a) The text about the monthly gas monitoring and control is slightly confusing. EPA suggests that the analysis be broken up into two parts: (i) methane results outside the landfill fence line (i.e. UCSF property, etc) and associated response actions; (ii) methane results at the landfill fence line and associated response actions. (b) Please add a summary of NMOC test results to date as well and any protectiveness implications of those results.	(a) The emphasis of this paragraph is that gas concentrations are below action levels. This point is made several times in this paragraph, and further revisions to the text have not been made. (b) The text has been revised as follows. "Current monitoring results indicate all methane *and nonmethane organic compound (NMOC)* detections remain below corresponding ~~methane~~ action levels (CKY 2012a, 2012b, *2013*)."
8.	Section 4.0, Remedial Actions, Page 25	Please revise Section 4 to consistently discuss O&M activities to date, whether there are any problems associated with O&M implementation.	Long-term monitoring and maintenance activities are presented in Sections 4.1.4.1 (Parcel B, IR-07/18), 4.9.4. (Parcel UC-1), and 4.10.4 (Parcel UC-2). Section 4.1.4.1 discusses the observations from the first year of inspections at IR-07/18. Sections 4.9.4 and 4.10.4 have been expanded as follows to describe initial inspection results and repairs made at Parcels UC-1 and UC-2. *"Repairs made during the quarterly inspections in January and April 2013 included minor maintenance items such as adding vegetation (hand planting) to poor growth areas, weed removal in sidewalk seams, and minor asphalt repairs (ERRG 2013a and 2013b)."* Operation and maintenance (O&M) plans have not yet been prepared for other parcels.

RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
9.	Section 4.0, Remedial Actions, Page 25	The text describing groundwater activities does not discuss monitoring for emerging contaminants such as 1,4-dioxane. As stated in General Comment #2, the FYR should discuss whether an evaluation of emergent chemicals has been carried out at the Shipyard and if groundwater has been analyzed for emerging contaminants. If such groundwater testing has already been completed, please revise Section 4.0 to discuss monitoring results for emerging contaminants.	Please refer to the response to Water Board comment 2.
10.	Section 4.1.4, Long-Term Monitoring and Maintenance Activities at Parcel B, Page 33	Section 4.1.4 does not discuss O&M activities associated with the soil-vapor extraction (SVE) and in situ groundwater remedies for IR-10, such as the frequency of monitoring and whether additional polylactate injections will be needed. Please revise Section 4.1.4 to discuss O&M activities associated with the SVE and in situ groundwater remedies for IR-10.	Specific details regarding the operation of the SVE system and implementation of polylactate injection at Parcel B are too extensive for incorporation into the five-year review report. These details are included in the remedial action work plan (ERRG 2012). There is only the implementation phase for the SVE system that is expected to continue for about 1 year; there is no “long-term” operation for the SVE system. Likewise, there is no O&M phase for the lactate injection—only long-term groundwater monitoring, which is addressed in Section 4.1.4.2. The text was not changed as a result of this comment.

Comment Number	Section/Page	Comment	Response to Comment
11.	Section 4.1.3.1, IR-07/18	(a) The fifth bullet in the bottom section of Page 30, uses the phrase "…..and excavated property boundary soil". Please re-phrase or clarify what "property boundary soil" means. (b) The fourth bullet on the top of Page 31 identifies "waste disposal" as a separate construction task. Please clarify that all wastes excavated at this site were transported and disposed off-site. (c) Since the Navy's draft FYR and other documents concerning IR Site 7/18 reiterates that radiological releases were potential and never confirmed, please edit and clarify why in the next to last paragraph of this section, that "109 LLRW bins representing 1,970 tons of waste removed and disposed off site as LLRW". Was this removal of LLRW due to a confirmed radiological release or due to outcome of applying stringent waste profiling criteria or other reasons?	(a) The text has been revised as follows. "…shoreline sediment, and ~~excavated property boundary~~ soil *excavated along the site boundary*." (b) The text has been revised as follows. "Waste disposal *(all wastes were disposed of off site)*" (c) The text has been expanded as follows. "…were removed because cesium or radium concentrations exceeded *the stringent* release criteria *or because the waste was unable to be scanned and as a result was assumed to be LLRW. No radiological releases were confirmed and no radiological devices were discovered during any of the radiological surveys*."

Comment Number	Section/Page	Comment	Response to Comment
12.	Section 4.2.2, Selected Remedy for Parcel C	The Navy may wish to consider mentioning its upcoming Explanation of Significant Differences (ESD) for the selected remedy for Parcel C in this section and in Section 7.2 as well.	The text of the first bullet item under "Soil" in Section 4.2.2 has been expanded as follows. "*The Navy is preparing an ESD to allow soil that poses very low risk to remain in place, protected by a durable cover*." Section 7.2.1 has been expanded as follows. "*The Navy is preparing an ESD for Parcel C to allow soil that poses very low risk to remain in place, protected by a durable cover. This change would not, however, affect the protectiveness of the remedy*."
13.	Section 4.9.3, Remedy Implementation at Parcel UC-1	The first text paragraph on page 53 (and the second paragraph on Page 55) states that the remedy for Parcels UC-1 and UC-2 includes removal of the top 2 feet of soil and replacement with clean, imported soil, followed by stabilization and planting with native species. However, soil excavation and removal is not described as an element of the selected remedy in the RODs for UC-1 and UC-2. Please rephrase this to clarify that the removal of the of the top 2 feet of soil was solely for purposes to install a soil cover (and not because of known contaminated soil was identified in the top 2 feet). Also, please clarify if top 2-foot soil removal was only in the sloped banks above Spear Ave and Fisher Ave or entirely across both parcels?	The text has been revised as follows. "…includes removal of the top 2 feet of soil *from the sloped areas above Fisher and Spear Avenues* and replacement with clean, imported soil, followed by stabilization and planting with native species. *Removal of the soil was solely for the purpose of installing the new soil cover based on the topographical constraints at the site. (That is, the arrangement of paving and retaining walls did not allow construction of the cover <u>over</u> the existing soil.)*"

Comment Number	Section/Page	Comment	Response to Comment
14.	Section 5.1, Progress on Soil Issues for Parcel B, Page 58	It appears that the second and third issues only cover Installation Restoration (IR) Sites 07/18; however, the shoreline revetment is being installed along much of the remainder of the Parcel B shoreline (i.e., where there is no seawall). For example, the second issue notes that excavations to the shoreline were not completed and then discusses construction of the revetment at IR 07/18. Please re-check the text in this section for clarity and revise these items to include all areas where a shoreline revetment will be installed or include additional issues to cover the remaining shoreline area in Parcel.	The text of the second and third bullets was expanded as follows. "…construction of the remainder of the revetment *to cover all of the rest of the shoreline where there is no seawall at Parcel B* is in progress."

Comment Number	Section/Page	Comment	Response to Comment
15.	Section 5.3, Progress on Groundwater Issues for Parcel B, Page 59 and Section 6.4.1, Parcel B, Page 60	As stated in General Comment #1, Section 5.3 and Section 6.4.1 should discuss the apparent increasing mercury concentrations in groundwater at IR-26 and recommend actions to evaluate mercury concentration in groundwater impacts to surface water in San Francisco Bay. The results of this evaluation should specify options to reduce Mercury groundwater concentrations as necessary to achieve Groundwater RAO #4 per the Amended Parcel B ROD. Please note that the Navy's first and second FYR reports identified groundwater contamination in IR-26 as a concern and the identified the need to ensure for protection of ecological receptors along the Bay shoreline.	Section 6.4.1.2 has been revised to include additional information related to mercury in groundwater at IR-26. However, the Navy does not agree that concentrations of mercury are increasing. The Navy agrees that evaluation of the mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A would be prudent and plans to conduct this evaluation in fiscal year 2014. Please refer to the responses to EPA general comment 1 and Water Board comment 1. Section 5.3 discusses progress made on groundwater issues at Parcel B since the previous (second) five-year review. Issues that could affect IR-26 included improvement of the overall groundwater monitoring plan (issue 1), re-evaluation of trigger levels (issue 2), and assessment of potential risk to ecological receptors (issue 5). However, mercury in groundwater at IR-26 was not identified as a specific issue in the first and second five-year reviews (Tetra Tech 2003, Jonas 2008). Consequently, Section 5.3 was not revised. Section 6.4.1.2 presents a detailed discussion of mercury in groundwater at IR-26.

Comment Number	Section/Page	Comment	Response to Comment
16.	Section 6.4 (and subsections under Section 6.4)	Please add the term "Groundwater" so the reader understands that Section 6.4 addresses groundwater data (and not of types of environmental data). In the table embedded on Page 62, please insert the term "Groundwater" for the column concerning Remediation Goal.	The text has been revised as requested.
17.	Section 6.4.2, Parcels D-1 and G, Page 65	The section discussing tetrachloroethene (PCE) in IR71MW03A states that "the most recent sample only slightly exceeds the remediation goal;" however, the trend graph in Appendix D for PCE in IR71MW03A shows an exceedance that is nearly 20 times the remediation goal. Please revise the text to acknowledge this exceedance.	The cited text refers to trichloroethene (TCE), not PCE. The text has been revised for clarity and updated to include the most recent sample data as follows. "The most recent sample *for TCE is less than* ~~only slightly exceeds~~ the remediation goal." Concentrations of PCE and TCE show decreasing trends in samples collected from well IR71MW03A since 2009.
18.	Section 7.2.3	Changes in Toxicity and Other Contaminant Characteristics. In the second paragraph, the text states that EPA has incorporated the mutagenicity of some chemicals into risk calculations for exposure to soil for non-adult receptors and implies that this toxicity change applies to PAHs only. Did the FYR consider recent EPA changes for the toxicity of TCE and PCE (which are COCs at the Shipyard) and how these changes may impact protectiveness of the Shipyard remedial actions involving those chemicals?	Changes to the toxicity of TCE and PCE through exposure via vapor intrusion into structures were incorporated in the establishment of soil gas action levels that were, in turn, used to evaluate soil gas data collected at HPNS. The remedies for parcels where TCE and PCE are present already address the potential for exposure to these chemicals via vapor intrusion. The text of the report was not changed as a result of this comment.

Comment Number	Section/Page	Comment	Response to Comment
19.	Figure 4	This figure is entitled "Areas Requiring Institutional Controls for VOC Vapors" however, the legend for this figure (i.e. red, green and white zones) do not clearly indicate which areas actually require an VOC ARIC. In the legend, please consider specifying these categories: (i) areas which require a VOC ARIC, (ii) areas evaluated and do not require a VOC ARIC, (iii) areas which have not yet been evaluated. Plus, why is there no VOC ARIC over IR-09 in the north-west area of Parcel G (see Figure 6)?	Figure 4 has been revised as requested. Figure 6 does not display areas requiring institutional controls (ARIC). Figure 4 presents the ARICs for volatile organic compound (VOC) vapors at Parcel G based on the soil gas survey completed in 2010 (Sealaska 2013).
20.	Table 1	The gray shaded bars in this table are difficult to see. Please darken them in the next version.	Table 1 has been revised to improve the clarity of the shaded bars.
21.	Appendix D, IR10MW59A	Why did Vinyl Chloride spike for a two year duration 5 years after the initial ZVI injection.	Concentrations of VOCs show the typical degradation sequence from TCE to dichloroethene (DCE) to vinyl chloride. However, the exact cause of the lag in concentrations from the initial zero-valent iron (ZVI) injection in 2003 to the concentrations observed in 2005 is unknown.

Comment Number	Section/Page	Comment	Response to Comment
Responses to Additional Comments from U.S. Environmental Protection Agency (Craig Cooper, dated October 18, 2013)			
1.	---	EPA has completed its review of both the Navy's Response to Comments on the Draft Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California and the Navy's preview version of the Final Third FYR dated September 2013. EPA's comments have been adequately addressed and we have no further comments at this time.	Comment noted.

RESPONSES TO CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013

Comment Number	Section/Page	Comment	Response to Comment
Responses to Comments from California Department of Toxic Substances Control (Ryan Miya, dated June 28, 2013)			
General Comment			
1.	---	Given that portions of the remedy are in the process of being implemented / constructed in Parcel C, please briefly explain why a protectiveness statement is not provided for Parcel C in the Draft Five-Year Review.	The text has been revised to add the following protectiveness statement to Section 9.0 and the Executive Summary. "*The remedy for Parcel C is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas*."
Specific Comments			
2.	Section 3.1 – Physical Characteristics	Please specify the approximate acreage of each of the 11 individual parcels in the text or in a new table.	Section 3.1 has been expanded to include a table listing the approximate area of each parcel.

Comment Number	Section/Page	Comment	Response to Comment
3.	Section 4.2.3 – Remedy Implementation at Parcel C, first bullet point	Please consider if the recently modified excavation areas and reduced volume estimates for the Parcel C removal action are going to be incorporated into the current document.	Bullet 1 in Section 4.2.3 has been revised as follows. "Excavate up to *26,300* ~~42,000~~ cy of soil from *27* ~~31~~ areas"
4.	Section 4.9.3 – Remedy Implementation at Parcel UC-1	Please add that a soil gas survey will be conducted in accordance with the Parcel UC-1 ROD and the results will be used to evaluate potential vapor intrusion risks and assess the need for ARICs.	The text has been revised as follows. "A soil gas survey at Parcel UC-*1 is scheduled for 2013* ~~have not yet been conducted~~. *Results from the survey will be used to evaluate potential risk to human health via vapor intrusion and to assess the need for ARICs for VOC vapors.*"
5.	Section 4.9.4 – Long-Term Monitoring and Maintenance Activities at Parcel UC-1	The fourth bullet in this section regarding groundwater monitoring wells does not appear necessary since it is only applicable to Parcel UC-2 given that no groundwater monitoring wells currently exist in Parcel UC-1.	The text has been revised to remove this bullet item.

Comment Number	Section/Page	Comment	Response to Comment
6.	Section 5.3 – Progress on Groundwater Issues for Parcel B, last bullet point	Please consider providing the number of "point-of-compliance" wells and "other characterization wells" that have been replaced at IR-07 that address this issue. Consideration should also be given to provide a list of these specific wells in the text, along with a reference to the corresponding figure (Figure 5?) accordingly.	The last bullet item has been expanded as follows. "*Groundwater samples are collected from wells IR07MW24A and IR07MW26A (see Figure 5) semiannually to monitor for potential migration of COCs toward the bay*." The terms "point of compliance" and "other characterization" no longer apply to monitoring wells at IR-07 within the basewide groundwater monitoring program (BGMP). Those terms were used in the previous remedial action monitoring plan (RAMP) (Tetra Tech and Morrison Knudsen Corporation [MK] 1999) to designate specific analytical suites for sampling and associated screening comparison values. A list of wells formerly located at IR-07 can be obtained from the BGMP contractor. The locations of these former wells do not affect the current monitoring plan and, therefore, a list of these wells and a figure showing their locations have not been added to the five-year review report.

RESPONSES TO CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
7.	Section 6.2 – Community Notification and Involvement	Please update this section to also include the recently completed Hunters Point Naval Shipyard Community Meeting on June 26, 2013 and consider providing a hard copy of the applicable handouts and presentation materials as an appendix to the report.	The text has been expanded as follows. "*The Navy presented a summary of the draft five-year review to the public at a community meeting on June 26, 2013*." The presentation from this meeting has been included a new appendix (Appendix G).
8.	Section 6.4.1.2 – Remainder of Parcel B. Summary for Remainder of Parcel B subsection, first paragraph	Please add that treatment of VOCs in soil gas is also in progress at IR-10 (via soil vapor extraction) which will address at least some of the future risk from inhalation via vapor intrusion.	The text has been revised as follows. "Treatment of VOCs in groundwater *and soil gas* is in progress at IR-10. *Groundwater* monitoring will be optimized… without appropriate soil vapor controls. *In addition, active treatment of soil gas at IR-10 using SVE is expected to further reduce potential risk from exposure to VOCs via vapor intrusion*."
9.	Section 7.1.1.2 – System Operations and O&M, first paragraph	Please briefly describe how the few shallow animal burrows were addressed in accordance with the approved Operation and Maintenance Plan for IR-07/18.	The text has been expanded as follows. "*Animal burrows were checked for inhabitants, confirmed to be unoccupied, and filled in using a spade. The disturbed area was then reseeded*."

RESPONSES TO CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
10.	Section 8.0 – Issues, Recommen-dations and Follow-up Actions	Please specify the frequency of sampling that the Navy is recommending for the Parcel B IR-26 groundwater plume.	The recommendation has been revised as follows. "Groundwater at wells IR26MW49A and IR26MW51A should continue to be monitored *semiannually* for mercury *to evaluate the trend in mercury concentrations*."
11.	Section 9.1 – Parcel B, IR-07/18 Subsection	Please add previous soil removals as well as durable covers have achieved the RAO of preventing exposure to contaminants in soil and sediment.	The text has been revised as follows. "*Previous soil removals and* durable covers on upland areas and ~~along~~ the revetment along the shoreline have achieved the RAO of preventing exposure to contaminants, including radionuclides, in soil and sediment."
12.	Section 9.4 – Parcel UC-1	Please add previous soil removals as well as durable covers have achieved the RAO of preventing exposure to contaminants in soil. The same comment also applies to the text in Section 9.5 (Parcel UC-2).	Soil removals at Parcels UC-1 and UC-2 were not conducted to remove contamination. Removal of the soil at Parcels UC-1 and UC-2 was solely for the purpose of installing the new soil cover based on the topographical constraints at the site. (That is, the arrangement of paving and retaining walls did not allow construction of the cover over the existing soil.) Please also refer to the response to EPA specific comment 13. The report was not changed as a result of this comment.

Comment Number	Section/Page	Comment	Response to Comment
13.	Figure 3 – Installation Restoration and Site Inspection Sites	Please either identify what a "Site Inspection Site" is or remove this designation from the figure.	Figure 3 has been revised to remove site inspection (SI) sites. None of the SI sites previously shown on Figure 3 are discussed in the five-year review report.
Responses to Additional Comments from California Department of Toxic Substances Control (Ryan Miya, dated September 24, 2013)			
1.	Comment 12	DTSC's original comment #12 on Section 9.4 and 9.5. DTSC requested that the Navy add that previous soil removals as well as durable covers have achieved the RAO of preventing exposure to contaminants in soil. The Navy response states that soil removals at Parcels UC-1 and UC-2 were not conducted to remove contamination. However, soils were removed from Parcels UC-1 and UC-2 (approximately 20,608 cubic yards) during storm drain and sanitary sewer line removals as a component of the radiological removal action completed in 2009. Therefore, please reconsider the previously submitted comment in light of this information.	The text in Sections 9.5 and 9.6 describing Parcels UC-1 and UC-2 and similar text in the Executive Summary has been revised as follows. "*Previous soil removals and* durable covers have achieved the RAO of preventing exposure to contaminants in soil."

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013

Comment Number	Section/Page	Comment	Response to Comment
Responses to Comments from San Francisco Bay Regional Water Quality Control Board (Ross Steenson, dated June 28, 2013)			
Specific Comments			
1.	---	**Mercury in Groundwater at IR 26** – Regional Water Board staff is concerned about the continuing exceedances of the groundwater trigger level (note 1) for mercury (for discharge to San Francisco Bay). Mercury concentrations in groundwater samples collected from well IR26MW49A (40 feet from the bay) have consistently exceeded its trigger level since the TCRA (note 2) was completed in October 2008, and there is an increasing trend. Because of the long site history for this issue, I prepared a summary of my understanding of site conditions so that my comments are presented in context: Note 1 -- Groundwater trigger level – Groundwater trigger levels are location-specific (i.e., well-specific) concentrations that indicate a potential a risk to ecological receptors if discharged to the bay. The levels are derived based on surface water quality criteria and distance from the location (well) to the bay. Only hydrodynamic dispersion is considered. Detailed information on the trigger levels is provided in Appendix I of the December 12, 2007 Final Parcel B Technical Memorandum in Support of a Record of Decision Amendment. Note 2 -- TCRA – January 2009 Final Parcel B, IR-26 Time Critical Removal Action, Removal Action Closeout Report. (comment continues below)	See below for response.

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	**Summary of Conditions** **TCRA** - The TCRA's remedial action objective was to protect the ecological receptors and beneficial uses of the bay. The work consisted of excavation of the soil area containing the suspected mercury source and stabilization of remaining mercury contamination to promote reduction of mercury concentrations in groundwater to below the HGAL (note 3) (0.6 ug/L). During the TCRA, over 6,000 cubic yards of soil were excavated. The highest soil concentration removed was 300 mg/kg, as compared to the mercury RG (note 4) of 2.3 mg/kg, which is the mercury HPAL (note 5). Of the 23 final confirmation soil samples (collected from bedrock), 5 soil sample concentrations exceeded the HPAL, as high as 15 mg/kg. The excavation was backfilled with CDF (note 6) to stabilize remaining mercury contamination. The report concludes that the primary source of anthropogenically related mercury was removed, and recommends groundwater monitoring to confirm the mercury source was removed and/or immobilized. Note 3 – HGAL -- Hunters Point Groundwater Ambient Level. Note 4 – RG – Remediation Goal. Note 5 – HPAL -- Hunters Point Ambient Level. Note 6 – CDF -- Controlled density fill, a Portland cement mixture that is much denser than water allowing for the backfilling of excavations that have standing groundwater. (comment continues below)	See below for response.

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	**Amended ROD** (note 7) – Section 7.3 of the Amended ROD discusses the groundwater trigger levels used and states that the remedial design will evaluate: • Changes to the frequency of monitoring for each well; • Adding or deleting wells; • Monitoring of the groundwater/surface water interface; • Adjusting the attenuation factors based on site-specific detailed information; or • Implementing a selected remediation alternative for groundwater treatment. Section 12.1.2 of the Amended ROD identifies injection of an organo-sulfur compound as the potential groundwater treatment alternative to immobilize metals contaminants. Note 7 -- Amended ROD – January 14, 2009 Final Parcel B Amended Record of Decision. (comment continues below)	See below for response.

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	**Remedial Design** (note 8) – The need for treatment of groundwater was not explicitly evaluated in the Design Basis Report portion of the Remedial Design. Section 3.2.4 of the Remedial Action Monitoring Plan portion of the Remedial Design lists four additional evaluations that may occur for cases where data indicate concentrations consistently exceed a comparison benchmark: • Increase monitoring frequency to evaluate whether elevated level is persistent; • Monitor further downgradient to evaluate if attenuation is occurring; • Use site-specific detailed information to more accurately estimate attenuation; or • Implement a selected remedial alternative for groundwater treatment. Note 8 -- Remedial Design – July 2011 Revised Final Remedial Design Package, Parcel B (Excluding Installation Restoration Sites 7 and 18). (comment continues below)	See below for response.

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	**Groundwater Concentration Trends** – There are two wells between the removal area and San Francisco Bay: well IR26MW49A (immediately downgradient of the suspected source area and 40 feet from the Bay) and well IR26MW51A (cross-gradient, about 70 feet northwest of 49A). Concentration-versus-time graphs are presented in Appendix D of the Five Year Review. Updated graphs that include March 2013 data were provided at the May 2013 BCT meeting. • Well IR26MW49A – Since the TCRA, there have been persistent exceedances of the well-specific trigger level (0.6 ug/L). There is fluctuation in the concentrations, possibly seasonal, ranging between 1 and 4 ug/L. There is an overall increasing trend, which indicates <u>migration</u>. The mercury plume appears to be <u>uncontrolled</u>. • Well IR26MW51A – There have been consistent exceedances of the well-specific trigger level (0.6 ug/L). Concentrations have fluctuated between about 0.2 and 1.5 ug/L. The overall trend is flat to slightly increasing. • As it stands, it appears that the purpose of 2008 TCRA has not been achieved. (comment continues below)	Although mercury concentrations in samples collected from wells IR26MW49A and IR26MW51A are consistently above the trigger level of 0.6 µg/L, the Navy does not agree that concentrations demonstrate an increasing trend in either well. Linear regression "best fit" trend lines for data collected after the groundwater field stabilized after the mercury TCRA at both wells indicate essentially flat trends. Refer to the graphs at the end of this RTC which present mercury data collected from July 2009 to February 2013. The Navy also disagrees with the description that the mercury plume appears to be migrating. The ground surface on the Point Avisadero peninsula is flat and the groundwater table is likewise approximately flat, with little to no groundwater flow gradient to drive migration. The recent installation of an asphalt cover over the surface will further diminish any infiltration that could drive groundwater migration. Groundwater is, more likely, approximately static and the observed variations in concentration indicate only random fluctuations around the flat trend. The Navy believes that the mercury TCRA did achieve its objective of delineating and removing the mercury source at IR-26. (response continues below)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	Comments on Section 8.0 (Issues, Recommendations, and Follow-up Actions) • Current Protectiveness – The table identifies the mercury groundwater plume as an issue but indicates that current protectiveness is not affected. Given that the mercury plume appears to be migrating, the finding that current protectiveness is not affected appears suspect and should be re-evaluated. • Recommendation – The Navy's recommendation is to continue monitoring. However, it is not clear how continued monitoring alone is going to resolve the issue or address the question regarding protectiveness. Therefore, either provide sufficient technical justification for the recommendation or recommend a different evaluation/action. • Other Follow-up Evaluations – Consider implementing one or more of the additional evaluations/actions listed in Section 7.3 of the ROD or Section 3.2.4 of the Remedial Action Monitoring Plan. Also, we support the US EPA suggestion to consider a mass flux/mass discharge evaluation (e.g., the August 2010 ITRC Use and Measurement of Mass Flux and Mass Discharge).	The TCRA removal action objectives included excavation until horizontal and vertical confirmation soil samples indicated concentrations at or below the HPAL (2.3 milligrams per kilogram [mg/kg]) or bedrock was reached. As discussed in Section 6.4.1.2, further investigation of mercury in the area included collection of 98 soil samples and 19 groundwater samples from 21 borings advanced to bedrock to delineate mercury source areas. None of the groundwater samples indicated a mercury concentration exceeding the HGAL (0.6 µg/L) with concentrations ranging from 0.085 to 0.3 µg/L. About 6,000 cy of soil was removed to a maximum depth of 18 feet below ground surface (bgs) to bedrock and disposed of off site. The maximum mercury concentration measured during the TCRA was 300 mg/kg in a sample (subsequently removed) collected at 3 feet bgs. Confirmation soil samples collected from excavation sidewalls all indicated mercury concentrations less than the removal goal (2.3 mg/kg). However, five of 23 samples collected from bedrock at the base of two of the excavations during the TCRA found mercury concentrations greater than the HPAL, as high as 15 mg/kg. These five samples may indicate that highly localized mercury anomalies are present within the native bedrock in the area of IR-26 that could continue to act as sources for mercury in groundwater. (response continues below)

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
1. (con't)	---	Continuation of response	Nevertheless, the Navy agrees that evaluation of the mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A would be prudent and Section 8.0 and the Executive Summary have been revised accordingly. Section 6.4.1.2 has been expanded to include additional information from the above response. The recommendation in Section 8.0 has been expanded as follows. "Groundwater at wells IR26MW49A and IR26MW51A should continue to be monitored *semiannually* for mercury *to evaluate the trend in mercury concentrations. Groundwater in the vicinity of wells IR26MW49A and IR26MW51A should be monitored to evaluate the mass flux of mercury into the bay*."

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
2.	---	**Emerging Contaminants of Concern –** On June 25, 2013, I requested via email that the Navy provide a copy of the Navy's response to our June 18, 2003 Request for a Technical Report on Emergent Chemicals Sources and Sampling, Hunters Point Naval Shipyard, San Francisco, California. I requested a copy because I cannot locate a response in our files. Please confirm whether or not the Navy has been able to locate the response. If not, indicate how the Navy plans to address the original request.	The Navy did not provide a specific letter or report in response to the Water Board's request; however, modifications were made to the basewide groundwater monitoring program (BGMP) to address the Water Board's comments. These modifications were incorporated into the final sampling and analysis plan (Tetra Tech 2004), that was approved by the Base Realignment and Closure Cleanup Team (BCT) members. Additional discussion is provided below. The June 18, 2003 request by the Water Board listed the follow emergent chemicals: perchlorate; n-nitrosodimethylamine (NDMA); 1,4-dioxane; 1,2,3-trichloropropane, chromium VI, and polybrominated diphenyl ether. All these chemicals, except perchlorate, were added to routine analytical suites for varying numbers of wells in the BGMP. The resultant data were evaluated in human health and ecological risk assessments prepared to support remedial investigations and feasibility studies, and ultimately RODs, at HPNS. (response continues below)

Comment Number	Section/Page	Comment	Response to Comment
2. (con't)	---	Continuation of response	Perchlorate, a common component of solid propellants and munitions, was not added to routine analytical suites for groundwater because there are no known sources of perchlorate at HPNS. The Navy collected samples from four wells within the landfill at Parcel E-2 (IR01MW16A, IR01MW38A, IR01MW60A, and IR01MW64A) for analysis of perchlorate—once in July 2008 and again in March 2009. Perchlorate was not detected in any sample above the reporting limit of 0.6 µg/L. The semivolatile organic compound (SVOC) 1,4-dioxane (also known as p-dioxane) is often used as a stabilizer in solvents. 1,4-dioxane was added to the routine analytical suite for a group of wells located within VOC plumes at HPNS. These wells included IR10MW33A at Parcel B, IR06MW59A1, IR28MW136A, IR28MW151A, IR28MW300F, IR28MW312F, and IR28MW397B at Parcel C, and IR03MW218A2 and IR36MW251A at Parcel E. Samples were collected quarterly from June 2004 to June 2008 (number of samples varies by well). 1,4-dioxane was detected only sporadically; the maximum observed concentration was 4.2 µg/L in a sample collected from well IR03MW218A2 in January 2006. Detections for the remaining emerging chemicals are summarized in the table at the end of this document (which will become Table 3 of the report). (response continues below)

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
2. (con't)	---	Continuation of response	Data collected for emerging chemicals were included in human health and ecological risk assessments. Only 1,2,3-trichloropropane and chromium VI posed potentially unacceptable risks to human health or the environment and plans for remediation of these chemicals were included in the appropriate RODs. Section 7.3 has been expanded as follows to discuss emerging chemicals. "*Emerging chemicals (perchlorate; n-nitrosodimethylamine [NDMA]; 1,4-dioxane; 1,2,3-trichloropropane, chromium VI, and polybrominated diphenyl ether) were routinely included in analytical suites for groundwater sampling activities at HPNS starting in 2004 although data for some chemicals exist as early as 1992. Table 3 presents a summary of groundwater sampling information for emerging chemicals. The resultant data were evaluated in human health and ecological risk assessments prepared to support RI/FSs, and ultimately RODs, at HPNS. Only 1,2,3-trichloropropane and chromium VI posed potentially unacceptable risks to human health or the environment and plans for remediation of these chemicals were included in the appropriate RODs. Concerns regarding emerging chemicals do not call into question the protectiveness of the remedies*."

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
3.	Section 3.2 (Land and Resource Use – Surface Water and Groundwater Use), second bullet, p. 12	While the City and County of San Francisco may prohibit the installation of domestic wells for drinking water use within city boundaries, I understand that there is no such limitation for municipal wells (e.g., Westside Groundwater Basin Water Supply Project). Therefore, the only comprehensive prohibition for groundwater use/well installation is the DTSC parcel-specific CRUP. Please revise the bullet text, as appropriate.	The second bullet item has been revised as follows. "The ~~State of California and~~ City and County of San Francisco will not allow the use of groundwater for drinking water because the city prohibits installation of domestic wells within city boundaries."
4.	Section 4.1.1 (Amended Remedial Action Objectives for Parcel B – Groundwater), first numbered bullet, p. 26	For clarity, state the justification/basis for soil vapor remediation goals superseding this remedial action objective for groundwater.	The text has been expanded as follows. "*This change is based on the preference for use of directly measured VOC concentrations in active soil gas samples over modeled soil gas concentrations based on VOC concentrations measured in groundwater samples. The use of active soil gas data reduces the uncertainty associated with chemical transport models necessary to estimate partitioning of chemicals in groundwater or soil to the vapor phase. In addition, soil gas data represent vapors originating from sources in both groundwater and soil.*"
5.	Section 4.1.3.1 (Remedy Implementation at Parcel B – IR-07/18), p. 29	Cite the concurrence letters from BCT members regarding remedy completion (construction) at IR-07/18.	References for the concurrence letters have been added to the text as requested.

Comment Number	Section/Page	Comment	Response to Comment
6.	Section 4.3.3 (Remedy Implementation at Parcel D-1), second full paragraph, p. 41	Clarify whether the Navy is selecting the remedial action contractor <u>for the remaining remedial actions</u>.	The text has been revised as follows. "The Navy *has selected* ~~is selecting~~ the remedial action contractor for Parcel D-1 *for the remaining remedial actions. A remedial action work plan is being prepared for the remaining actions*."
7.	Section 5.1 (Progress on Soil Issues for Parcel B), fifth bullet of section, p. 59	Under "Follow-up" the text states "This issue was addressed in the TMSRA (note 9) and was the basis for changing the remedy for soil from excavation and disposal to parcel-wide covers." Based on Section 6.5.1 of the TMSRA and Section 12.0 of the Amended ROD, it is my understanding that the original soil remedy of excavation and disposal was not changed to parcel-wide covers. Rather, the durable cover and institutional controls were added to address ubiquitous metals because it was not practicable to remove all soil exceeding the RGs for ubiquitous metals. For other chemicals, the excavation and disposal remains valid, as was performed for the "hot spot" excavations between February and July 2011 (Section 3.3.1 of the Five Year Review). Note 9 -- TMSRA – December 12, 2007 Final Parcel B Technical Memorandum in Support of a Record of Decision Amendment.	The text has been revised as follows. "This issue was addressed in the TMSRA and was the basis for *expanding* ~~changing~~ the remedy for soil from excavation and *off-site* disposal to *also include* parcel-wide covers."

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
8.	Section 6.4 (Data Review)	Address the following:	Header row, no response necessary.
8a.	Section 6.4 (Data Review)	**Consistent Descriptions of Trends –** Confirm that the text presenting the results for each well includes a description of the trend (stable, decreasing, increasing or erratic, etc.) for each constituent. For instance, adding a description of the trend for selenium at Parcel B wells IR10MW81A and IR26MW49A would provide confidence that the concentrations are likely to remain below the trigger level.	Section 6.4 has been revised to include a description of the concentration trend for each COC.
8b.	Section 6.4 (Data Review)	**BGMP (note 10) Optimization Recommendations –** For a number of wells, the BGMP optimization evaluation recommendations are stated in the text (e.g., IR70MW11A in Parcel D-1). The regulatory agency concurrence or nonconcurrence with those recommendations should be consistently cited so that the agreed-upon path forward for those wells is clear. Note 10 -- BGMP – Basewide Groundwater Monitoring Program	The text has been revised as follows. "The BGMP optimization evaluation recommended eliminating well IR70MW11A from further sampling (CE2-Kleinfelder 2012b); *the BCT representatives concurred with this recommendation.*" Similar changes were made throughout Section 6.4.

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
9.	Section 7.2.2 (Changes in Exposure Pathways), first paragraph, last sentence, p. 79	While the 2010 Amended Hunters Point Shipyard Redevelopment Plan did not add new exposure scenarios, it changed the reuse plan for some areas. For instance, IR-18 on Parcel B included residential reuse in the 1997 plan, but this was changed to open space in the 2010 Amended Plan. It would be helpful to clarify this in the text.	The text has been expanded as follows. "*Examples of changes in the expected reuse include changing the reuse options at IR-18 at Parcel B from options that allow residential use to only open space use and expanding potential reuse options at Parcel G to include residential use options*."
10.	Figure 3 (Installation Restoration and Site Inspection Sites)	Define a "site inspection site" on the figure. This term does not appear to be used in the text.	Figure 3 has been revised to remove site inspection (SI) sites. None of the SI sites previously shown on Figure 3 is discussed in the five-year review report.
Responses to Additional Comments from San Francisco Bay Regional Water Quality Control Board (Ross Steenson, dated October 15, 2013)			
1.	---	For wells IR26MW49A and IR26MW51A, consider monitoring them quarterly for mercury rather than semiannually to better assess the trend.	The Navy anticipates that additional sampling will occur in support of the mass flux evaluation. Therefore, the Navy intends to maintain semiannual monitoring for both wells IR26MW49A and IR26MW51A until completion of the evaluation or any follow on action, at which time the Navy will reassess the frequency of sampling at these wells. The report was not changed as a result of this comment.

RESPONSES TO SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (WATER BOARD) COMMENTS ON THE DRAFT FINAL RECORD OF DECISION FOR PARCEL D-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED JUNE 29, 2011 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
2.	Executive Summary and Section 8.0	For the recommendations in the Executive Summary and Section 8.0 – Consider re-wording the second sentence to “The mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A should be evaluated.” The first sentence already addresses monitoring.	The text has been revised as requested.
3.	Section 7.3	Also, the incorporation of the information regarding emerging chemicals into Section 7.3 is helpful.	Comment noted.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013

Comment Number	Section/Page	Comment	Response to Comment
Responses to Comments from City and County of San Francisco (Amy Brownell, dated June 18, 2013)			
General Comment			
1.	---	It is SFDPH’s opinion that durable covers only minimize exposure – they don't prevent exposure.	The text has been changed from “prevent” to “minimize” in Section 3.3.1 (bullet describing May 2000 through December 2001 remedial action). However, other locations within the text where “prevent exposure” occurs in relation to the durable covers were copied directly from another document, usually a ROD. The text was not changed at those locations to maintain consistency with the RODs.
Specific Comments			
2.	Five-Year Review Summary Form, Page ES-3, Protectiveness Statement(s)	We request that a statement regarding the fact that the shipyard is safe for current visitors and tenants be included as this section currently states that remedies are “expected to be protective of human health and the environment upon completion.”	The protectiveness statements already include similar language: “In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.” The report was not changed as a result of this comment.

Comment Number	Section/Page	Comment	Response to Comment
3.	Five-Year Review Summary Form, Page ES-3	Mercury exceeding trigger levels in groundwater is stated as an Issue and additional monitoring is recommended. Please discuss mercury as it relates to the Parcel B protectiveness statement. Also indicate the purpose and recommended frequency of groundwater monitoring.	The recommendation has been revised as follows. “Groundwater at wells IR26MW49A and IR26MW51A should continue to be monitored *semiannually* for mercury *to evaluate the trend in mercury concentrations. Groundwater in the vicinity of wells IR26MW49A and IR26MW51A should be monitored to evaluate the mass flux of mercury into the bay*.”
4.	Section 4.1.2, Amended Selected Remedy for Parcel B	Please identify the specific institutional controls to be applied.	This level of detail regarding ICs is unnecessary for a five-year review. Information on specific ICs to be applied is available in the land use control remedial designs (LUC RD) for Parcel B (ChaduxTt 2010a, 2011). The report was not changed as a result of this comment.
5.	Section 4.1.3.2, Remedy Implementation at Parcel B, Page 32	Please clarify whether groundwater was treated for metal COCs (chromium VI, copper, lead, and mercury) by organosulfur compound injections as part of the remedy at Parcel B. This treatment option was identified in Section 4.1.2, Amended Selected Remedy for Parcel B, on page 28, which stated that the need for this treatment was to be evaluated in the RD, whereas the Parcel B Remedial Action Monitoring Plan (RAMP) (Navy, 2010) recommended groundwater monitoring and comparison to trigger levels.	The text has been expanded to include the following bullet item as the first bullet under the groundwater subheading in Section 4.1.3.2. “*Treat groundwater by injecting a biological amendment in the plume at IR-10 to break down VOCs. (The RD did not include treatment to immobilize metals [chromium VI, copper, lead, and mercury].)*”

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
6.	Section 4.1.4.1, Long Term Monitoring and Maintenance at IR-7/18, Page 34, 6th Bullet Point	The text states that there will be "…no land disturbing activity or disturbance of remedy components…" This statement seems in conflict with the planned development in that there will be some amount of disturbance of the cap/cover system to install stormwater conveyance structures and possibly irrigation systems. A statement to the effect of "Any land disturbing activities will be conducted in accordance with the requirements and restrictions outlined in an IR-7/18 risk management plan or other guiding document but in no case will work occur below the demarcation layer."	The text has been expanded to include the following. "*(Some restricted activities may be conducted provided that the requirements of the LUC RD [ChaduxTt 2010a] are followed.)*" Similar changes have been made in Sections 4.9.4 and 4.10.4.1.
7.	Section 4.1.4.3, Soil Gas Monitoring at Parcel B, Page 36 and Figure 4	The last sentence indicates that the ARIC for VOC vapors was recommended to be reduced to the eight blocks where risk exceeded 10-6 and refers to Figure 4. Please revise Figure 4 to clearly indicate the revised ARIC(s) for VOCs as the Final Tier Risk from VOCs Greater than 1.0E-06.	Figure 4 has been updated as requested.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
8.	Section 4.2, Parcel C, Page 36	Please discuss any plans to change/revise the ROD and/or RD in relation to soil excavation optimization at Remedial Units C1, C4, and C5. It is our understanding that the Navy is currently evaluating which excavations may require a change to the ROD, if any, and which will be "optimized" under the RD. If a change to the ROD has been determined necessary, please specify whether that change will also affect the soil excavations related to "the five buildings" on Parcel C (Buildings 134, 214, 231, 272, and 281).	The text of the first bullet item under "Soil" in Section 4.2.2 has been expanded as follows. "*The Navy is preparing an ESD to allow soil that poses very low risk to remain in place, protected by a durable cover.*"
9.	Section 4.3.2, Selected Remedy for Parcel D-1, Page 40 and Figure 4	The sentence regarding the extent of the VOC ARIC is out-of-date; please make the text consistent with the extent of the ARIC shown in Figure 4. Please revise the Figure 4 legend to clearly indicate that the revised ARIC(s) for VOCs includes the area on Parcel D-1 with the Final Tier Risk from VOCs Greater than 1.0E-06.	The text has been revised as follows. "The initial ARIC for VOC vapors ~~will~~ include*d* all of Parcel D-1. *The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.3.4.2).*" Figure 4 has been revised as requested.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
10.	Section 4.3.3, Remedy Implementation at Parcel D-1, Page 42	Please define Phase II of the radiological removals at Parcel D-1.	The text has been expanded as follows. "*Phase I included the Gun Mole Pier and the South Pier and nearby Buildings 274 and 383, former building sites 313/313A/322, and a portion of the storm drain and sanitary sewer system (see Figure 3 for pier and building locations). Phase II includes the remainder of Parcel D-1*."
11.	Section 4.6.3, Selected Remedy for Parcel E-2, Page 45	Please identify the institution controls to be applied, similar to previous sections of this report.	This level of detail regarding ICs is unnecessary for a five-year review. Information on specific ICs to be applied is available in the LUC RD for Parcel E-2 (ERRG 2013). The report was not changed as a result of this comment.
12.	Section 4.6.4.2, Methane Gas Monitoring, Page 46	Discussion of current methane monitoring results should refer to the most recent monitoring report, "HPNS Parcel E-2 Landfill Gas Monitoring - April 2013 event."	The text and references have been updated to include the most recent quarterly landfill gas monitoring report (CKY 2013b).

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
13.	Section 4.6.4.2, Methane Gas Monitoring, Page 46	Please identify any known data gaps at Parcel E-2. For example, please cite the upcoming landfill gas survey at Parcel E-2, which will be used to collect additional data necessary to develop the RD.	The text has been expanded as follows. "*A soil gas survey is under way at Parcel E-2 to address the following objectives to support the RD: (1) evaluate whether soil gas mitigation will be necessary in conjunction with installation of a soil cover and protective liner in select portions of the areas outside of the landfill cap, and (2) conduct a landfill gas generation study to estimate the gas generation rates from the Parcel E-2 landfill, determine the content of the landfill gas (to refine the design of the landfill gas treatment system), and estimate the radius of influence of future gas extraction wells (ERRG 2013c).*"
14.	Section 4.6.4.4, Storm Water Discharge Monitoring, Page 46	Please cite most recent storm water discharge monitoring report/record of evaluation. Please also describe how sediment transport and/or erosion could occur due to stormwater flowing across Parcel E-2 given that the elevation of Parcel E-2 is generally higher than surrounding land areas.	The text has been expanded as follows. "*Compared with the flat-lying terrain at most of the rest of HPNS, Parcel E-2 has more relief — ranging in elevation from about 30 feet above msl to sea level at the shoreline. Consequently, there is an increased potential for erosion and sediment transport by flowing storm water.* Results *from the storm water discharge monitoring* to date *(Accord MACTEC 2013)* indicate no incidents of noncompliance at Parcel E-2…"

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
15.	Section 4.8.2, Selected Remedy for Parcel G, Page 48 and Figure 4	The sentence regarding the extent of the VOC ARIC is out-of-date; please make the text consistent with the extent of the ARIC shown in Figure 4. Please revise the Figure 4 legend to clearly indicate that the revised ARIC(s) for VOCs includes the area on Parcel G with the Final Tier Risk from VOCs Greater than 1.0E-06.	The text has been revised as follows. "The initial ARIC for VOC vapors ~~will~~ include*d* all of Parcel G. *The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.8.4.2*)." Figure 4 has been revised as requested.
16.	Section 4.9.2, Selected Remedy for Parcel UC-1, Page 51	Please indicate that the physical barriers will also cut off potential exposure to PAHs, which was identified in the RAOs (Section 4.9.1).	The text in Section 4.9.1 was revised as follows to remove polycyclic aromatic hydrocarbons (PAH) from the RAO. The RAO was prepared for both Parcels D-1 and UC-1, but the presence of PAHs applies to Parcel D-1 and does not apply to Parcel UC-1. "Prevent exposure to ~~PAHs and~~ metals in soil at concentrations above remediation goals developed in the HHRA…"

Comment Number	Section/Page	Comment	Response to Comment
17.	Section 4.10.2, Selected Remedy for Parcel UC-2, Page 54 and Figure 4	The sentence regarding the extent of the VOC ARIC is out-of-date; please make the text consistent with the extent of the ARIC shown in Figure 4. Please revise the Figure 4 legend to clearly indicate the revised ARIC(s) for VOCs includes the area on Parcel UC-2 with the Final Tier Risk from VOCs Greater than 1.0E-06.	The text has been revised as follows. "The initial ARIC for VOC vapors ~~will~~ include*d* the portion of Redevelopment Block 10 on Parcel UC-2 (a portion of Robinson Street and the parking lot northeast of Building 101). *The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.10.4.3*)." Figure 4 has been revised as requested.
18.	Section 4.9.2, Selected Remedy for Parcel UC-1, Soil, Page 51	Please clarify that the results of the vapor intrusion risk evaluation may be used to reduce the ARIC.	The text has been revised as follows. "Use the results of the surveys to evaluate potential vapor intrusion risks and assess the need for additional remedial activities or *reduction in the* ARIC *for VOC vapor*s."
19.	Section 4.9.2, Selected Remedy for Parcel UC-1, Soil, Page 51	Please list the anticipated date(s) of the future soil gas survey(s).	The text of Section 4.9.3 has been expanded as follows. "A soil gas survey at Parcel UC-1 *is scheduled for 2013* ~~have not yet been conducted~~."

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Comment Number	Section/Page	Comment	Response to Comment
20.	Section 5.2, Progress on Radiological Issues for Parcel B, Page 59	Suggest adding the California Department of Public Health ("CDPH") has completed further surface scans at IR7 and 18 following completion of the remedial action.	The text has been expanded as follows. "*CDPH completed further surface scans at IR-07 and IR-18 after the remedial actions were completed* and DTSC approved an unrestricted release for radionuclides in the remainder of Parcel B…"

Comment Number	Section/Page	Comment	Response to Comment
21.	Section 6.4.1, Parcel B, Page 61	Given that TPH contamination has been recently identified along the Parcel B shoreline near the proposed revetment, please discuss any additional recommended evaluations and/or remedial actions that will be conducted to further evaluate TPH mobility at this location. TPH has been identified in groundwater near the shoreline at concentrations that exceed screening criteria for TTPH (e.g., at IR24MW07A). According to the Final Petroleum Hydrocarbon Site Closeout Report (2011), TPH contamination was also left in place at AOC 26-C near Building 140 (~10 feet from shoreline). At AOC 26-C, benzo(a)pyrene is above human health screening levels (Parcel B TPH Closeout Report), but below the RG (amended ROD). Please evaluate the protectiveness of the RG versus the human health screening level and discuss any plans to further evaluate TPH and benzo(a)pyrene mobility at this location, if needed. This discussion may also apply to 7.1.1.4, Optimization and Early Indicators of Potential Problems, Section 7.2.2, Changes in Exposure Pathways, and Section 7.3, Question C, for Parcel B.	The five-year review focuses on remedial activities conducted to meet the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and therefore, does not address cleanup activities undertaken solely for the petroleum program. Consequently, the five-year review report does not discuss recent total petroleum hydrocarbons (TPH) contamination discovered along the shoreline of Parcel B beyond the impact it may have on the completion of the CERCLA remedy (revetment) along the shoreline. Similarly, AOC 26-C is not a TPH-commingled site (that is, where fuels are commingled with CERCLA hazardous substances) and is not addressed by the five-year review. Concentrations of benzo(a)pyrene in soil that are below remediation goals would not pose an unacceptable risk to human health or the environment. The report was not changed as a result of this comment.

Comment Number	Section/Page	Comment	Response to Comment
22.	Section 6.4.1.2, Remainder of Parcel B, Metals at individual wells, Page 63	The RAMP provides recommendations regarding more frequent groundwater monitoring, evaluation of contaminant attenuation, and/or implementation of a remedy if groundwater trigger levels are frequently exceeded. Given that mercury has consistently exceeded its trigger level at wells IR26MW49A and IR26MW51A, have any actions/planning been initiated to implement RAMP recommendations? See RAMP excerpt below: • "Increasing the frequency of monitoring in the well where the comparison benchmark 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 results that exceed criteria; • Monitoring groundwater at a location farther downgradient to evaluate whether the attenuation estimated in establishing the trigger level has occurred; – Downgradient monitoring will include evaluation of plume stability; (comment continues below)	The Navy implemented a TCRA in 2008 to delineate and remove the source of mercury at IR-26. Although mercury concentrations in samples collected from wells IR26MW49A and IR26MW51A are consistently above the trigger level of 0.6 µg/L, evaluation of data collected after July 2009 indicate essentially flat trends in mercury concentrations. Samples of bedrock collected during the TCRA indicate that highly localized mercury anomalies may be present within the native bedrock in the area of IR-26 that could continue to act as sources for mercury in groundwater. Nevertheless, the Navy agrees that evaluation of the mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A would be prudent and Section 8.0 and the Executive Summary have been revised accordingly. Please also refer to the response to Water Board comment 1.

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Comment Number	Section/Page	Comment	Response to Comment
22. (con't)	Section 6.4.1.2, Remainder of Parcel B, Metals at individual wells, Page 63	• Using site-specific detailed information to more accurately estimate attenuation (including processes such as adsorption and degradation); or • Implementing a selected remediation alternative for groundwater treatment."	See response above.
23.	Section 6.4.2, Data Review, Parcels D-1 and G, Page 65	Most groundwater monitoring well discussions do clearly introduce the monitored COCs specific to the well, but some are missing (e.g., IR44MW08A and IR70MW04A). Please introduce the monitored COCs for each well discussed. Also, we disagree with the statement in the second paragraph of Section 6.4.2 that states "refer to the RAMP for specific COCs." Please delete this statement and introduce the groundwater COCs for Parcels D-1 and G.	Discussions of chemicals of concern (COC) have been modified as requested. The statements referring to the RAMP have been deleted, except for well IR24MW07A where 23 individual VOCs are included in the analytical suite. The text describes the six detected VOCs, but refers the reader to the RAMP for the remaining VOCs.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
24.	Section 7.1, Question A, Page 73	Please indicate whether the minor issues identified during O&M activities (e.g., storm water ponding at UC-1/UC-2) were addressed or if these issues should be further discussed as opportunities for optimization/early indicators of potential problems.	The text in Sections 7.1.4.2 and 7.1.5.2 has been expanded as follows. "Minor issues encountered included evidence of storm water ponding at the border of Parcels UC-1 and UC-2 *observed during an inspection in January 2013 (ERRG 2013a). A small amount of accumulated sediment was removed from this location; no damage to the asphalt cover was observed. No evidence of ponding was observed in the subsequent inspection in April 2013 (ERRG 2013b).*" The asphalt cover is functioning as intended. Minor, occasional ponding of storm water is not considered an early indicator of potential problems.
25.	Section 7.1.4.1, Remedial Action Performance, Page 77	A soil gas survey/vapor intrusion risk evaluation and the assessment for need for additional remedial actions or ARICs are listed as part of the selected remedy for Parcel UC-1. Please clarify that all components of the remedy as outlined in the ROD have NOT yet been implemented.	The text has been revised as follows. "A review of documents, site inspections, and interviews with personnel knowledgeable about the site indicates that all components of the remedy as outlined in the ROD, *except the soil gas survey*, have been implemented and are functioning as intended."

Comment Number	Section/Page	Comment	Response to Comment
26.	Section 7.2.3, Changes in Toxicity and Other Contaminant Characteristics, Page 79	Please confirm that the Navy SGALs are based on the most currently available toxicity criteria. If not, then are the SGALs adequately protective?	Soil gas action levels (SGAL) are based on the most current toxicity criteria. Please also refer to the response to EPA specific comment 18. The report was not changed as a result of this comment.
27.	Figure 4, Areas Requiring Institutional Controls for VOC Vapors	Please identify areas where soil vapor intrusion assessments are pending.	Figure 4 has been revised to indicate areas that have not yet been evaluated for potential for vapor intrusion.
Minor Comments			
1.	Acronyms and Abbreviations, Page vi	Code of Federal Regulations should not be italicized.	The term *Code of Federal Regulations* is italicized in the main text and, therefore, is also italicized in the list of acronyms and abbreviations. The report was not changed as a result of this comment.
2.	Five-Year Review Summary Form, Page ES-4, Parcel G, 2nd paragraph	"removal soil stockpiles" should read "removal of soil stockpiles."	The text has been revised as requested.

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Comment Number	Section/Page	Comment	Response to Comment
3.	Section 3.1.3, Hydrostrati-graphy, Page 10, Last Sentence	"contract" should read "contact."	The text has been revised as requested.
4.	Section 4.0, Remedial Actions, Soil Gas Monitoring Subsections for Parcels B, D-1, G, and UC-2	Please clarify that the geotechnical soil samples were collected to obtain physical parameters needed for assessing potential vapor intrusion.	The text in Section 4.1.4.3 has been revised as follows. "In addition, 29 soil samples were collected for geotechnical analysis *to obtain physical parameters used for assessing the potential for vapor intrusion*." Similar changes have been made in Sections 4.3.4.2, 4.8.4.2, and 4.10.4.3.
5.	Section 6.4.2, Parcels D-1 and G, VOCs at IR-71 West, Page 65, 1st Paragraph	"IR70MW1A" should read "IR70MW11A."	The text has been revised as requested.
6.	Table 1: Status of Remedial Actions	Shading is too light to distinguish on printed copy.	Table 1 has been revised to improve the clarity of the shaded bars.

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Comment Number	Section/Page	Comment	Response to Comment
Additional Comments (Amy Brownell via email dated July 1, 2013)			
1.	---	We appreciate that the Navy is tasked with summarizing past conclusions and decisions and then providing updates in this document. In regards to soil gas, the end result is confusing because sometimes the information changes immediately from one paragraph to the next. I note some examples below where it may just be easier to combine the information or at least refer the reader to the section where the updated information is presented.	Please refer to the responses to the following comments.
2.	Section 4.1.2 Amended Remedy for Parcel B, fifth bullet, page 27	The bullet starts: "Apply institutional controls for VOCs..." It may be productive to refer the reader to Section 4.1.4.3 where this VOC ARIC is recommended for revision as noted on Figure 4.	The text has been expanded as follows. "*(Refer to Section 4.1.4.3 and Figure 4 for updated information about the ARIC for VOC vapors.)*"

Comment Number	Section/Page	Comment	Response to Comment
3.	Section 4.3.1 Remedial Action Objectives for Parcel D-1, Soil and Groundwater, page 39	Item #2 under soil states that RGs for VOCs "may be superseded" and then immediately in the #1 Groundwater item it states that it "has been superseded by remediation goals established for soil vapor..." It may be easier to just state at the first instance that the RGs have been superseded.	The text has been revised as follows. "Remediation goals for VOCs to address exposure via indoor inhalation of vapors *have been* ~~may be~~ superseded based on COC identification information from ~~future~~ soil gas surveys. ~~Future~~ Action levels *have been* ~~would be~~ established for soil gas, ~~would~~ account for vapors from both soil and groundwater, and *were* ~~would be~~ calculated based on a cumulative risk level of 10-6 using the accepted methodology for risk assessments at HPNS *(ChaduxTt 2011d; Sealaska 2013)*."
4.	Section 4.8.1 Remedial Action Objectives for Parcel G, Soil and Groundwater, page 47	Exact same issue listed above for Section 4.3.1.	See the response to city additional comment 3. Similar changes have been made to the text in Section 4.8.1.
5.	Section 4.9.3 Remedy Implementation at Parcel UC-1, page 52, first full paragraph	Would it be possible to add a sentence, "Surveys are planned to be conducted in 2013"? Or whatever the correct date might be.	The text has been expanded as follows. "A soil gas survey at Parcel UC-1 *is scheduled for 2013* ~~have not yet been conducted~~."

Comment Number	Section/Page	Comment	Response to Comment
6.	Section 4.10.2 Selected Remedy for Parcel UC-2, Soil, second bullet, page 54	Third sentence starts "Initial ARIC for VOC vapors..." It may be productive to refer the reader to Section 4.10.4.3 where this VOC ARIC is recommended to be reduced to a one acre block in a different location as noted on Figure 4.	The text has been revised as follows. "The initial ARIC for VOC vapors ~~will~~ include*d* the portion of Redevelopment Block 10 on Parcel UC-2 (a portion of Robinson Street and the parking lot northeast of Building 101). *The ARIC for VOC vapors was subsequently revised based on the results of a soil gas survey (Sealaska 2013) (see Figure 4 and Section 4.10.4.3).*"
Responses to Additional Comments from City and County of San Francisco (Amy Brownell, dated October 17, 2013)			
General Comment			
1.	---	We strongly support the Navy's decision to undertake an evaluation of the mass flux of mercury into the bay in the vicinity of wells IR26MW49A and IR26MW51A, as requested by EPA. This issue is critical to resolve prior to transfer; a continuing release of mercury to the bay would be highly problematic.	Comment noted.
Specific Comments			
2.	Summary Form, page 1	Typically a 5 year review is completed following the 5 years that have passed since the previous review period. Should this state 11/2008 to 11/2013?	The review period for the third five-year review began at the end of the review period for the second five-year review — July 2008. The report was not changed as a result of this comment.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
3.	Section 3.1.2, Topography, page 11	Is the Environmentally sensitive areas insert meant to be a separate section?	A subheader was inserted merely to highlight the discussion of environmentally sensitive areas. A separate section was deemed unnecessary. The report was not changed as a result of this comment.
4.	Section 4.1.2, Amended Remedy Selected for Parcel B, Section 4.1.3, Remedy Implementation Section 4.1.3.1, IR07/18, and Section 4.1.3.2, Parcel B, pages 29 - 36	The Amended ROD remedies are stated in Section 4.1.2 for Parcel B and IR-07/18, and then restated in Section 4.1.3.1 for IR-07/18 and in Section 4.1.4.12 for the Remainder of Parcel B. It would be clearer to list the remedies once in each of the subsections followed by the implementation description rather than list the remedies twice.	The content and subsections for Parcel B (specifically language provided in 4.1.2, 4.1.3, 4.1.3.1, and 4.1.3.2) is in line with the formatting and content for all other parcel sections and, in an effort to remain consistent, no changes were made as a result of this comment.
5.	Section 4.1.3.1, Remedy Implementation at IR-07/18, page 31	Suggest describing that CDPH completed gamma surveys prior to and following installation of the engineered cap soil cover, documented results in a Gamma Scan Survey Pre-cap and Post-cap Report, and concluded that there was no evidence or indication of radiological health and safety concerns due to surface gamma radiation in the surveyed areas of IR-07/18.	The text has been expanded as follows. "*CDPH completed further surface scans at IR-07 and IR-18 both before and after the soil cover was installed. CDPH concluded that there was no evidence or indication of radiological health and safety concerns based on surface gamma radiation in the surveyed areas of IR-07/18 (CDPH 2013).*"

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
6.	Section 6.4.1, Parcel B, page 65, and Figure 5, Groundwater Monitoring Well Locations, Parcels B and UC-2	Figure 4 presents the areas requiring Institutional Controls for VOC vapors and Figure 5 presents groundwater monitoring well locations and the current extent of VOCs exceeding remediation goals. When referring the reader to Figure 5, there needs to be an explanation as to the remediation goals exceeded and whether they reflect risk due to VOC vapors as shown on Figure 4. For example, the ARICs for VOC vapors do not coincide with locations where groundwater remediation goals are exceeded at UC-2. Please clarify that groundwater remediation goal exceedances may not reflect soil gas sampling results, and that although groundwater concentrations at IR06MW54F exceed remediation goals, this area is not shown as an ARIC for VOC vapors because soil gas concentrations were below soil vapor remediation goals.	The text has been expanded as follows. "*Plumes of VOCs in groundwater (defined as areas where concentrations exceed groundwater remediation goals) are shown on Figure 5 only to illustrate the approximate extent of VOCs in groundwater. ARICs for VOC vapors (as identified in Figure 4) are based on concentrations measured in soil gas and may not be co-located with groundwater VOC plumes*." A similar note has also been added to Figure 5.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
7.	Section 6.4.2, Parcels D-1 and G, page 69, and Figure 6, Groundwater Monitoring Well Locations, Parcels D-1 and G	See Comment 5. When referring the reader to Figure 6, include an explanation as to the remediation goals exceeded and whether they reflect risk due to VOC vapors as shown on Figure 4. The areas with current groundwater remediation goal exceedances on Figure 6 for Parcels G and D-1 do not coincide with current ARICs for VOC vapors. Please clarify.	The text has been expanded as follows. "*Plumes of VOCs in groundwater are shown on Figure 6 only to illustrate the approximate extent of VOCs in groundwater. ARICs for VOC vapors (as identified in Figure 4) are based on concentrations measured in soil gas and may not be co-located with groundwater VOC plumes*." A similar note has been added to Figure 6.

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
8.	Section 6.4.3, Parcel UC-2, Summary for Parcel UC-2, VOCs, page 74	We disagree with the second and third sentences which state "Risk from VOCs in groundwater, however, is from inhalation via vapor intrusion into residential structures. This risk is addressed by ICs that prohibit residential construction without appropriate soil vapor controls." As stated early in your report, the groundwater to indoor air pathway is no longer presumed because it has been superseded by the use of soil gas samples to directly measure soil vapor that might be present and could potentially cause an indoor air risk. And as illustrated on Figure 4, the soil gas samples collected on UC-2 near the monitoring wells do not show a vapor intrusion risk and there are no restrictions related to this issue or a requirement for vapor controls for residential construction on this area of the parcel. We suggest deleting these two sentences. The first sentence adequately summarizes the VOC trends. Please remove statements about a groundwater to indoor air vapor intrusion risk and related text. This pathway has been superseded by soil gas to indoor air vapor intrusion risk.	The subject sentences have been deleted from Section 6.4.3 and the text has been expanded as follows. "*Furthermore, the soil vapor investigation conducted in 2010 did not identify any risk from inhalation via vapor intrusion in the area of the identified groundwater plume (Sealaska 2013).*" In addition, Sections 6.4.1 and 6.4.2 have been expanded as follows. "This risk is addressed by ICs that prohibit residential construction without appropriate soil vapor controls *in specific areas identified during the soil vapor investigation conducted in 2010 (Sealaska 2013).*"

RESPONSES TO CITY AND COUNTY OF SAN FRANCISCO (CITY) COMMENTS ON THE DRAFT THIRD FIVE-YEAR REVIEW, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA, DATED MAY 13, 2013 (CONTINUED)

Comment Number	Section/Page	Comment	Response to Comment
9.	Section 7.2.1, Changes in Standards and TBCs, page 84	The proposed second sentence is misleading in that it is describing one piece the ESD change without putting it in the proper context. Your change that will be proposed in the ESD is to slightly increase a few COCs in soil - in some areas of Parcel C - that will remain in place and present a risk that will still be within the risk range. There were already numerous COCs identified in the RODs for all parcels, including parcels without durable covers, which have left COCs at levels that present a risk within the risk range. Arsenic with a HPAL of 11.1 is the best example. Also you don't need to mention the durable cover because it is a separate piece of the remedy that isn't being changed. We suggest rewording the second sentence as "The RODs for all the parcels contain remedial goals that incorporate the use of the risk range for certain COCs. The Navy is preparing an ESD for Parcel C to allow a few additional COCs in soil that ~~pose~~ will pose a risk within the risk ranges ~~very low risk~~ to remain in place in specific areas. ~~protected by a durable cover~~."	The text has been revised as follows. "*The RODs for all parcels contain remediation goals for selected COCs that incorporate the use of the risk management range of 10^{-6} to 10^{-4}. In keeping with this approach*, the Navy is preparing an ESD for Parcel C to allow *a few* ~~additional~~ *COCs at select locations to remain in soil at levels above the ROD remediation goals, where the overall risk will still be within the risk management range.* ~~that poses a very low risk *within EPA's risk management range of* 10^{-6} *to* 10^{-4} to remain in place *in specific areas*, protected by a durable cover. *The RODs for all parcels contain remediation goals that incorporate the use of the risk management range for selected COCs.*~~ This change ~~would~~ *will* not, however, affect the protectiveness of the remedy."

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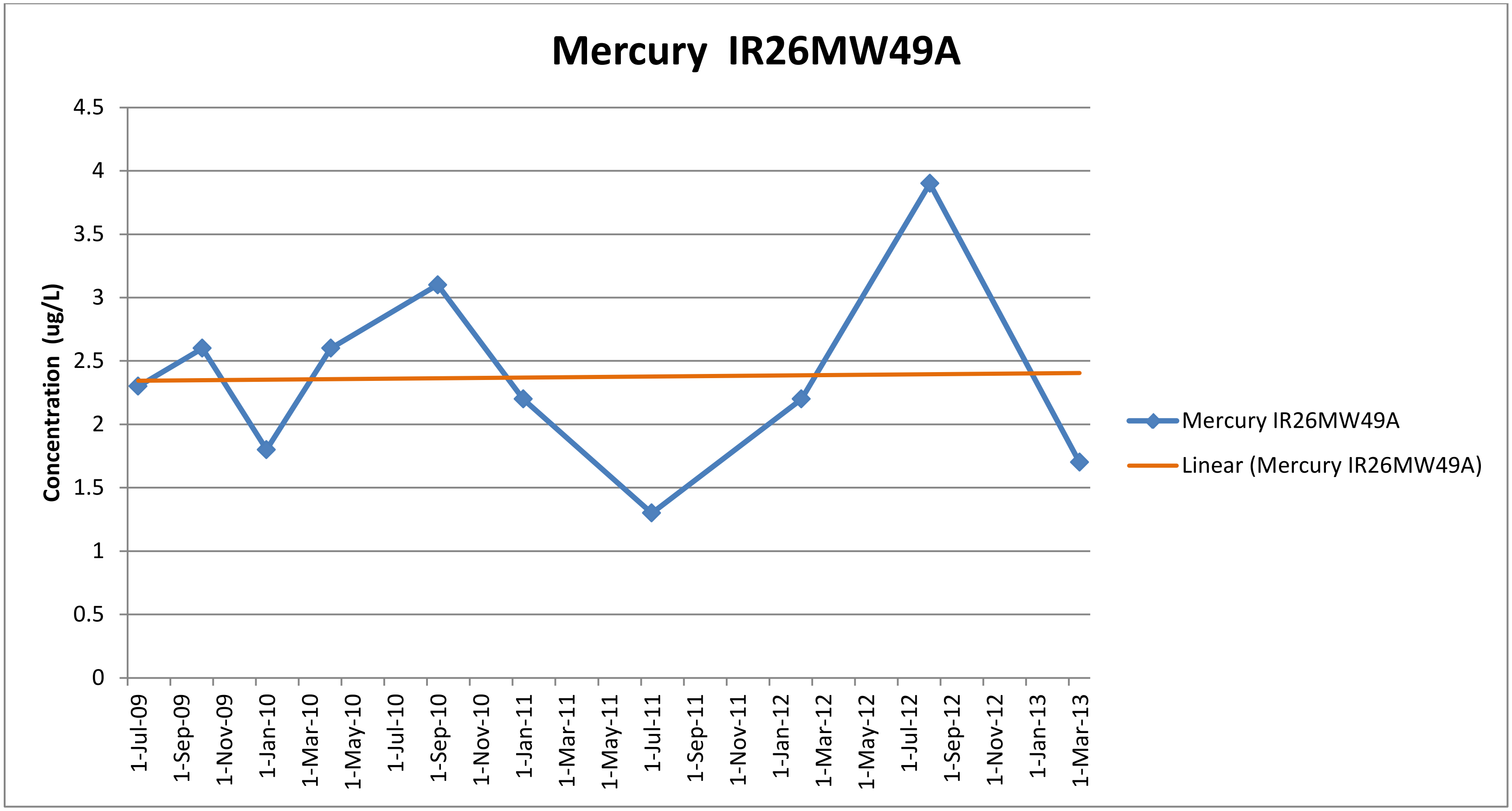
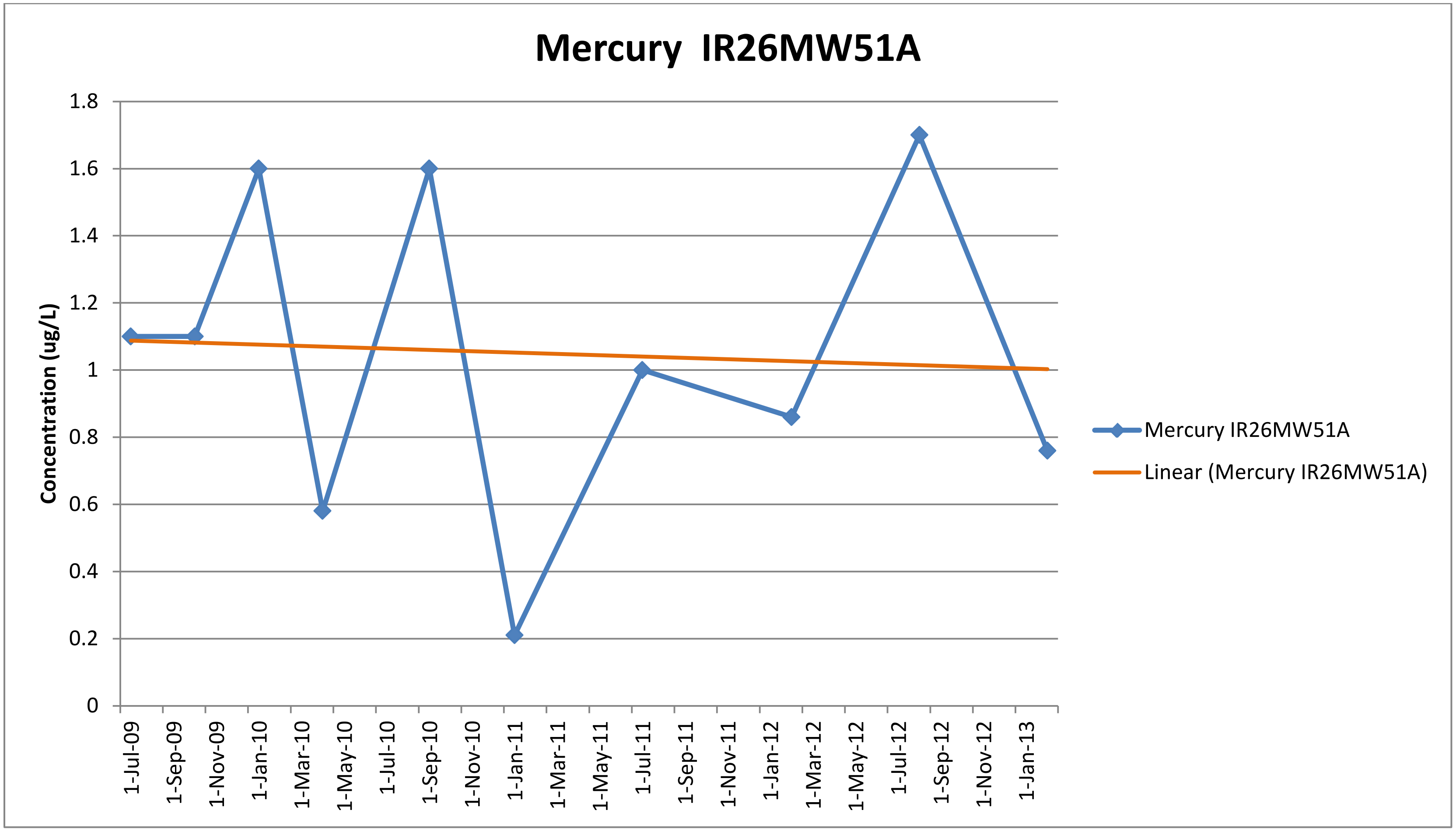

Mercury IR26MW49A
Concentration (ug/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1-Jul-09
1-Sep-09
1-Nov-09
1-Jan-10
1-Mar-10
1-May-10
1-Jul-10
1-Sep-10
1-Nov-10
1-Jan-11
1-Mar-11
1-May-11
1-Jul-11
1-Sep-11
1-Nov-11
1-Jan-12
1-Mar-12
1-May-12
1-Jul-12
1-Sep-12
1-Nov-12
1-Jan-13
1-Mar-13
Mercury IR26MW49A
Linear (Mercury IR26MW49A)



Mercury IR26MW51A
Concentration (ug/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1-Jul-09
1-Sep-09
1-Nov-09
1-Jan-10
1-Mar-10
1-May-10
1-Jul-10
1-Sep-10
1-Nov-10
1-Jan-11
1-Mar-11
1-May-11
1-Jul-11
1-Sep-11
1-Nov-11
1-Jan-12
1-Mar-12
1-May-12
1-Jul-12
1-Sep-12
1-Nov-12
1-Jan-13
Mercury IR26MW51A
Linear (Mercury IR26MW51A)

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA

Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

	Parcel																																	
	B						C					D-1				D-2	E				E-2				F	G				UC-1	UC-2		UC-3	
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
1,1,2,2-Tetrachloroethane								x																										
1,1,2-Trichloroethane								x																										
1,1-Dichloroethane								x	x														x											
1,2,3-Trichloropropane								x															x											
1,2,4-Trichlorobenzene			x						x																									
1,2,4-Trimethylbenzene			x					x																										
1,2-Dichlorobenzene			x					x	x																									
1,2-Dichloroethane			x				x		x																									
1,2-Dichloroethene (total)			x					x	x																									
1,2-Dichloropropane			x					x	x																									
1,3,5-Trimethylbenzene			x					x	x																									
1,3-Dichlorobenzene									x																									
1,4-Dichlorobenzene			x	x			x		x										x				x											
2,4-Dimethylphenol									x																									
2,4-Dinitrotoluene									x																									
2-Methylnaphthalene			x				x		x																									
2-Methylphenol									x																									
3,3'-Dichlorobenzidine							x										x																	
4-Methylphenol									x																									
4-Nitrophenol																	x						x											
4,4'-DDD																	x																	
4,4'-DDE																	x																	
Aldrin									x								x																	
alpha-BHC									x								x																	
Aluminum		x																																
Americium-241																				x														
Antimony	x			x			x		x								x				x	x												
Aroclor-1016																							x											
Aroclor-1242																					x		x											

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA

Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

	Parcel															
	B						C					D-1				D-2
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides
Aroclor-1248																
Aroclor-1254	x						x									
Aroclor-1260	x						x									
Arsenic	x			x			x		x			x				
Benzene			x	x			x	x	x				x			
Benzo(a)anthracene	x						x		x							
Benzo(a)pyrene	x						x		x			x				
Benzo(b)fluoranthene	x						x					x				
Benzo(k)fluoranthene	x						x									
beta-BHC	x															
bis(2-Ethylhexyl)phthalate	x						x		x							
Bromodichloromethane			x					x	x							
Cadmium	x						x									
Carbazole									x							
Carbon Tetrachloride								x					x			
Cesium-137						x					x				x	x
Chlorobenzene			x					x	x							
Chloroethane			x	x				x	x							
Chloroform			x						x				x			
Chromium VI					x				x	x				x		
Chrysene							x		x							
cis-1,2-Dichloroethene			x					x	x							
cis-1,3-Dichloropropene								x								
Cobalt-60						x					x				x	
Copper	x	x			x	x	x									
Dibromochloromethane								x								
Dichlorodifluoromethane			x													
Dibenz(a,h)anthracene	x	x					x									
Dibenzofuran									x							

	Parcel																	
	E				E-2				F	G				UC-1	UC-2		UC-3	
Chemical	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
Aroclor-1248					x													
Aroclor-1254	x				x		x											
Aroclor-1260	x				x		x											
Arsenic	x		x		x					x								
Benzene	x						x				x							
Benzo(a)anthracene	x				x		x										x	
Benzo(a)pyrene	x				x		x			x							x	
Benzo(b)fluoranthene	x				x		x										x	
Benzo(k)fluoranthene	x				x		x										x	
beta-BHC							x											
bis(2-Ethylhexyl)phthalate	x						x											
Bromodichloromethane																		
Cadmium	x	x			x													
Carbazole	x																	
Carbon Tetrachloride							x				x				x			
Cesium-137				x				x	x				x	x		x		x
Chlorobenzene																		
Chloroethane																		
Chloroform							x				x				x			
Chromium VI												x						
Chrysene	x						x											
cis-1,2-Dichloroethene																		
cis-1,3-Dichloropropene																		
Cobalt-60				x				x	x				x	x				
Copper	x	x			x	x			x								x	
Dibromochloromethane																		
Dichlorodifluoromethane																		
Dibenz(a,h)anthracene	x						x										x	
Dibenzofuran																		

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA
Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

	Parcel																																	
	B						C					D-1				D-2	E				E-2				F	G				UC-1	UC-2		UC-3	
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
Dieldrin	x	x					x		x								x				x	x	x											
Endrin																						x												
gamma-BHC (Lindane)							x										x																	
Heptachlor																							x											
Heptachlor epoxide	x						x		x								x				x		x											
Heptachlor epoxide A																							x											
Heptachlor epoxide B																							x											
Hexachlorobenzene							x																											
Hexachloroethane									x																									
Hydrogen-3															x														x	x				
Indeno(1,2,3-cd)pyrene	x						x										x				x		x										x	
Iron	x						x		x								x						x											
Isopropylbenzene								x																										
Lead	x	x			x		x										x	x			x	x	x			x							x	
Manganese	x			x			x		x			x					x		x		x					x								
Mercury	x		x		x		x										x	x			x	x			x									
Methylene Chloride			x					x	x														x				x							
Methoxychlor		x																																
Molybdenum																		x																
Naphthalene	x		x				x	x	x				x				x						x				x							
Nickel					x		x							x							x	x						x						
n-Nitroso-di-n-propylamine							x										x																	
n-Nitrosophenylamine																	x																	
Organic Lead							x																											
Pentachlorophenol				x					x								x																	
Plutonium-239						x					x				x					x					x				x	x				
Potassium-40											x																							
Radium-226						x					x				x	x				x				x	x				x	x		x		x
Selenium					x																													

TABLE 1. CHEMICALS OF CONCERN AND CONTAMINATED MEDIA
Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

	Parcel																																	
	B						C					D-1				D-2	E				E-2				F	G				UC-1	UC-2		UC-3	
Chemical	Soil	Sediment	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, domestic use	Groundwater, ecological	Soil and structures, radionuclides	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Soil	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Soil, human health and terrestrial wildlife	Sediment	Groundwater, domestic use	Soil and structures, radionuclides	Sediment	Soil	Groundwater, vapor intrusion	Groundwater, ecological	Soil and structures, radionuclides	Soil and structures, radionuclides	Groundwater, vapor intrusion	Soil and structures, radionuclides	Soil	Soil and structures, radionuclides
Strontium-90						x					x				x	x				x				x	x				x	x		x		x
Tetrachloroethene	x		x				x	x	x				x						x				x				x							
Thallium				x			x		x								x		x				x											
Thorium-232											x				x														x	x				
Total Aroclors		x																x			x	x			x									
Total DDT		x																x			x	x												
Total HMW PAHs																					x													
trans-1,2-Dichloroethene			x					x	x																									
trans-1,3-Dichloropropene								x																										
Trichloroethene	x			x			x						x				x		x				x				x				x			
Trichlorofluoromethane			x					x	x																									
Uranium-235															x					x					x				x	x				
Vanadium	x						x										x				x													
Vinyl Chloride			x				x	x	x										x				x											
Xylene (total)													x				x										x							
Zinc	x	x					x			x							x	x			x													

BHC	Benzene hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
HMW	High molecular weight
PAH	Polycyclic aromatic hydrocarbon

TABLE 3. SUMMARY OF GROUNDWATER SAMPLING DATA FOR EMERGENT CHEMICALS

Third Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California

Parcel B / Parcel C / Parcel D-1

	Parcel B					Parcel C					Parcel D-1				
Chemical	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates
1,2,3-Trichloropropane	1	10	0/10	ND (1)	12/05 - 4/08	93	27	0/1142	ND (1)	12/05 - 3/13	12	19	0/62	ND (1)	1/06 - 4/10
1,4-Dioxane	0	--	--	--	--	6	11	0/64	0.53 - 1.2	12/05 - 4/08	0	--	--	--	--
4-Bromophenyl Phenyl Ether	1	10	0/10	ND (10)	12/05 - 4/08	10	11	0/74	ND (10)	12/05 - 4/08	0	--	--	--	--
Chromium VI	28	25	94/251	0.11 - 680	12/05 - 3/13	9	20	53/76	0.15 - 245	12/05 - 3/13	2	6	1/15	1	5/07 - 3/13
n-Nitrosodimethylamine	2	11	0/21	ND (10)	12/05 - 4/08	9	11	0/63	ND (10)	12/05 - 4/08	0	--	--	--	--
Perchlorate	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--

	Parcel E					Parcel E-2					Parcel G				
Chemical	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates
1,2,3-Trichloropropane	42	19	0/378	ND (1)	1/06 - 4/10	26	27	0/478	ND (1)	1/06 - 3/13	45	19	0/221	ND (1)	1/06 - 4/10
1,4-Dioxane	2	11	8/12	2.1 - 4.2	1/06 - 6/08	0	--	--	--	--	1	11	0/11	ND (1)	1/06 - 6/08
4-Bromophenyl Phenyl Ether	10	11	0/101	ND (10)	1/06 - 6/08	24	27	0/452	ND (10)	1/06 - 3/13	0	--	--	--	--
Chromium VI	6	11	12/49	0.19 - 19	1/06 - 4/08	6	7	12/30	0.89 - 3	11/06 - 3/13	35	25	189/226	0.12 - 601	1/06 - 3/13
n-Nitrosodimethylamine	10	11	0/101	ND (10)	1/06 - 6/08	24	27	0/452	ND (10)	1/06 - 3/13	0	--	--	--	--
Perchlorate	0	--	--	--	--	4	2	0/8	ND (0.6)	7/08 - 3/09	0	--	--	--	--

	Parcel UC-2				
Chemical	Number of Wells Sampled	Number of Sampling Events	Detection Frequency	Concetration Range (ug/L)	Sample Dates
1,2,3-Trichloropropane	2	12	0/24	ND (1)	12/05 - 4/10
1,4-Dioxane	0	--	--	--	--
4-Bromophenyl Phenyl Ether	0	--	--	--	--
Chromium VI	1	13	13/13	57 - 83	12/05 - 3/09
n-Nitrosodimethylamine	0	--	--	--	--
Perchlorate	0	--	--	--	--

Data summarized from basewide groundwater monitoring program from December 2005 through March 2013. Earlier data also are available in NIRIS for samples collected as early as 1992.

ND	Not detected; detection limit in parentheses
NIRIS	Naval Installation Restoration Information Solution
ug/L	Micrograms per liter
--	Not applicable

APPENDIX C
LIST OF DOCUMENTS REVIEWED

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LIST OF DOCUMENTS REVIEWED

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APPENDIX D
CONCENTRATION TREND GRAPHS FOR GROUNDWATER

EXPLANATION

Open symbol indicates no detection and the value shown is the detection limit.

Concentration trend lines are broken when there is a significant (usually more than 12 to 18 months) hiatus in sample collection.

Remedial goals are shown for both residential and industrial exposure for wells at Parcels D-1 and G where both apply.

Industrial goals apply based on 1997 SFRA reuse plan.

Residential goals are shown because instititutional controls will remain in effect if groundwater concentrations exceed residential goals.

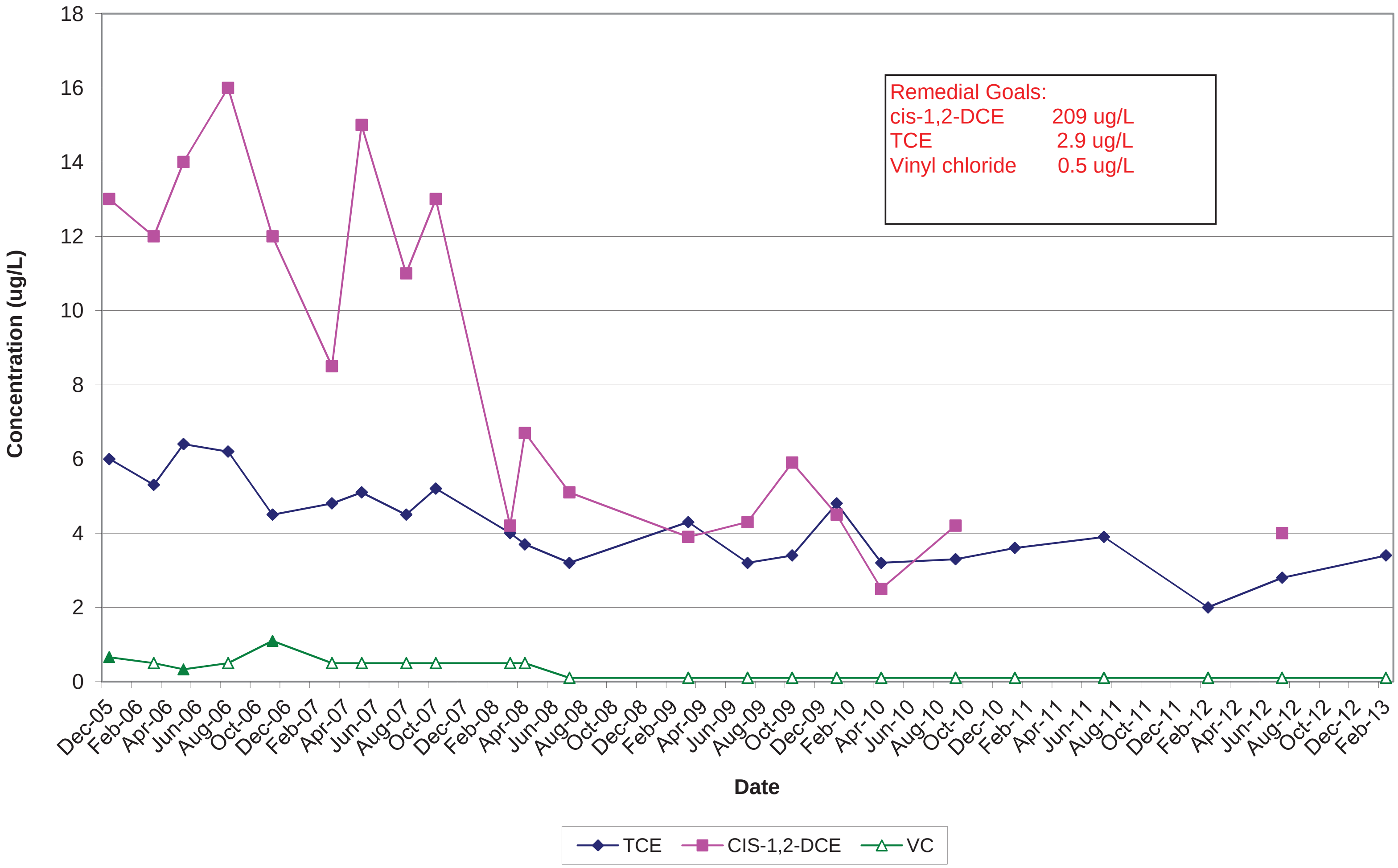
SFRA 1997. "Hunters Point Shipyard Redevelopment Plan." July 14.

Abbreviations

Cr VI	Hexavalent chromium
DCE	Dichloroethene
ug/L	Microgram per liter
PCE	Tetrachloroethene
SFRA	San Francisco Redevelopment Agency
TCE	Trichloroethene
TCRA	Time critical removal action
U	Not detected
VC	Vinyl chloride
ZVI	Zero-valent iron

GRAPHS FOR PARCEL B

IR10MW13A1



Concentration (ug/L)
18
16
14
12
10
8
6
4
2
0
Remedial Goals:
cis-1,2-DCE 209 ug/L
TCE 2.9 ug/L
Vinyl chloride 0.5 ug/L
Dec-05
Feb-06
Apr-06
Jun-06
Aug-06
Oct-06
Dec-06
Feb-07
Apr-07
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
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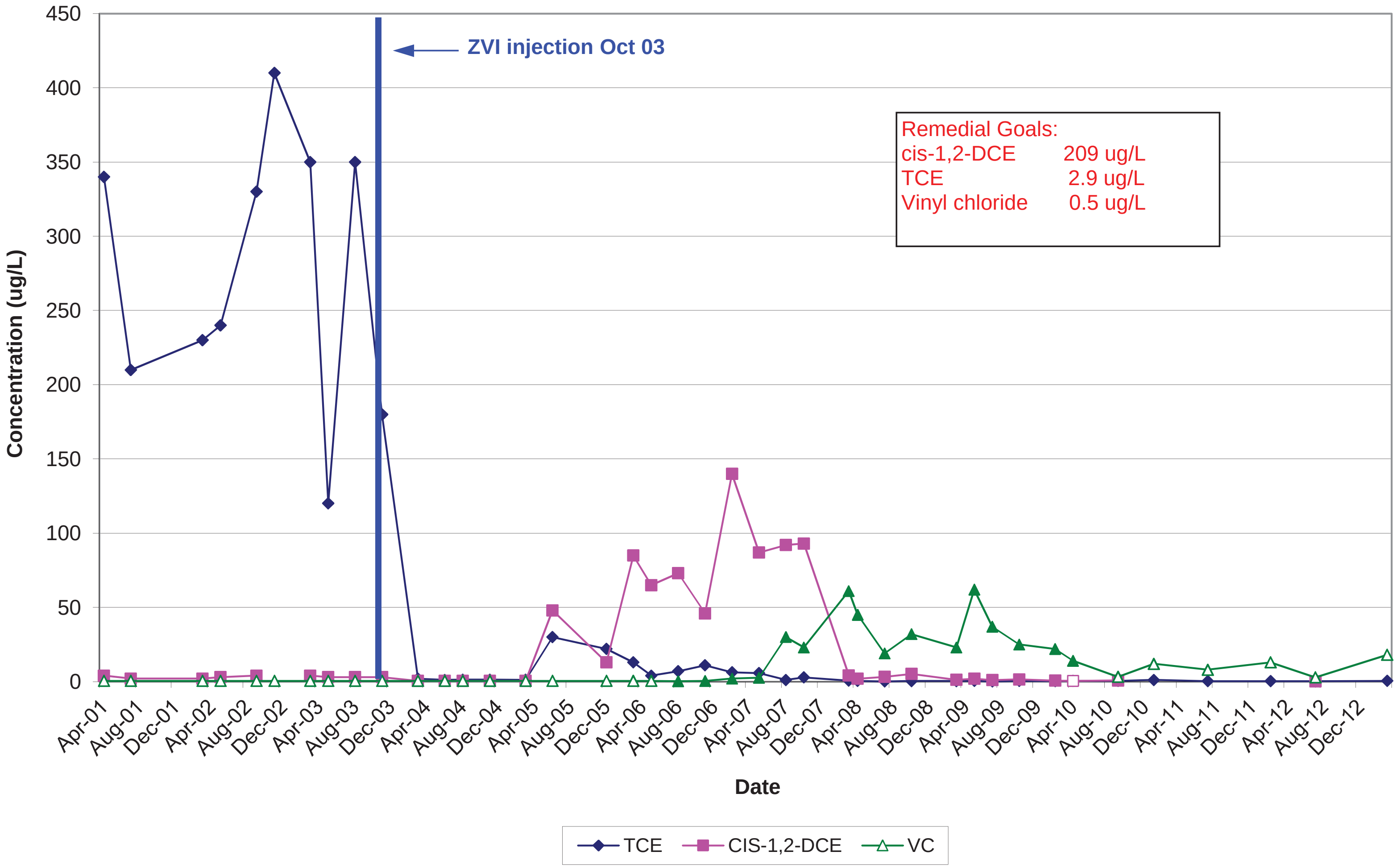
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Date
TCE
CIS-1,2-DCE
VC

IR10MW59A



450
400
350
300
250
200
150
100
50
0
Concentration (ug/L)
ZVI injection Oct 03
Remedial Goals:
cis-1,2-DCE 209 ug/L
TCE 2.9 ug/L
Vinyl chloride 0.5 ug/L
Apr-01
Aug-01
Dec-01
Apr-02
Aug-02
Dec-02
Apr-03
Aug-03
Dec-03
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10
Aug-10
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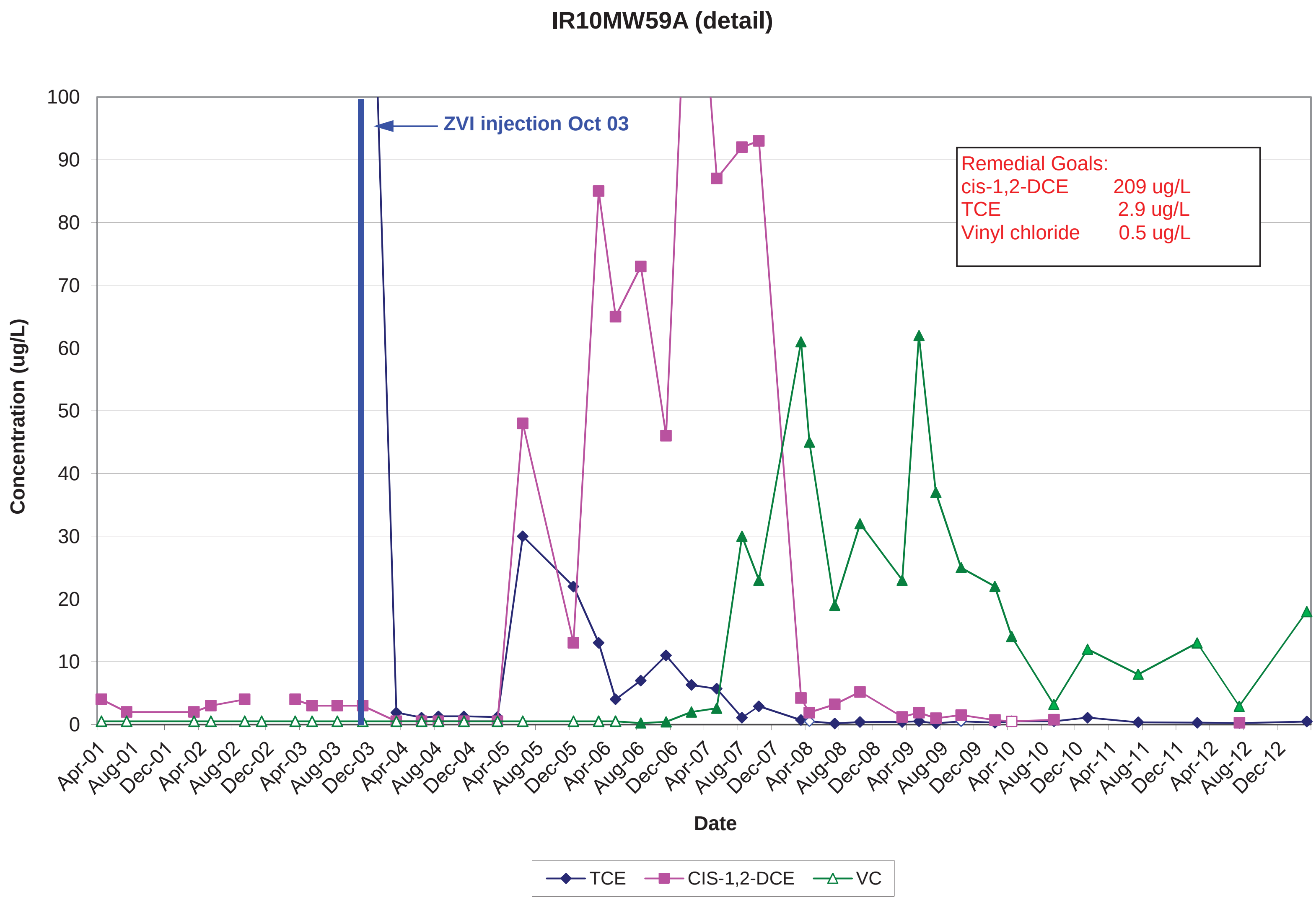
Dec-12
Date
TCE
CIS-1,2-DCE
VC


IR10MW59A (detail)
ZVI injection Oct 03
Remedial Goals:
cis-1,2-DCE 209 ug/L
TCE 2.9 ug/L
Vinyl chloride 0.5 ug/L
Concentration (ug/L)
100
90
80
70
60
50
40
30
20
10
0
Apr-01
Aug-01
Dec-01
Apr-02
Aug-02
Dec-02
Apr-03
Aug-03
Dec-03
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10
Aug-10
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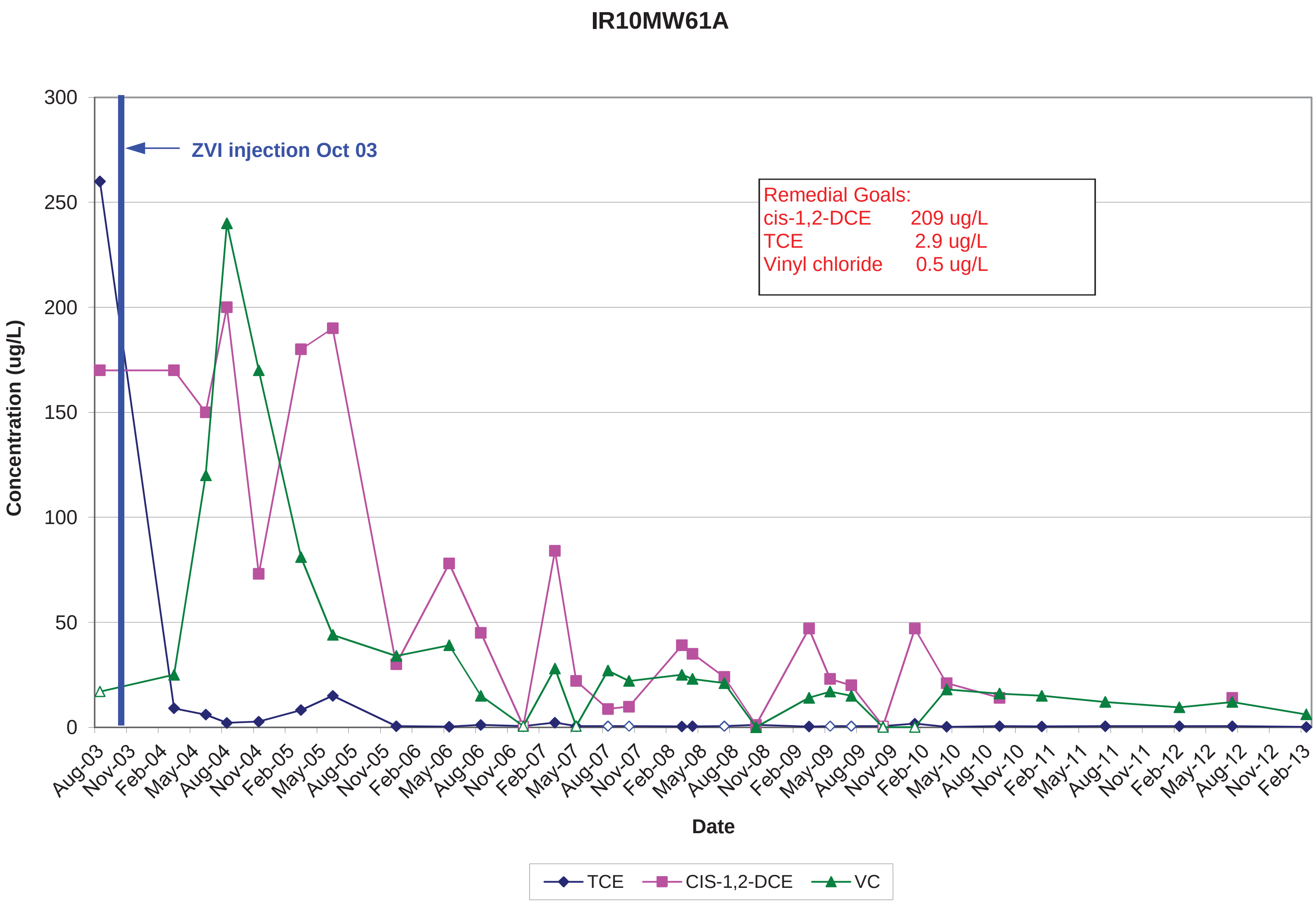
Date
TCE
CIS-1,2-DCE
VC


IR10MW61A
ZVI injection Oct 03
Remedial Goals:
cis-1,2-DCE 209 ug/L
TCE 2.9 ug/L
Vinyl chloride 0.5 ug/L
Concentration (ug/L)
300
250
200
150
100
50
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
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Nov-09
Feb-10
May-10
Aug-10
Nov-10
Feb-11
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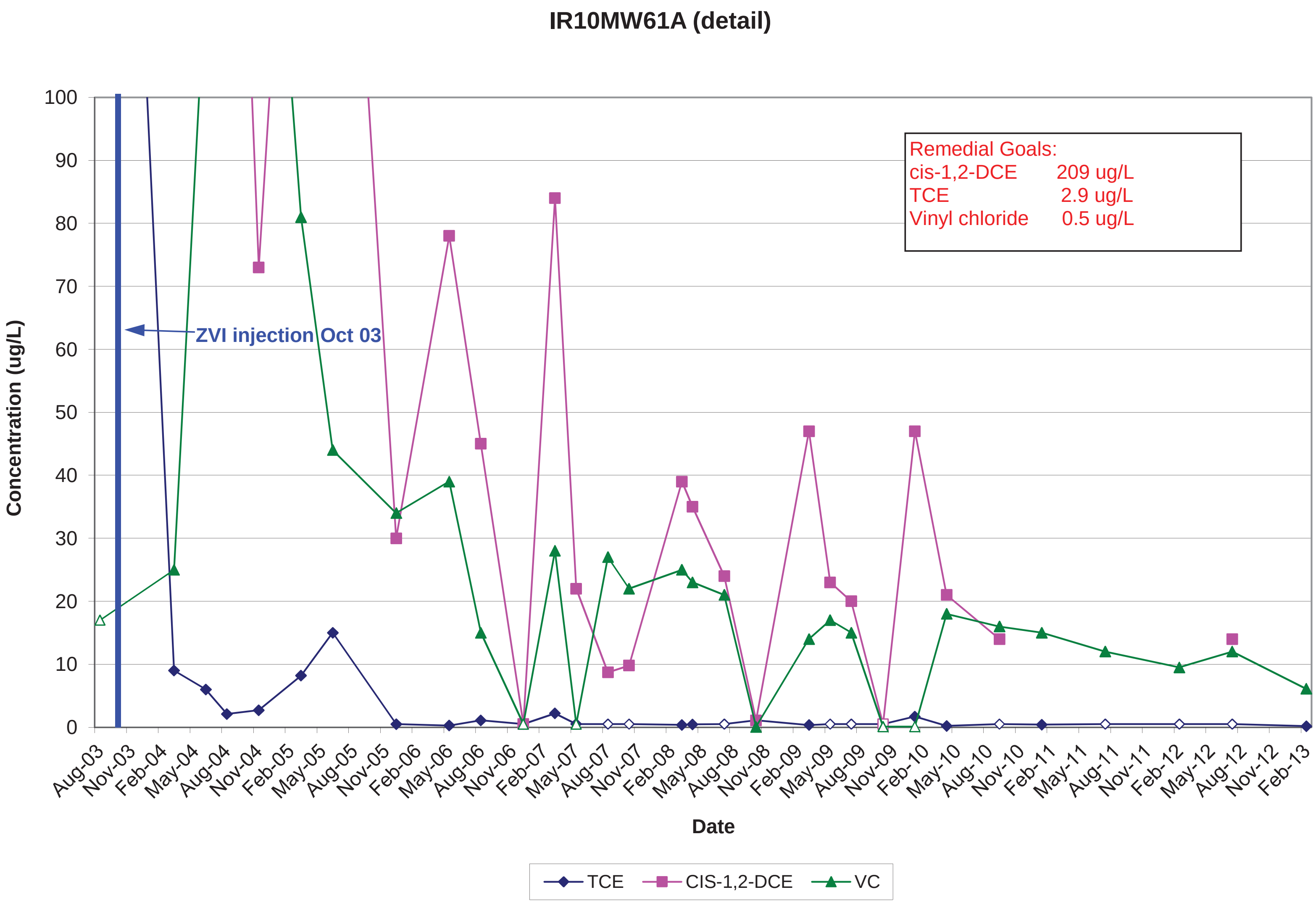
Feb-13
Date
TCE
CIS-1,2-DCE
VC



IR10MW61A (detail)
Remedial Goals:
cis-1,2-DCE 209 ug/L
TCE 2.9 ug/L
Vinyl chloride 0.5 ug/L
ZVI injection Oct 03
Concentration (ug/L)
100
90
80
70
60
50
40
30
20
10
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
Aug-09
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May-10
Aug-10
Nov-10
Feb-11
May-11
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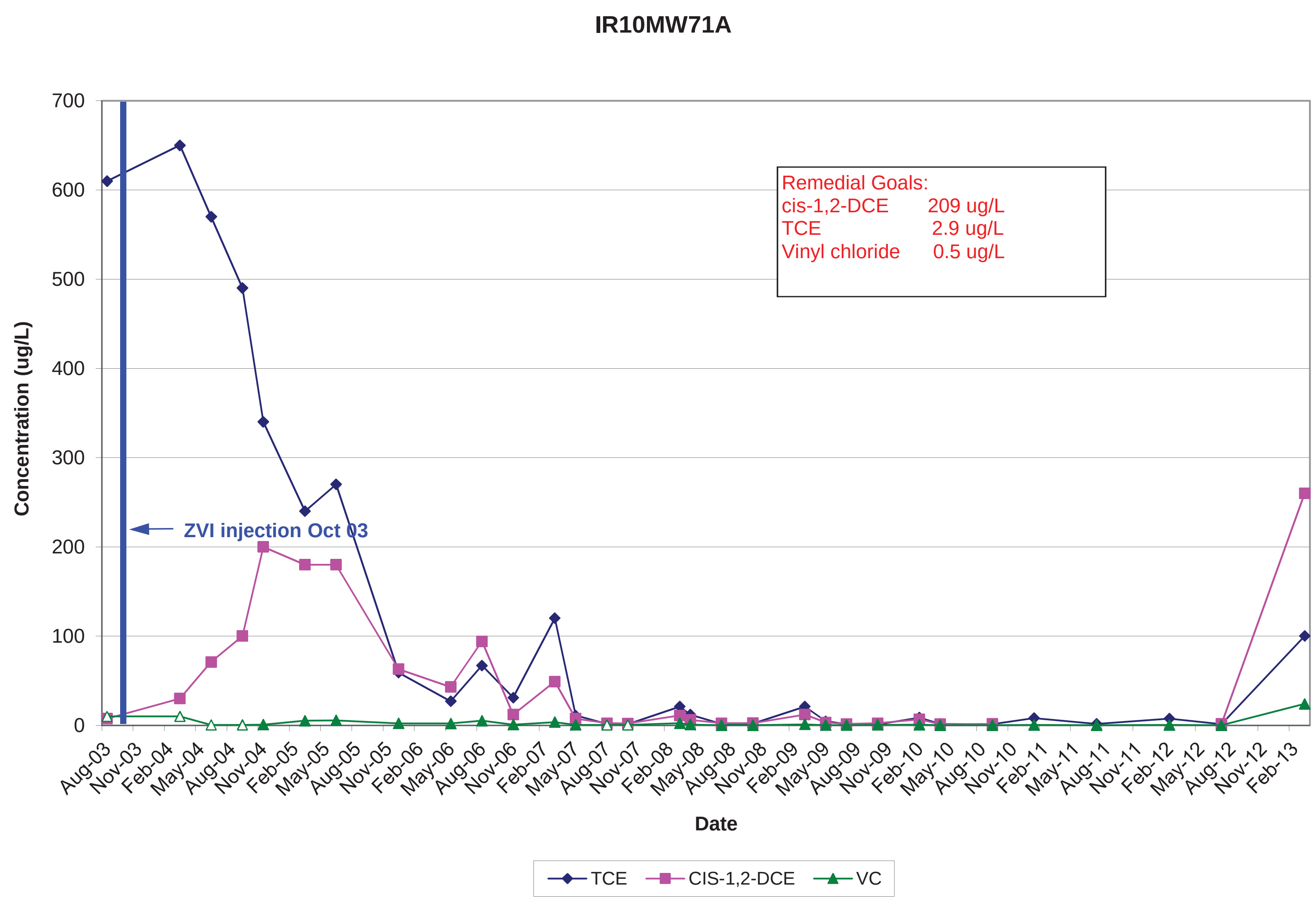
Feb-12
May-12
Aug-12
Nov-12
Feb-13
Date
TCE
CIS-1,2-DCE
VC



IR10MW71A
Concentration (ug/L)
700
600
500
400
300
200
100
0
ZVI injection Oct 03
Remedial Goals:
cis-1,2-DCE 209 ug/L
TCE 2.9 ug/L
Vinyl chloride 0.5 ug/L
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Feb-11
May-11
Aug-11
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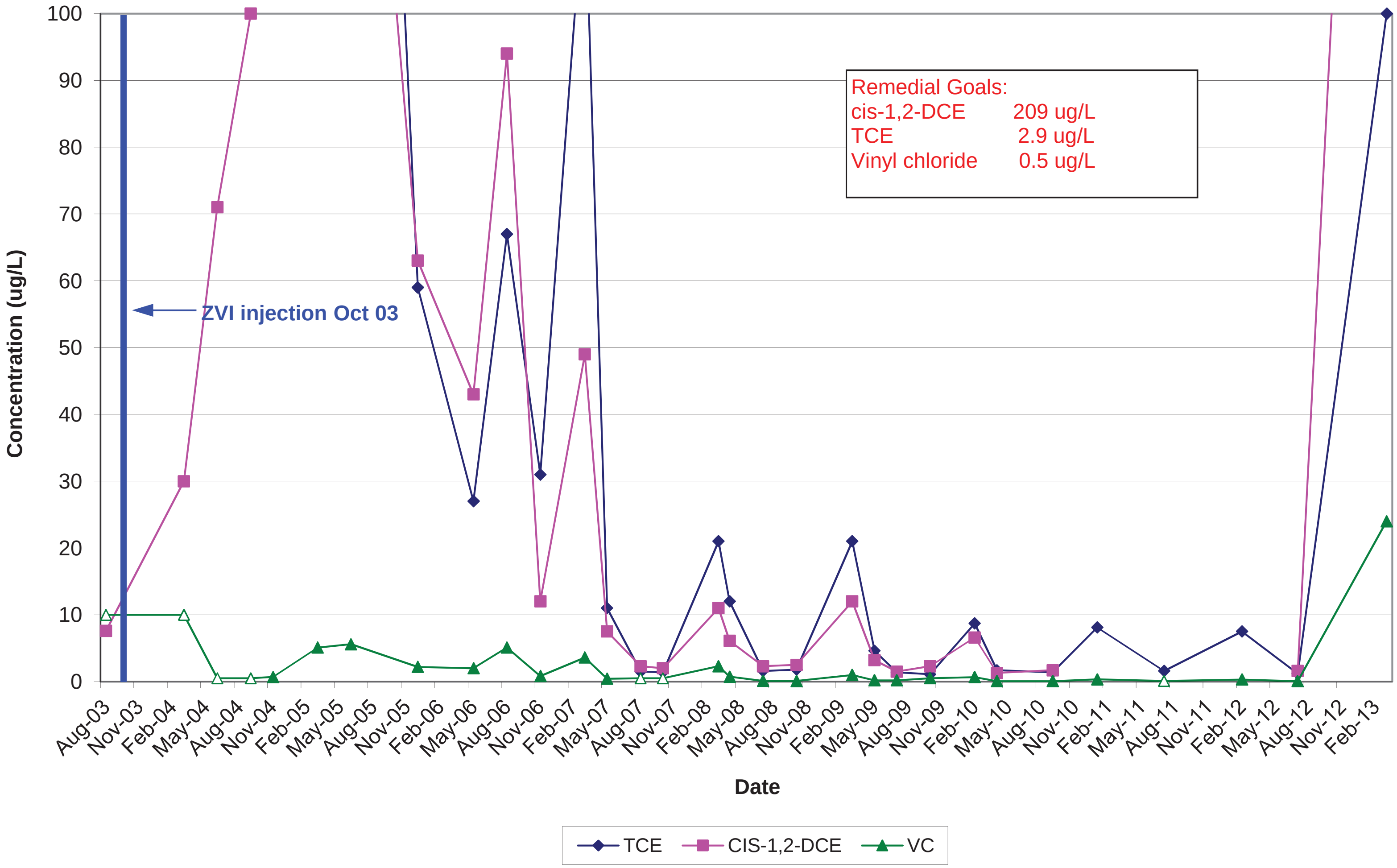
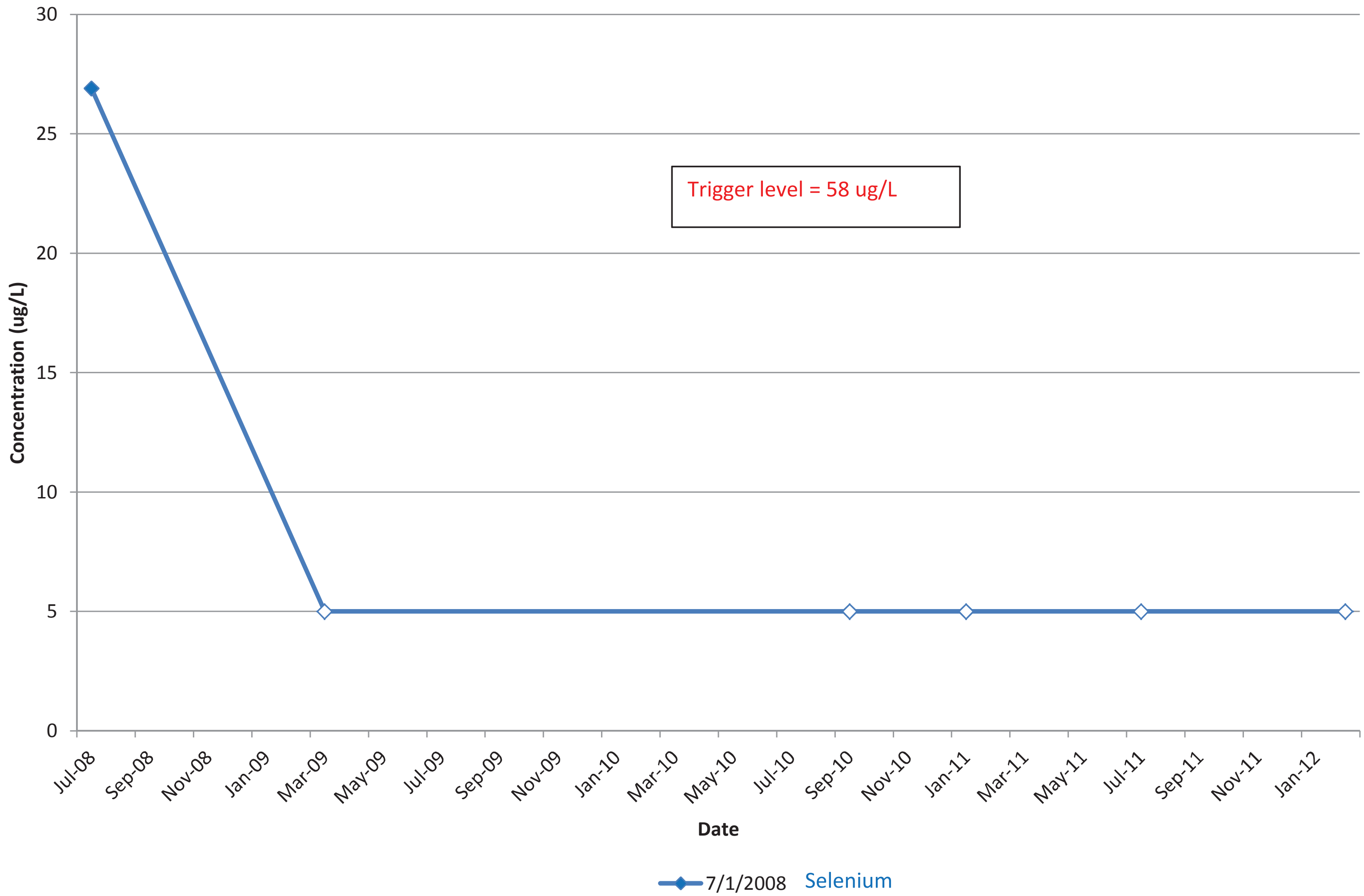
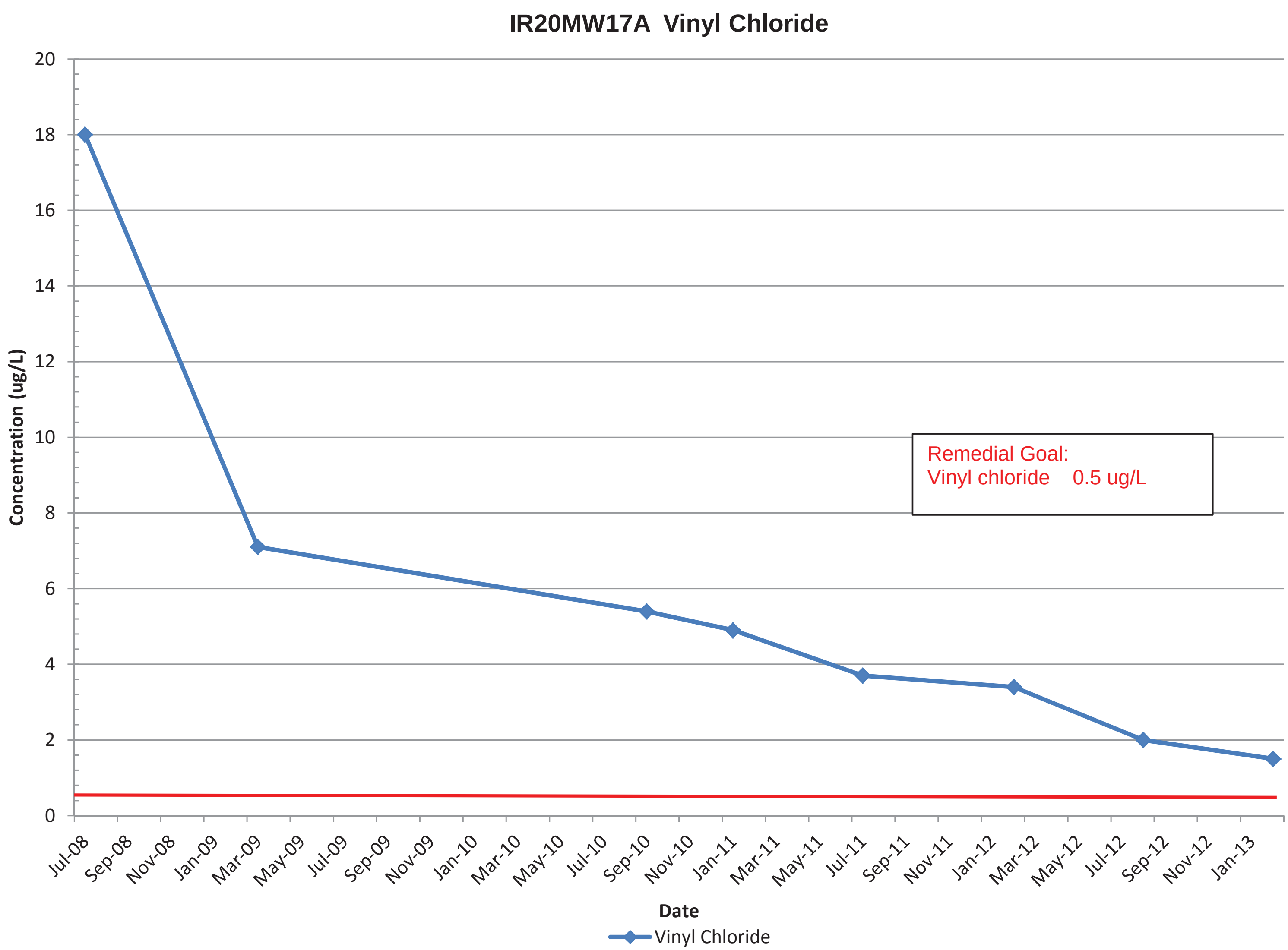
Aug-12
Nov-12
Feb-13
Date
TCE
CIS-1,2-DCE
VC

IR10MW71A (detail)



IR10MW81A Selenium




IR20MW17A Vinyl Chloride
Concentration (ug/L)
0
2
4
6
8
10
12
14
16
18
20
Remedial Goal:
Vinyl chloride 0.5 ug/L
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
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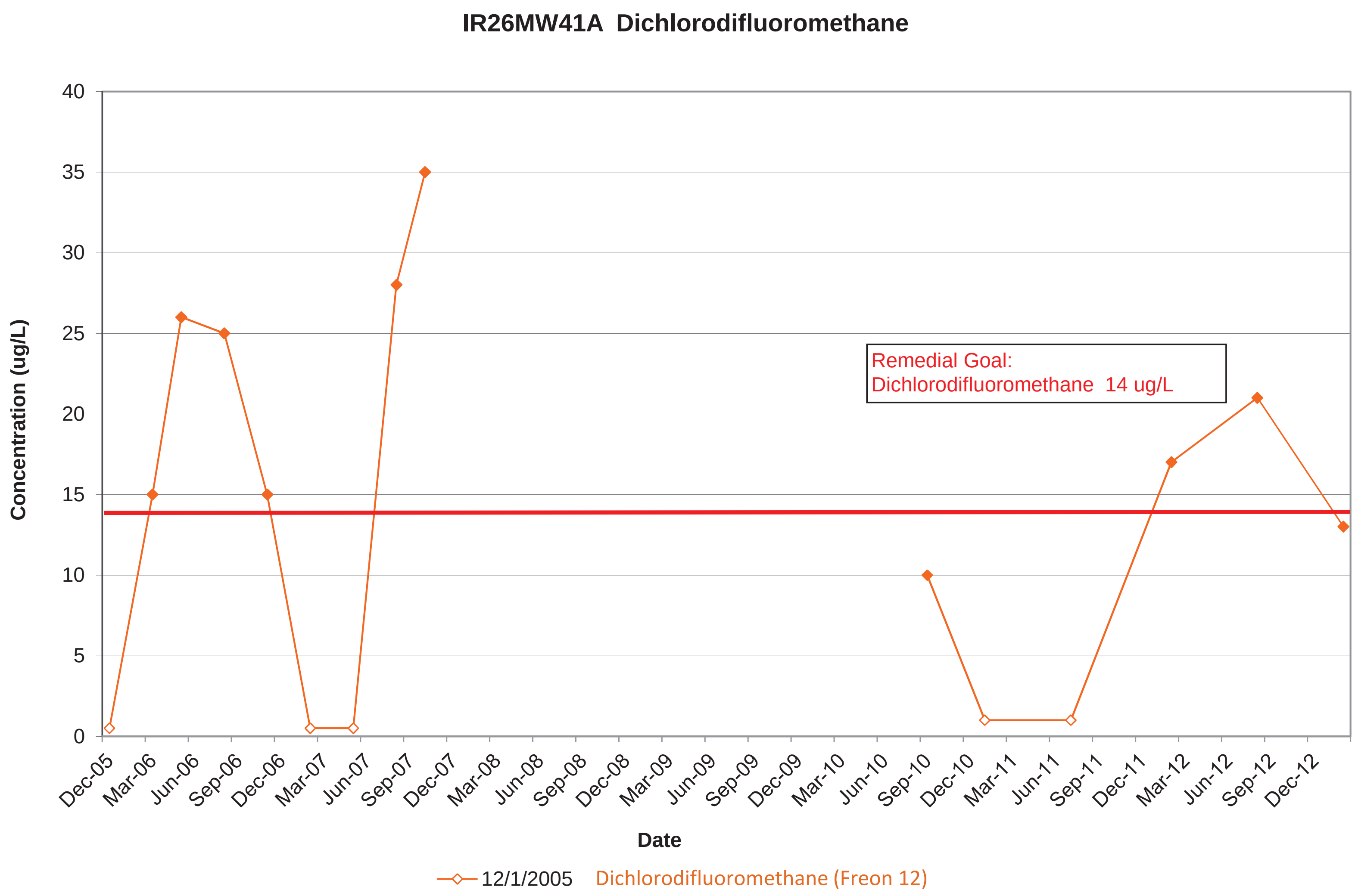
Jan-13
Date
Vinyl Chloride


IR26MW41A Dichlorodifluoromethane
Remedial Goal:
Dichlorodifluoromethane 14 ug/L
Concentration (ug/L)
40
35
30
25
20
15
10
5
0
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
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Sep-10
Dec-10
Mar-11
Jun-11
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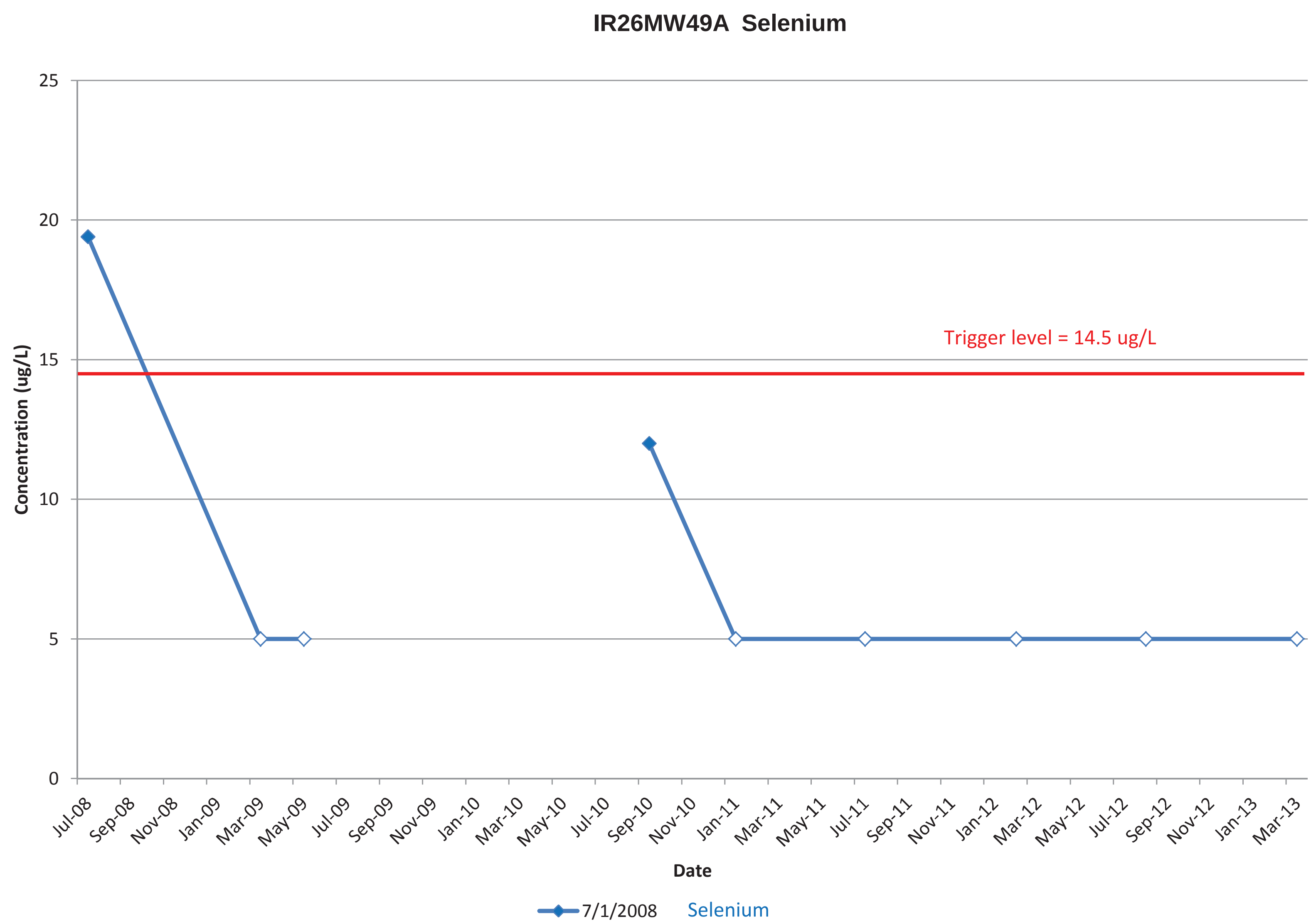
Mar-12
Jun-12
Sep-12
Dec-12
Date
12/1/2005
Dichlorodifluoromethane (Freon 12)


IR26MW49A Selenium
25
20
15
10
5
0
Concentration (ug/L)
Trigger level = 14.5 ug/L
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
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May-11
Jul-11
Sep-11
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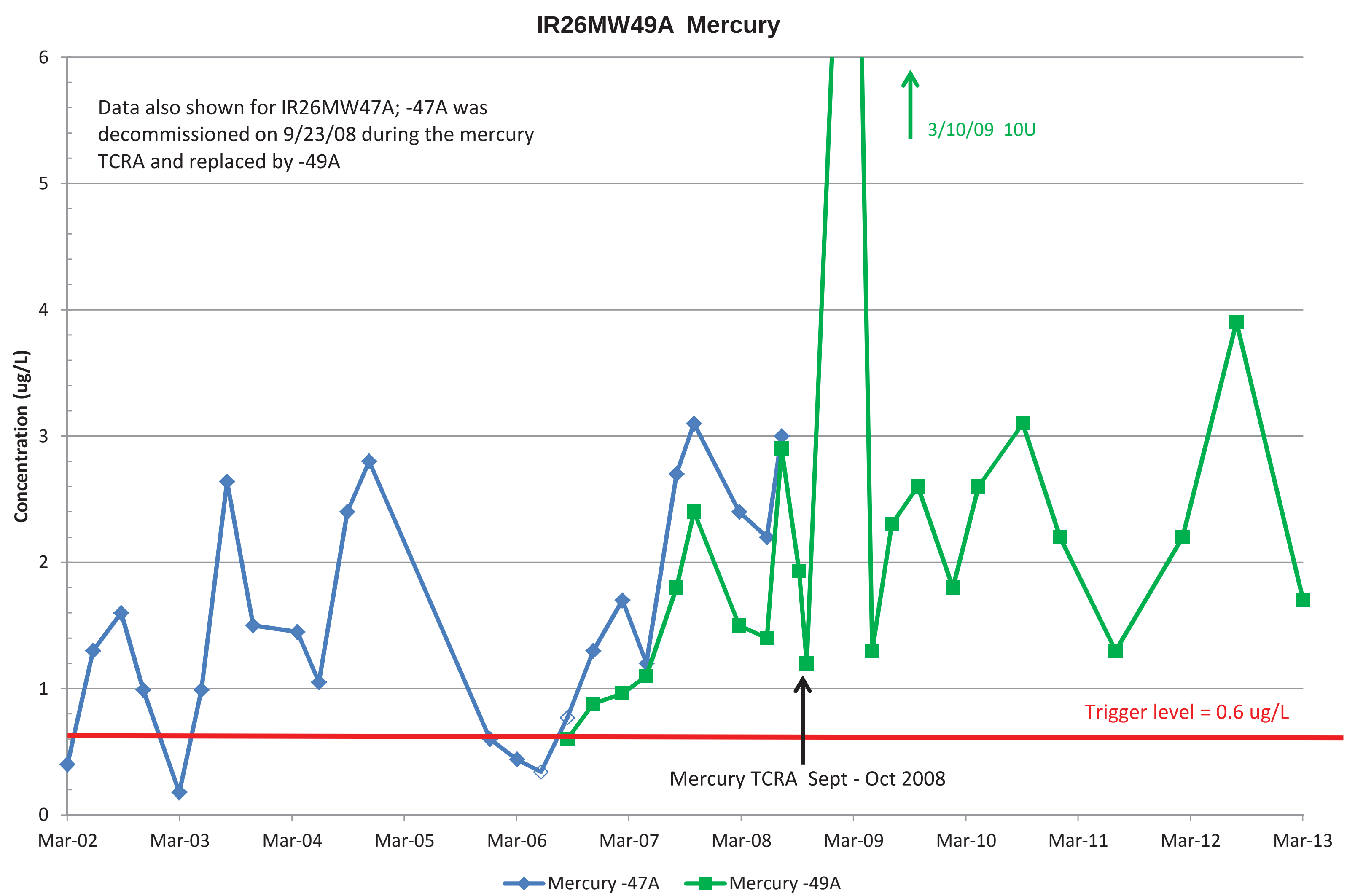
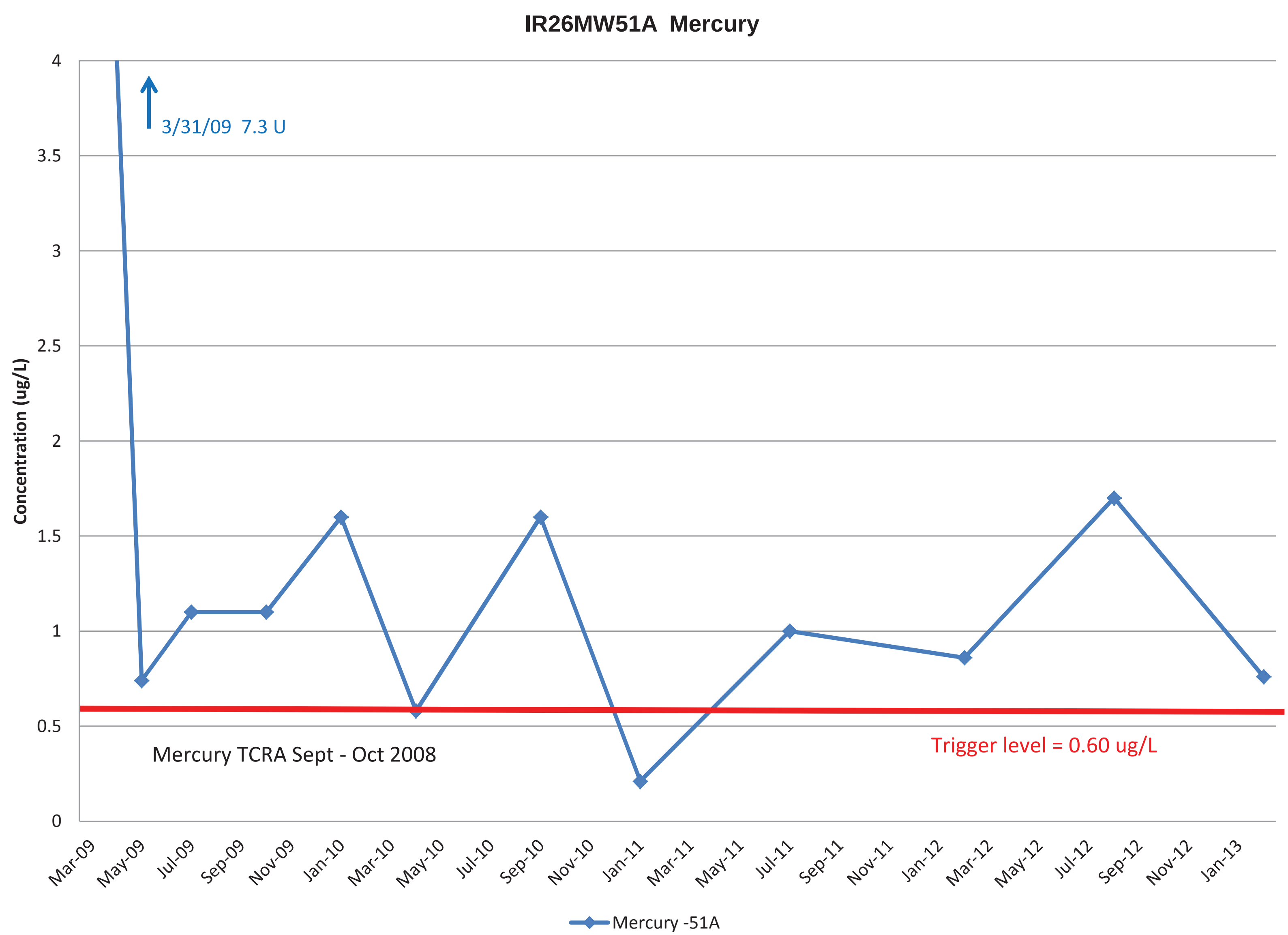
Date
7/1/2008
Selenium


IR26MW49A Mercury
Data also shown for IR26MW47A; -47A was decommissioned on 9/23/08 during the mercury TCRA and replaced by -49A
3/10/09 10U
Trigger level = 0.6 ug/L
Mercury TCRA Sept - Oct 2008
Concentration (ug/L)
0
1
2
3
4
5
6
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mercury -47A
Mercury -49A


IR26MW51A Mercury
Concentration (ug/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
3/31/09 7.3 U
Mercury TCRA Sept - Oct 2008
Trigger level = 0.60 ug/L
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
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Jul-11
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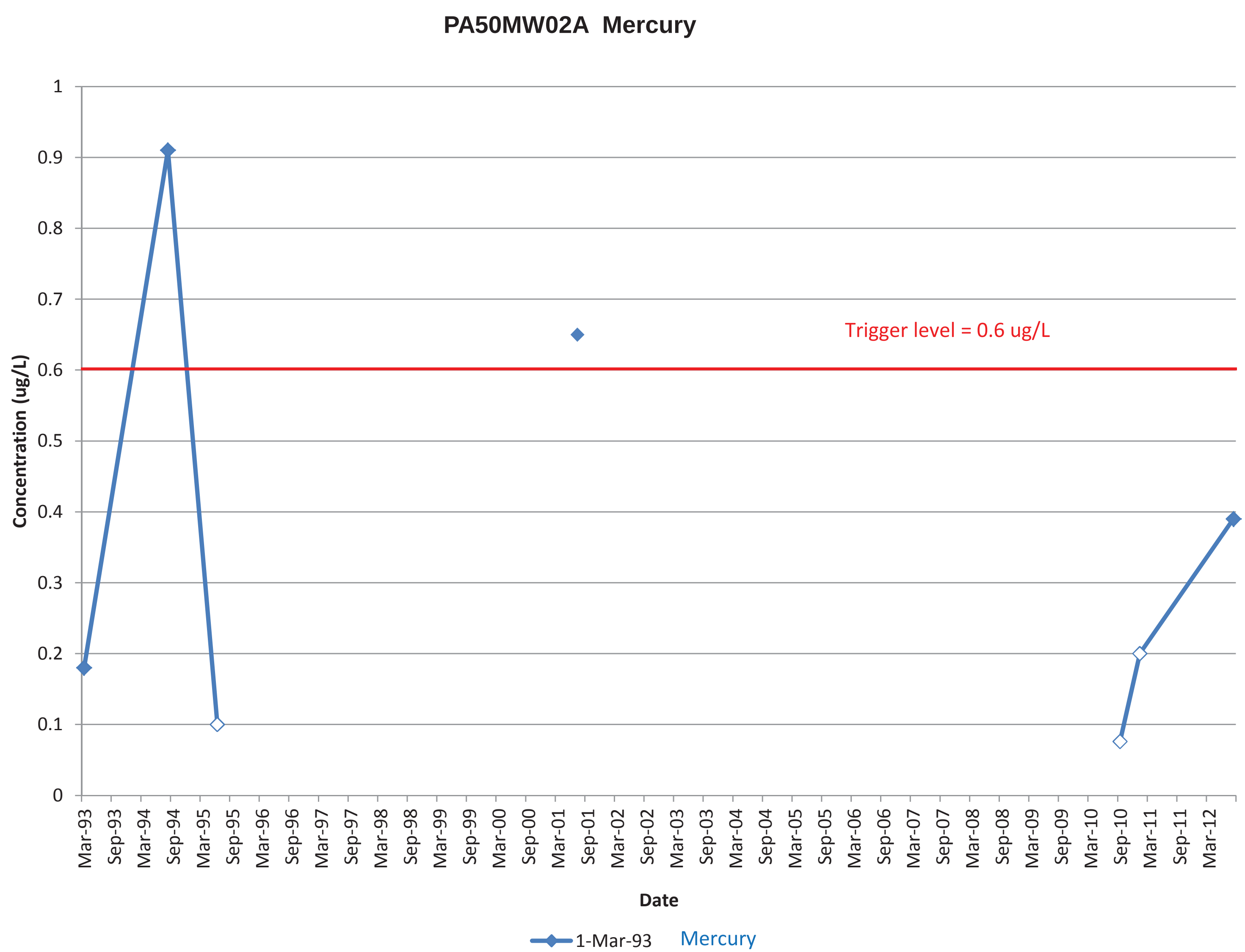
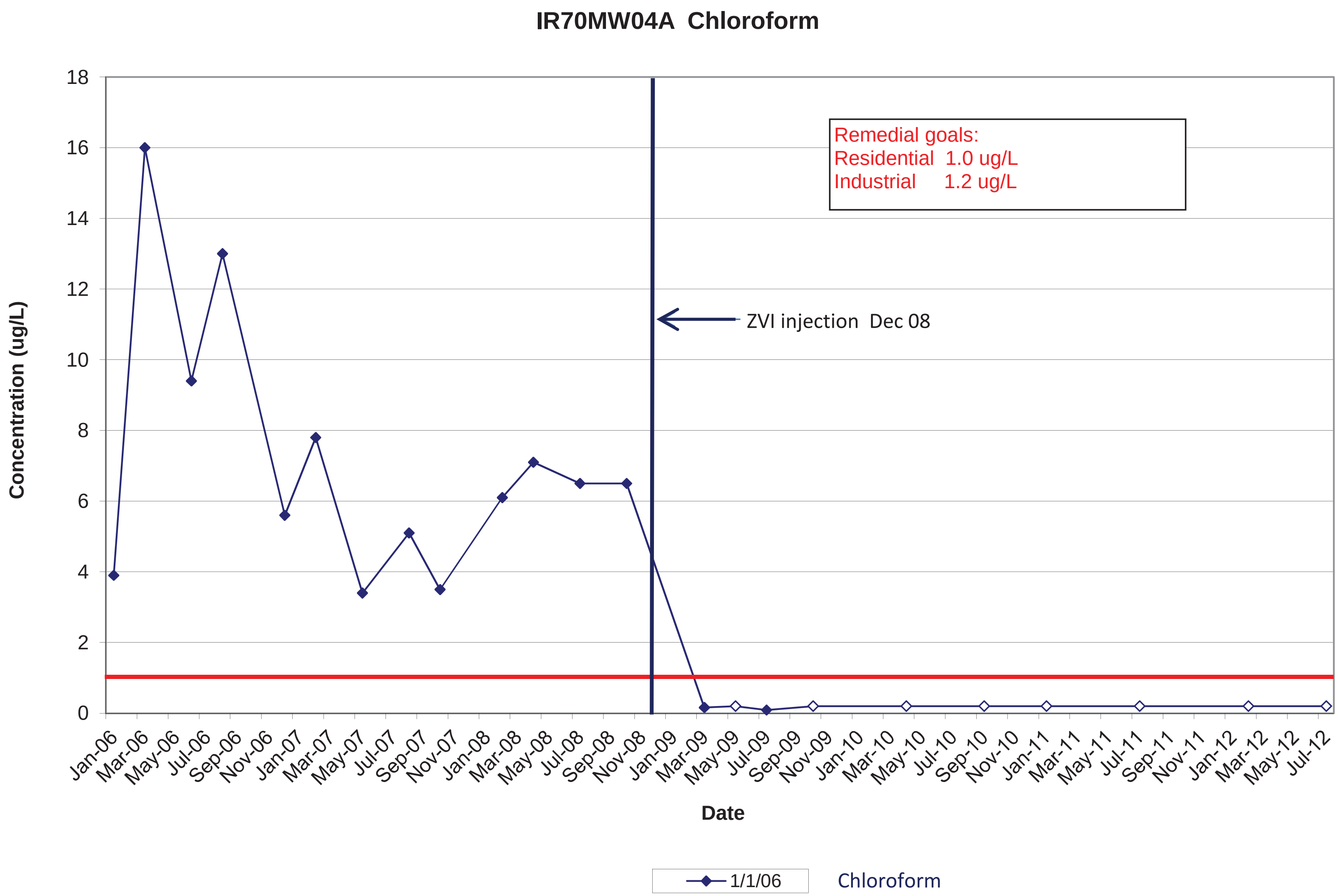
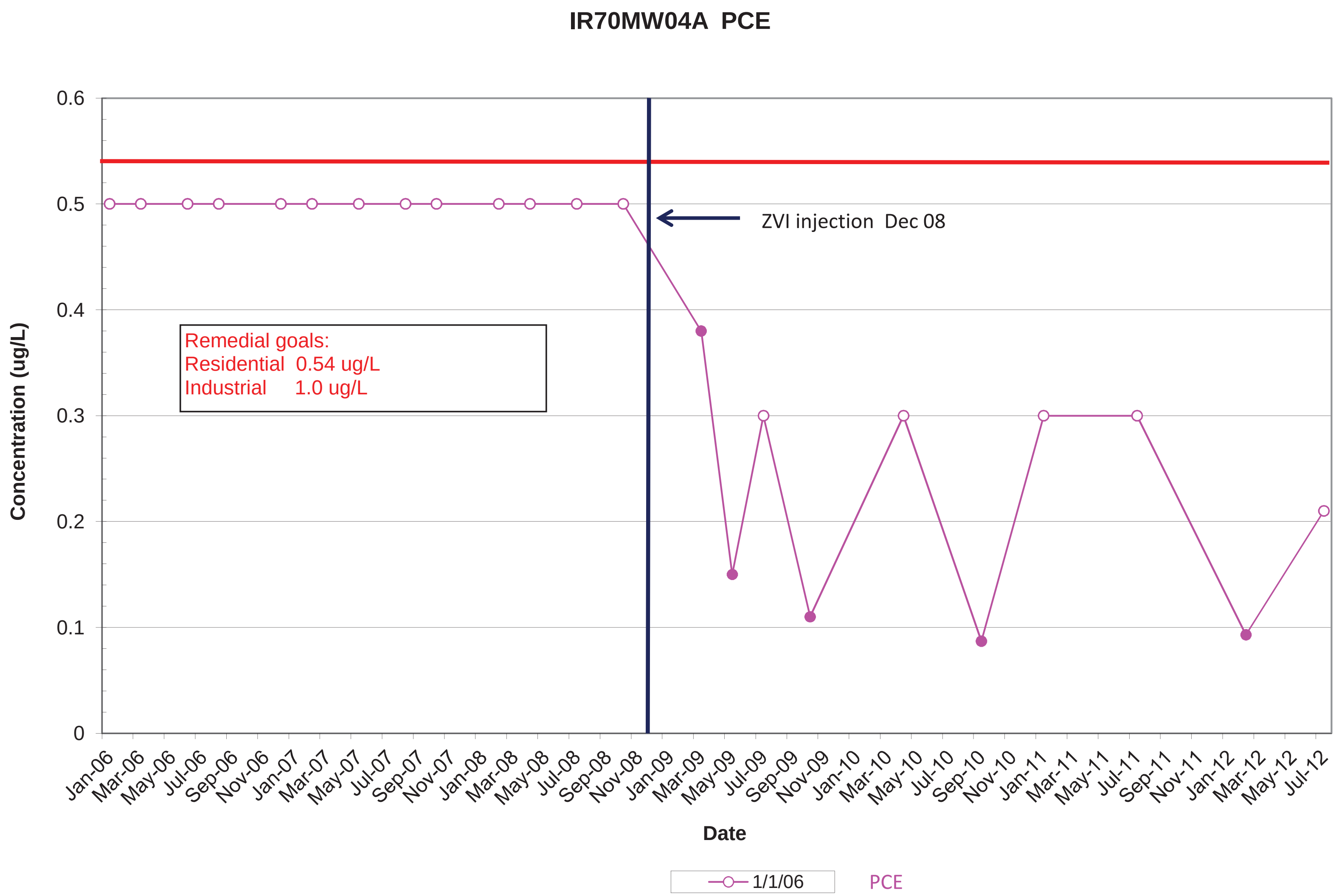
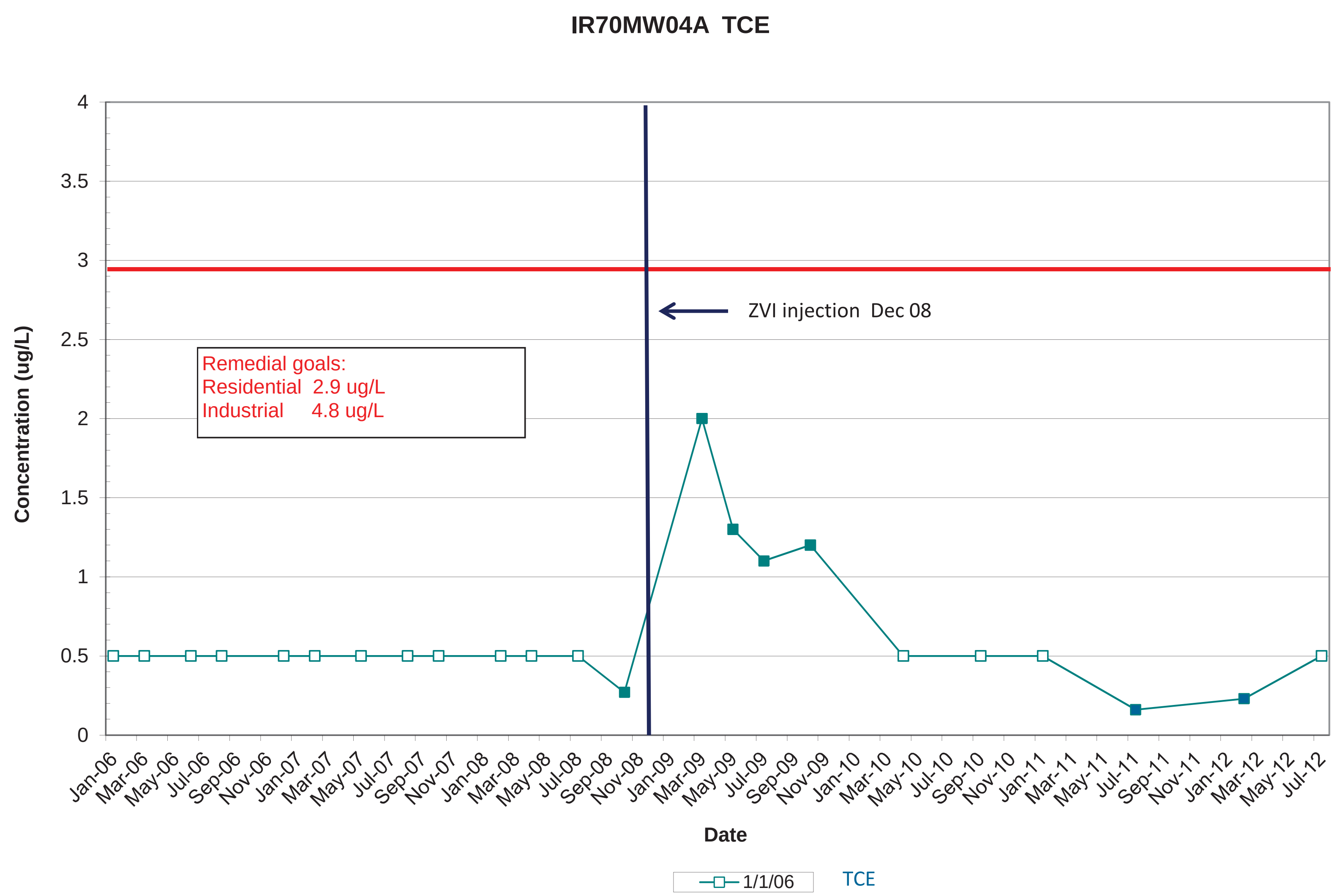
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mercury -51A


PA50MW02A Mercury
Concentration (ug/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Trigger level = 0.6 ug/L
Mar-93
Sep-93
Mar-94
Sep-94
Mar-95
Sep-95
Mar-96
Sep-96
Mar-97
Sep-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
Sep-11
Mar-12
Date
1-Mar-93
Mercury

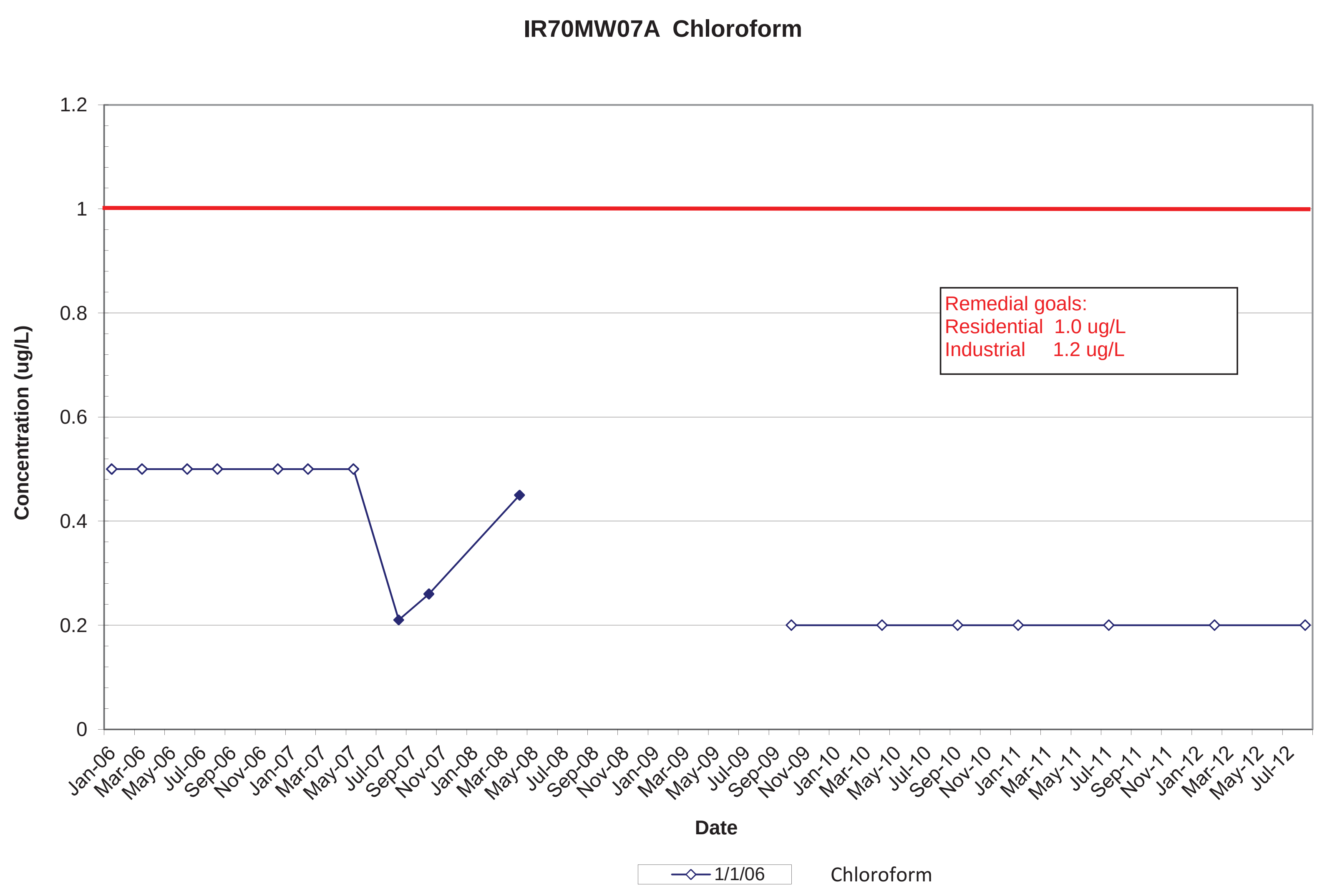
GRAPHS FOR PARCEL D-1


IR70MW04A Chloroform
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
ZVI injection Dec 08
Concentration (ug/L)
Date
18
16
14
12
10
8
6
4
2
0
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
1/1/06
Chloroform

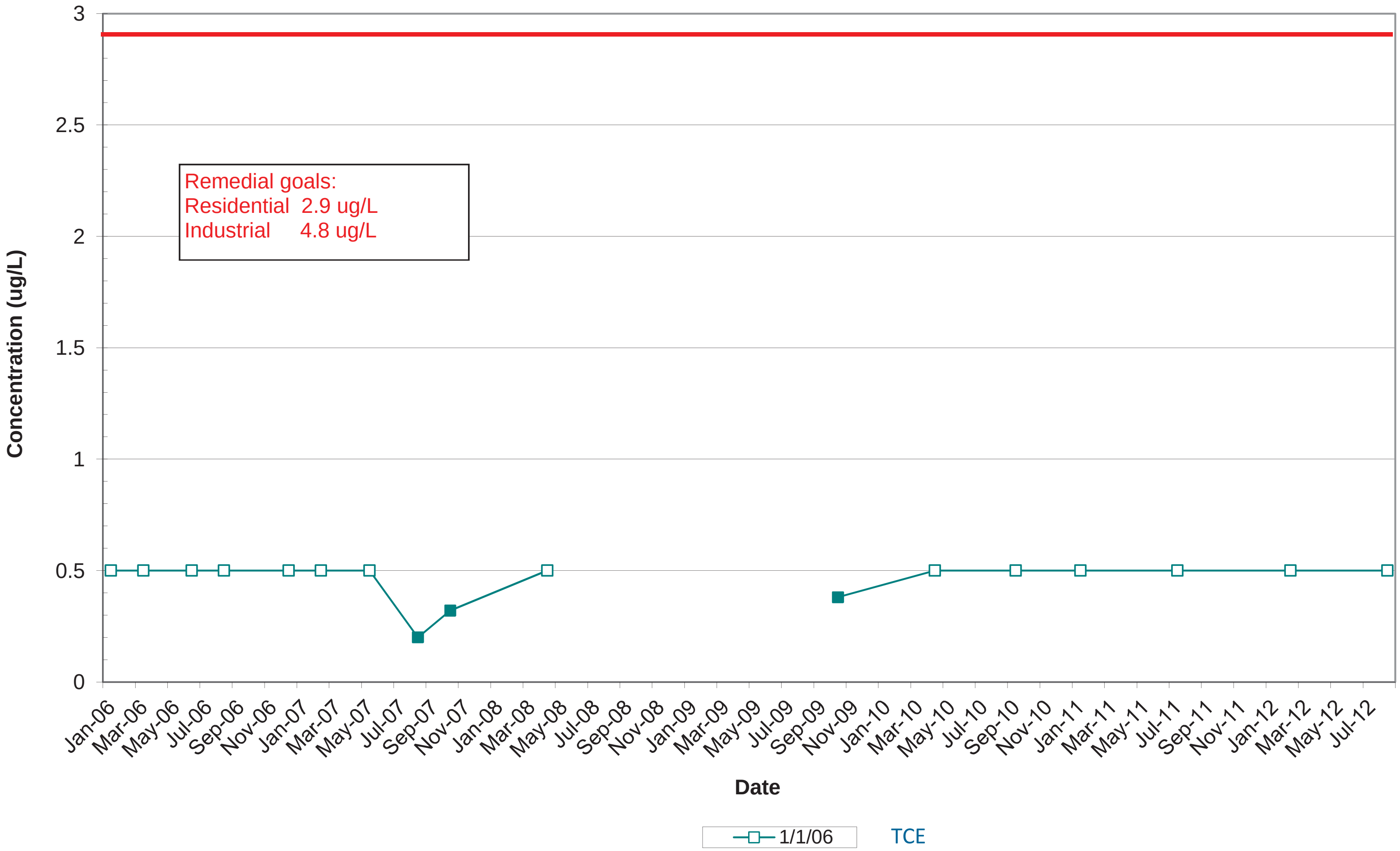

IR70MW04A PCE
Concentration (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
ZVI injection Dec 08
Remedial goals:
Residential 0.54 ug/L
Industrial 1.0 ug/L
Jan-06 Mar-06 May-06 Jul-06 Sep-06 Nov-06 Jan-07 Mar-07 May-07 Jul-07 Sep-07 Nov-07 Jan-08 Mar-08 May-08 Jul-08 Sep-08 Nov-08 Jan-09 Mar-09 May-09 Jul-09 Sep-09 Nov-09 Jan-10 Mar-10 May-10 Jul-10 Sep-10 Nov-10 Jan-11 Mar-11 May-11 Jul-11 Sep-11 Nov-11 Jan-12 Mar-12 May-12 Jul-12
Date
1/1/06
PCE



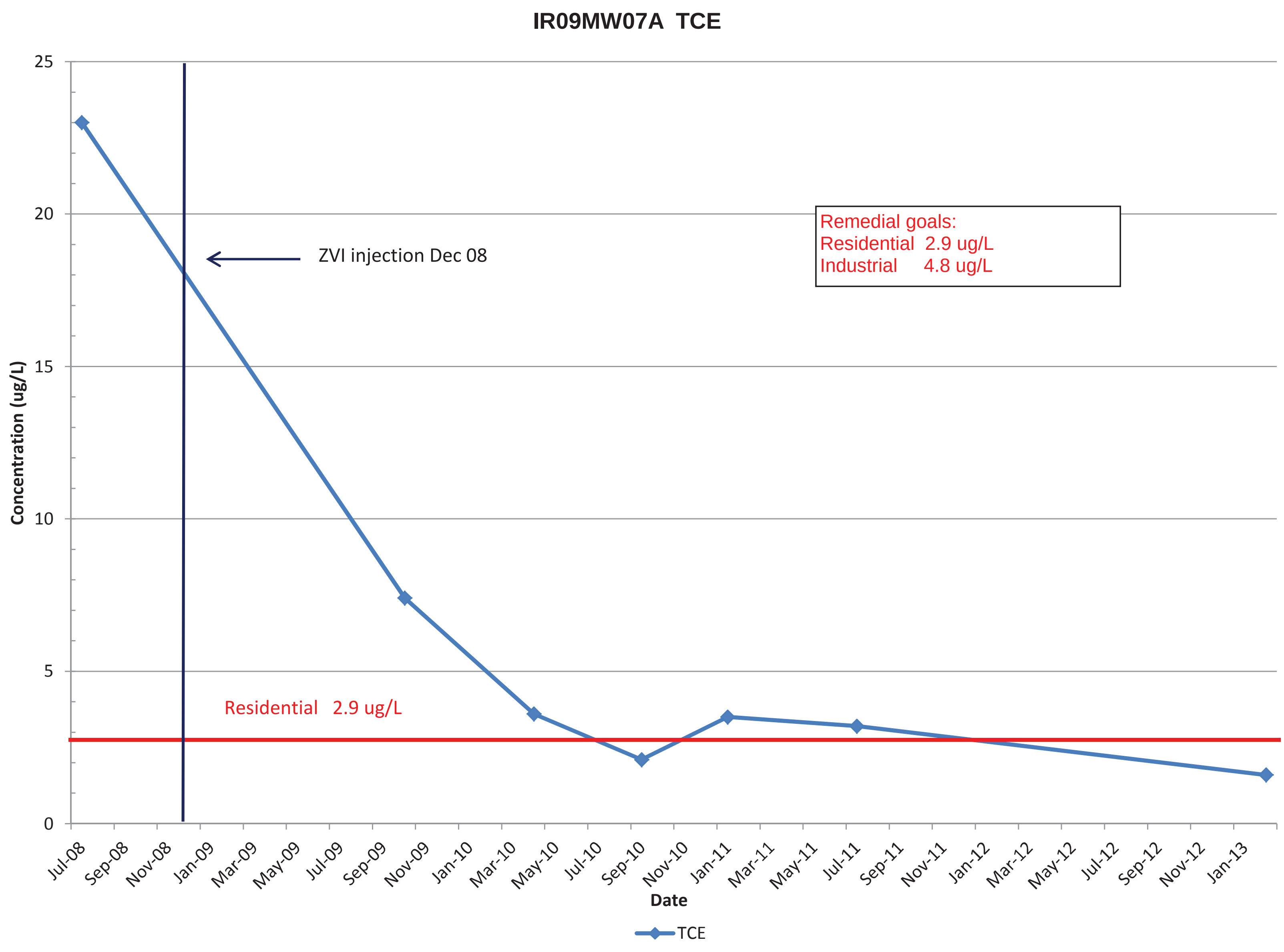
IR70MW04A TCE
Concentration (ug/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
ZVI injection Dec 08
Remedial goals:
Residential 2.9 ug/L
Industrial 4.8 ug/L
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Date
1/1/06
TCE


IR70MW07A Chloroform
Concentration (ug/L)
1.2
1
0.8
0.6
0.4
0.2
0
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Jan-06 Mar-06 May-06 Jul-06 Sep-06 Nov-06 Jan-07 Mar-07 May-07 Jul-07 Sep-07 Nov-07 Jan-08 Mar-08 May-08 Jul-08 Sep-08 Nov-08 Jan-09 Mar-09 May-09 Jul-09 Sep-09 Nov-09 Jan-10 Mar-10 May-10 Jul-10 Sep-10 Nov-10 Jan-11 Mar-11 May-11 Jul-11 Sep-11 Nov-11 Jan-12 Mar-12 May-12 Jul-12
Date
1/1/06
Chloroform

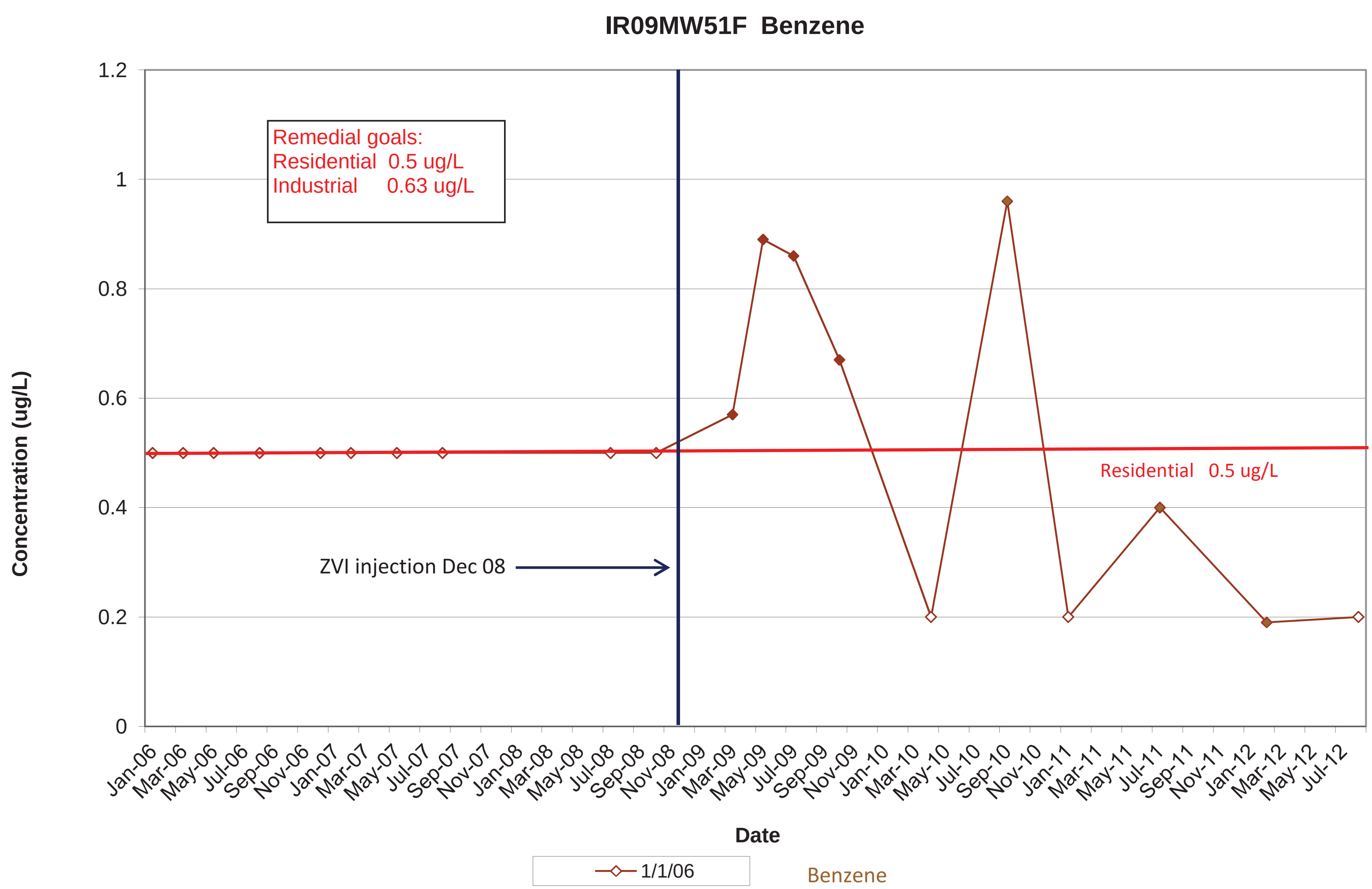
IR70MW07A TCE



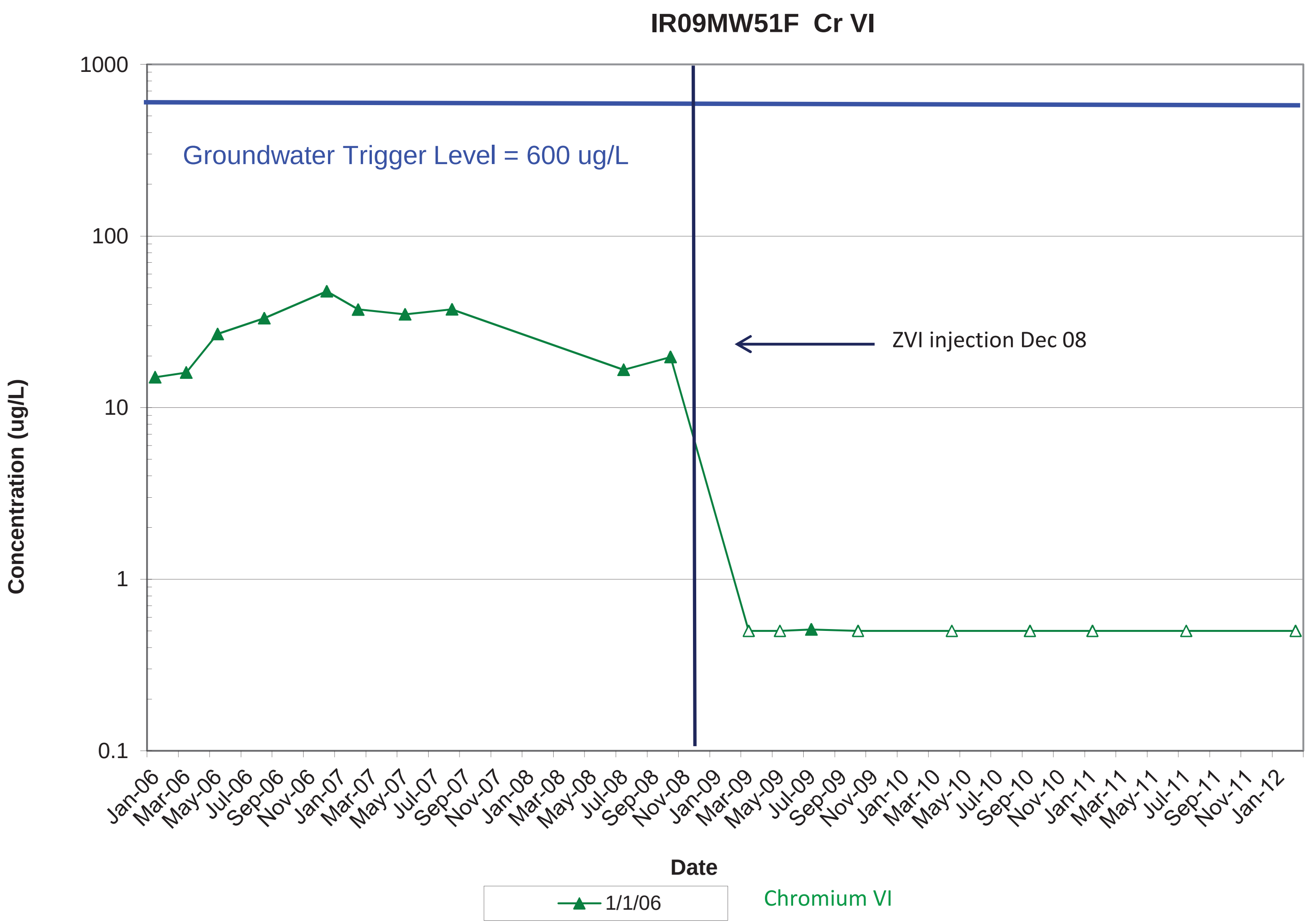
GRAPHS FOR PARCEL G



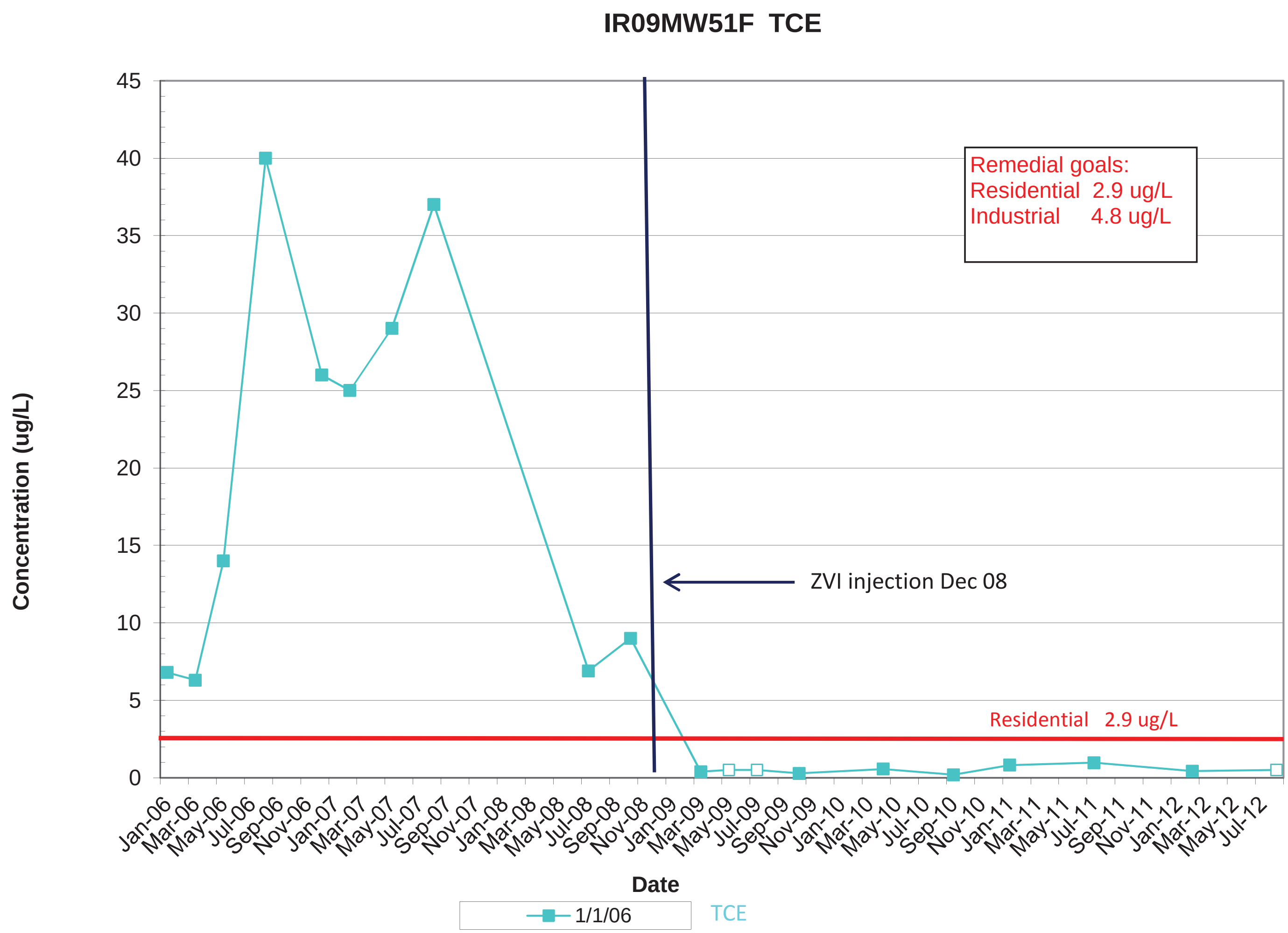
IR09MW07A TCE
Concentration (ug/L)
25
20
15
10
5
0
ZVI injection Dec 08
Remedial goals:
Residential 2.9 ug/L
Industrial 4.8 ug/L
Residential 2.9 ug/L
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Date
TCE



IR09MW51F Benzene
Remedial goals:
Residential 0.5 ug/L
Industrial 0.63 ug/L
ZVI injection Dec 08
Residential 0.5 ug/L
Concentration (ug/L)
Date
1.2
1
0.8
0.6
0.4
0.2
0
Jan-06 Mar-06 May-06 Jul-06 Sep-06 Nov-06 Jan-07 Mar-07 May-07 Jul-07 Sep-07 Nov-07 Jan-08 Mar-08 May-08 Jul-08 Sep-08 Nov-08 Jan-09 Mar-09 May-09 Jul-09 Sep-09 Nov-09 Jan-10 Mar-10 May-10 Jul-10 Sep-10 Nov-10 Jan-11 Mar-11 May-11 Jul-11 Sep-11 Nov-11 Jan-12 Mar-12 May-12 Jul-12
1/1/06
Benzene



IR09MW51F Cr VI
Concentration (ug/L)
1000
100
10
1
0.1
Groundwater Trigger Level = 600 ug/L
ZVI injection Dec 08
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Date
1/1/06
Chromium VI


IR09MW51F TCE
Remedial goals:
Residential 2.9 ug/L
Industrial 4.8 ug/L
ZVI injection Dec 08
Residential 2.9 ug/L
Concentration (ug/L)
Date
1/1/06
TCE
45
40
35
30
25
20
15
10
5
0
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
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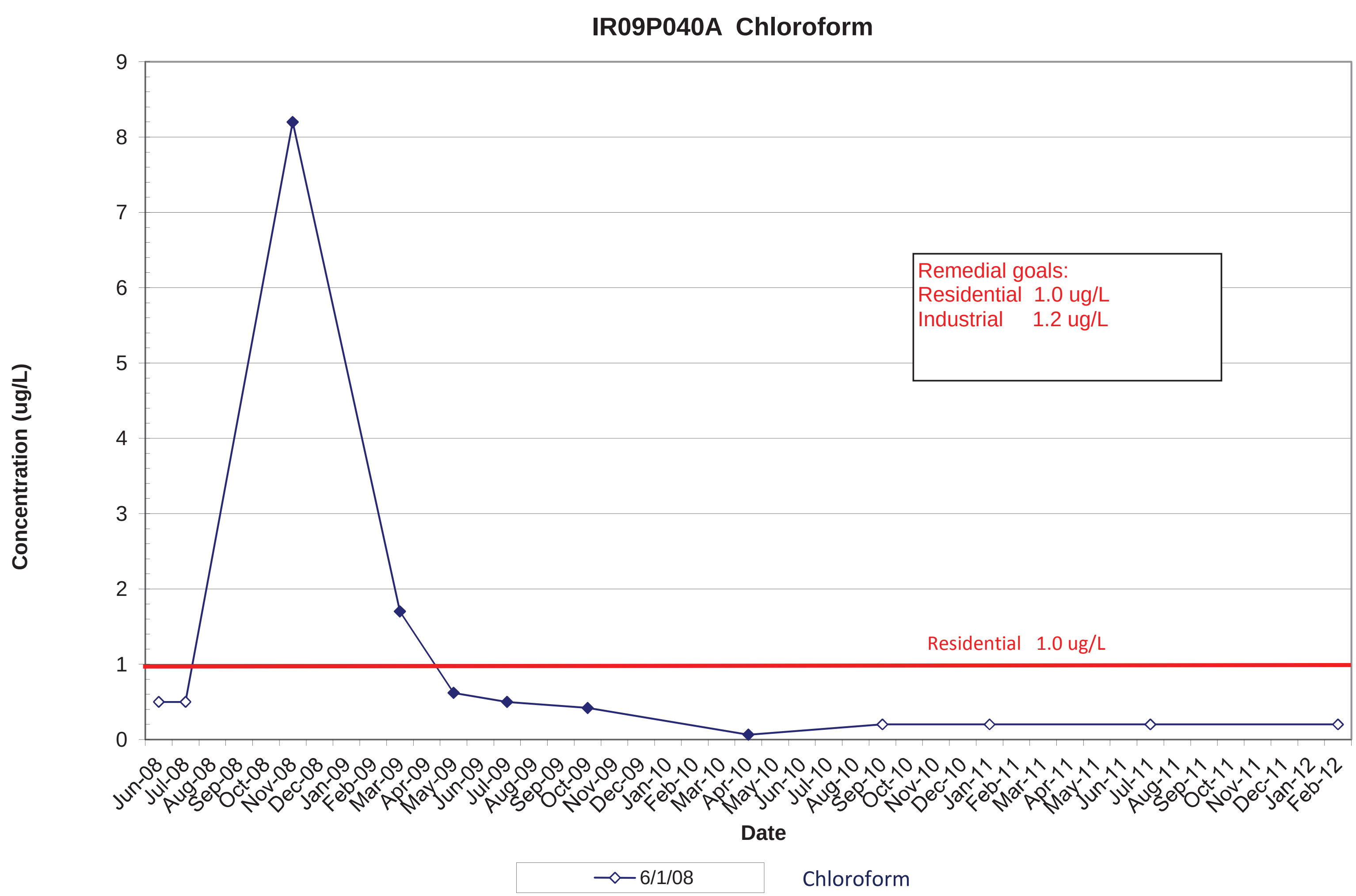
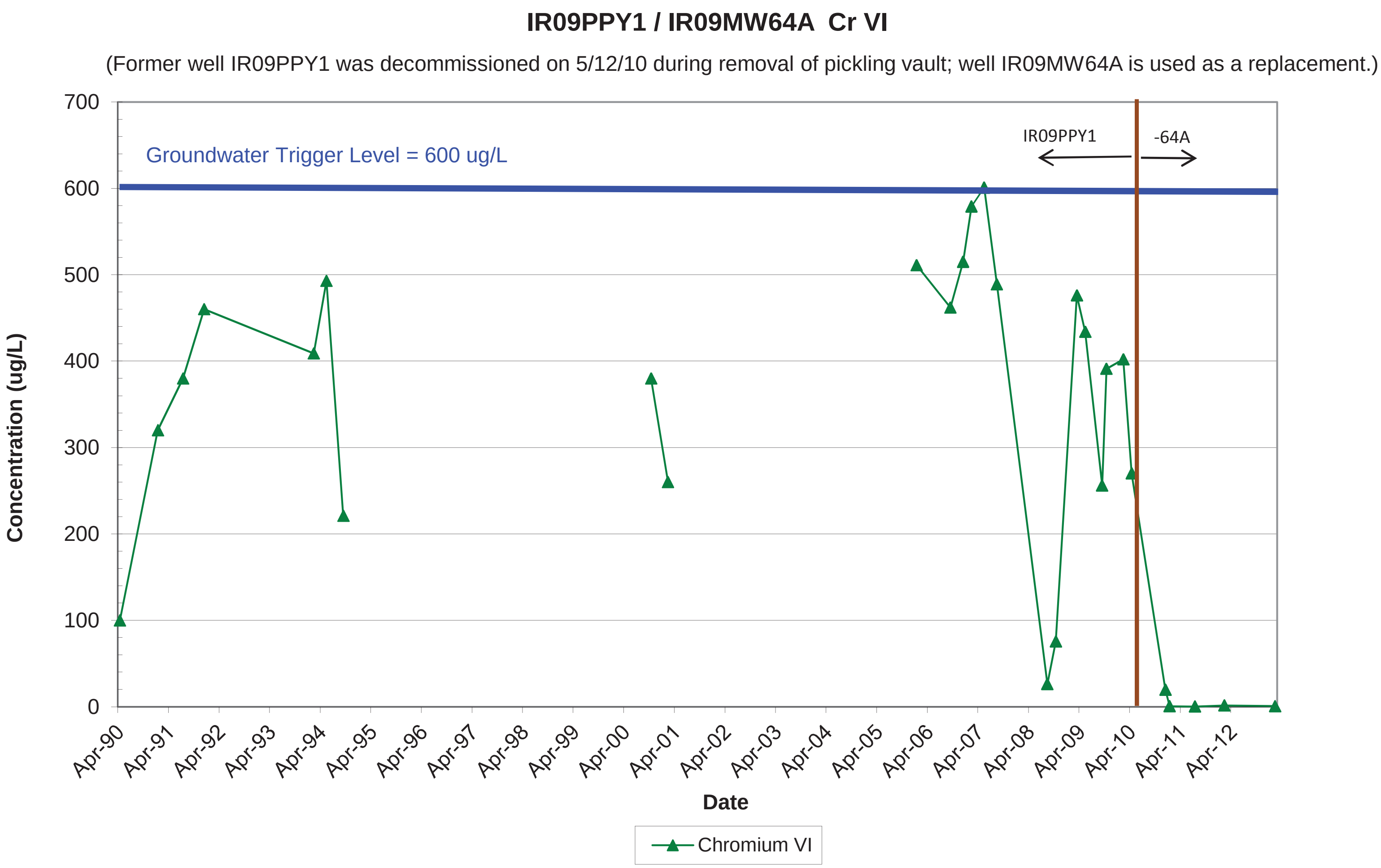
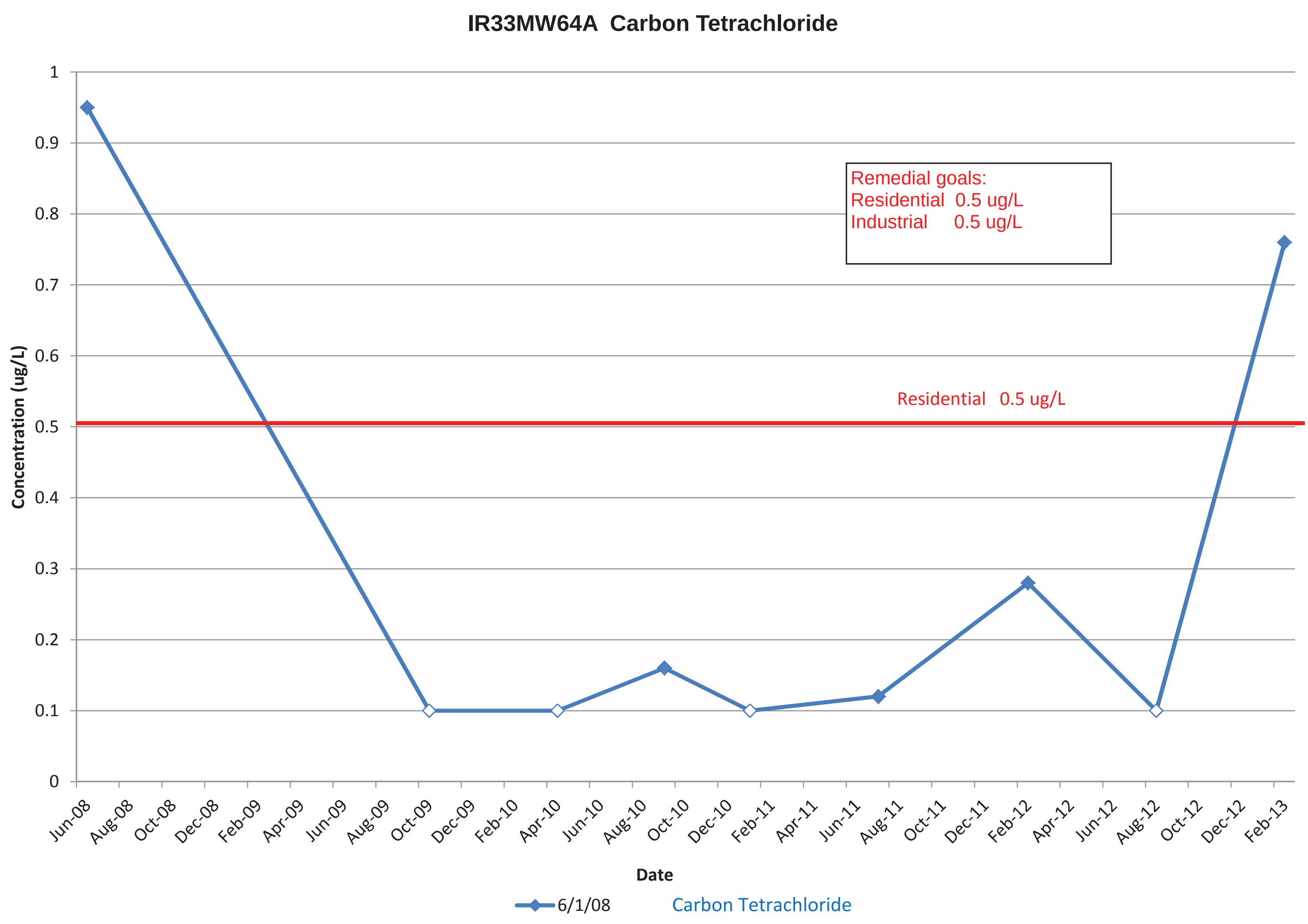
Nov-11
Jan-12
Mar-12
May-12
Jul-12

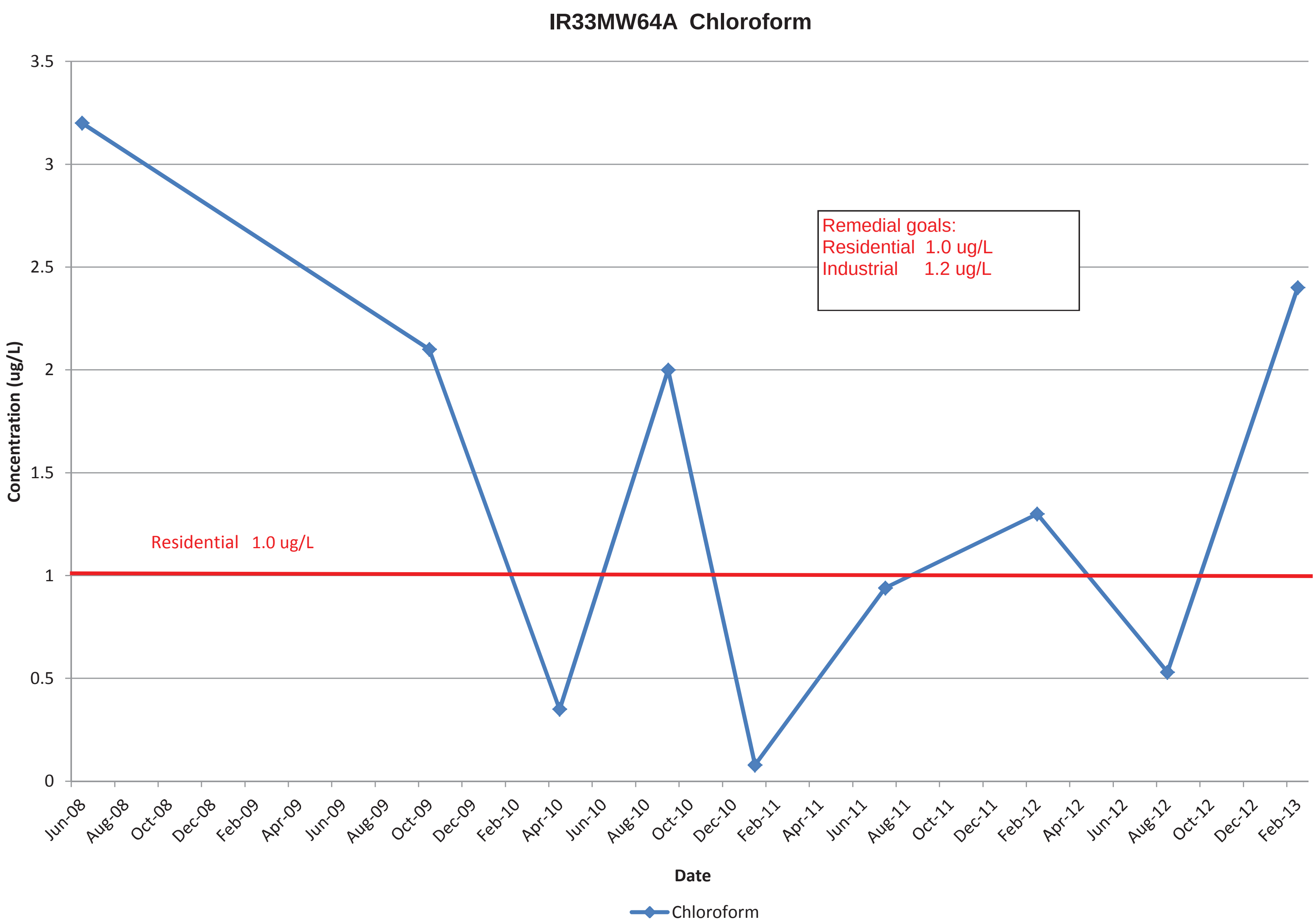

IR09P040A Chloroform
Concentration (ug/L)
0
1
2
3
4
5
6
7
8
9
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Residential 1.0 ug/L
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Date
6/1/08
Chloroform

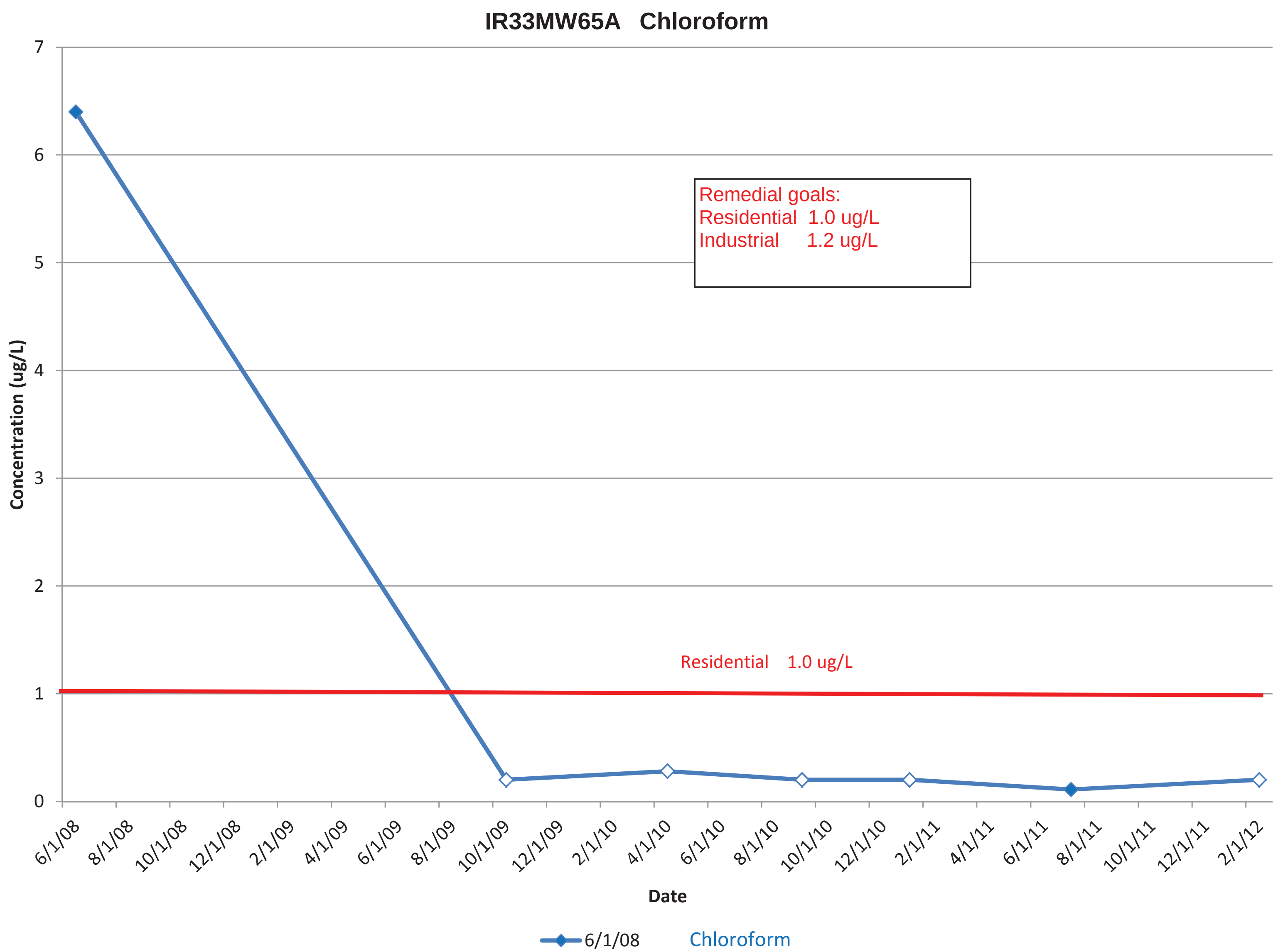


IR09PPY1 / IR09MW64A Cr VI
(Former well IR09PPY1 was decommissioned on 5/12/10 during removal of pickling vault; well IR09MW64A is used as a replacement.)
Groundwater Trigger Level = 600 ug/L
IR09PPY1
-64A
Concentration (ug/L)
0
100
200
300
400
500
600
700
Apr-90
Apr-91
Apr-92
Apr-93
Apr-94
Apr-95
Apr-96
Apr-97
Apr-98
Apr-99
Apr-00
Apr-01
Apr-02
Apr-03
Apr-04
Apr-05
Apr-06
Apr-07
Apr-08
Apr-09
Apr-10
Apr-11
Apr-12
Date
Chromium VI

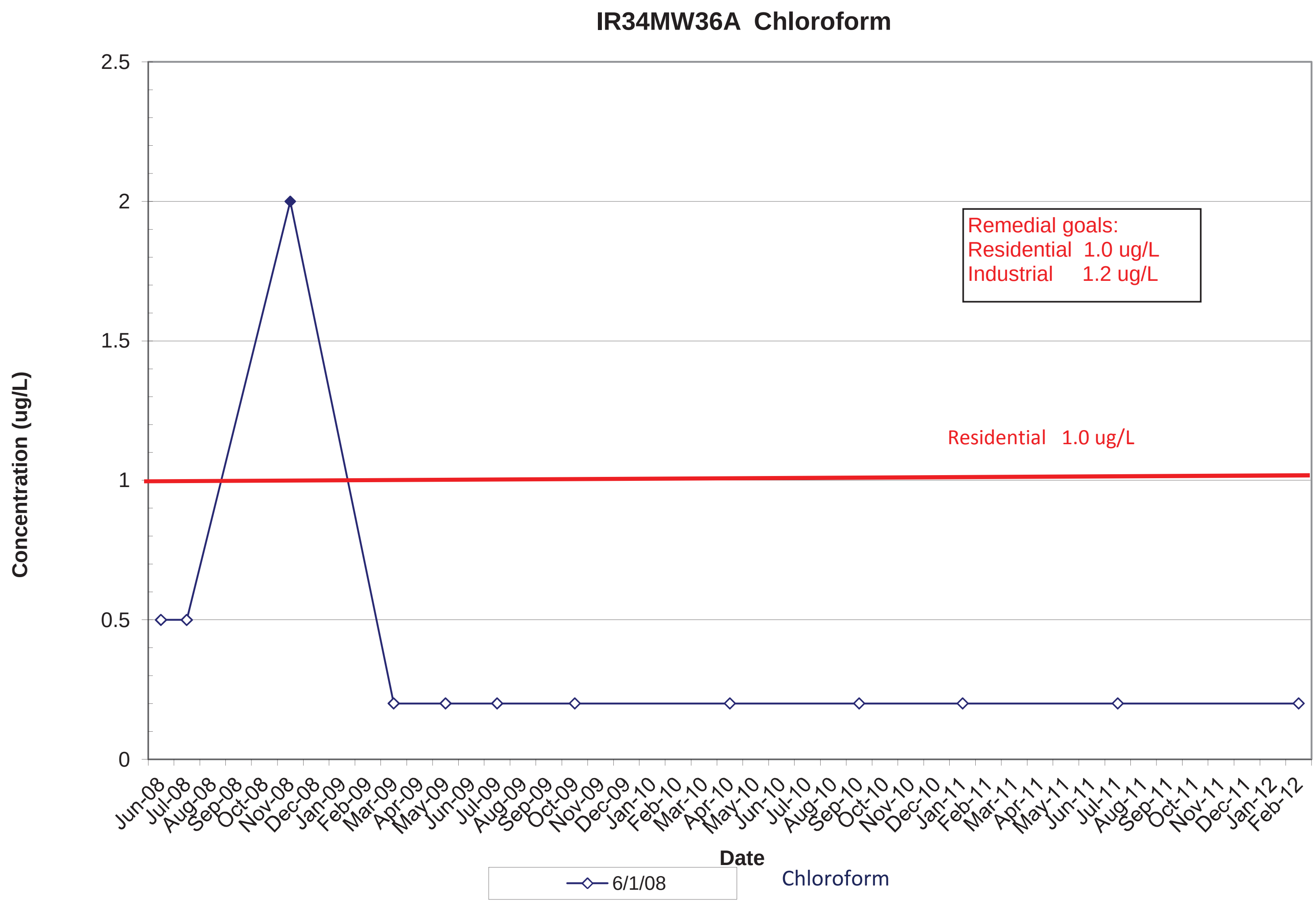


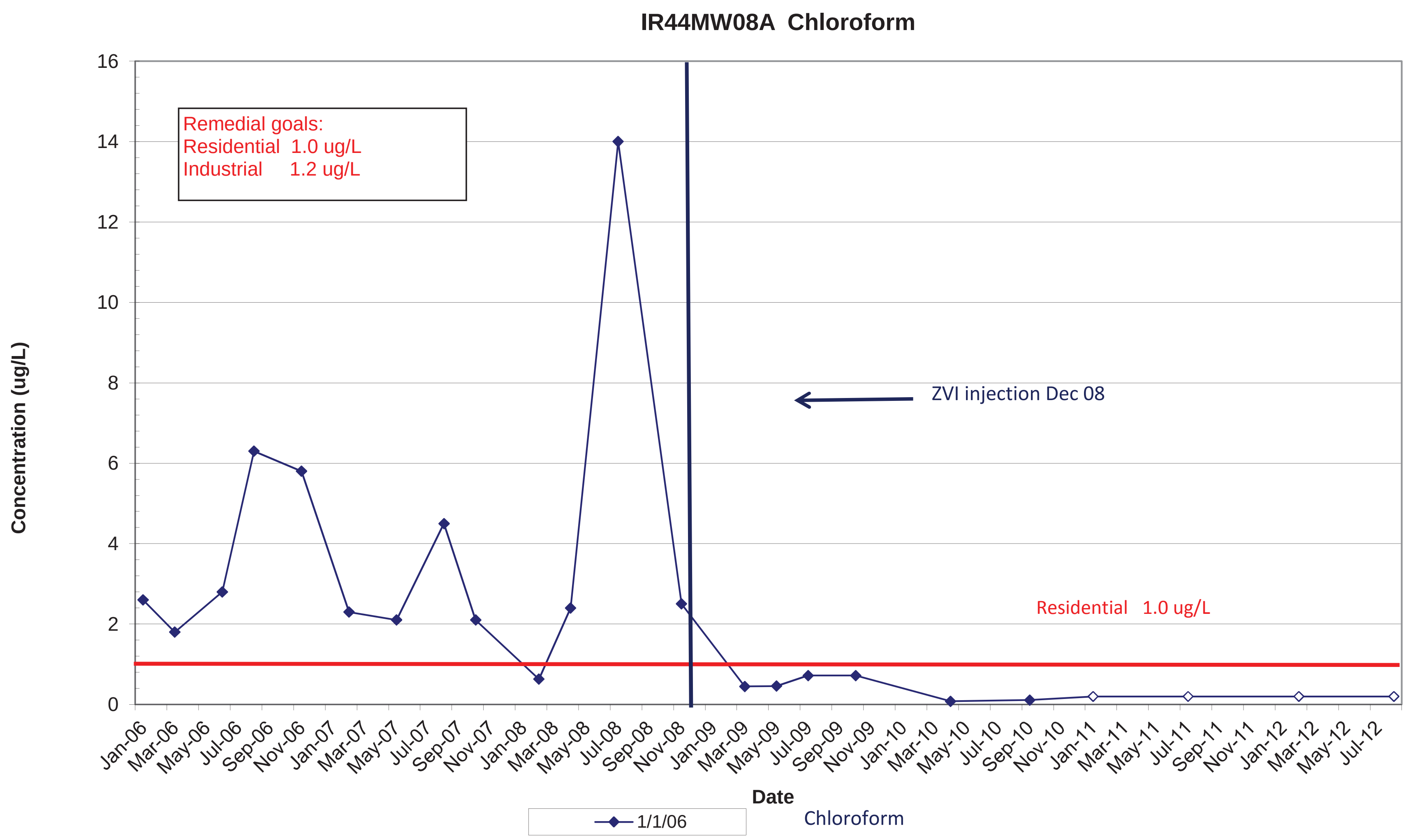
IR33MW64A Carbon Tetrachloride
Remedial goals:
Residential 0.5 ug/L
Industrial 0.5 ug/L
Residential 0.5 ug/L
Concentration (ug/L)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Date
6/1/08
Carbon Tetrachloride


IR33MW64A Chloroform
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Residential 1.0 ug/L
Concentration (ug/L)
3.5
3
2.5
2
1.5
1
0.5
0
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Date
Chloroform

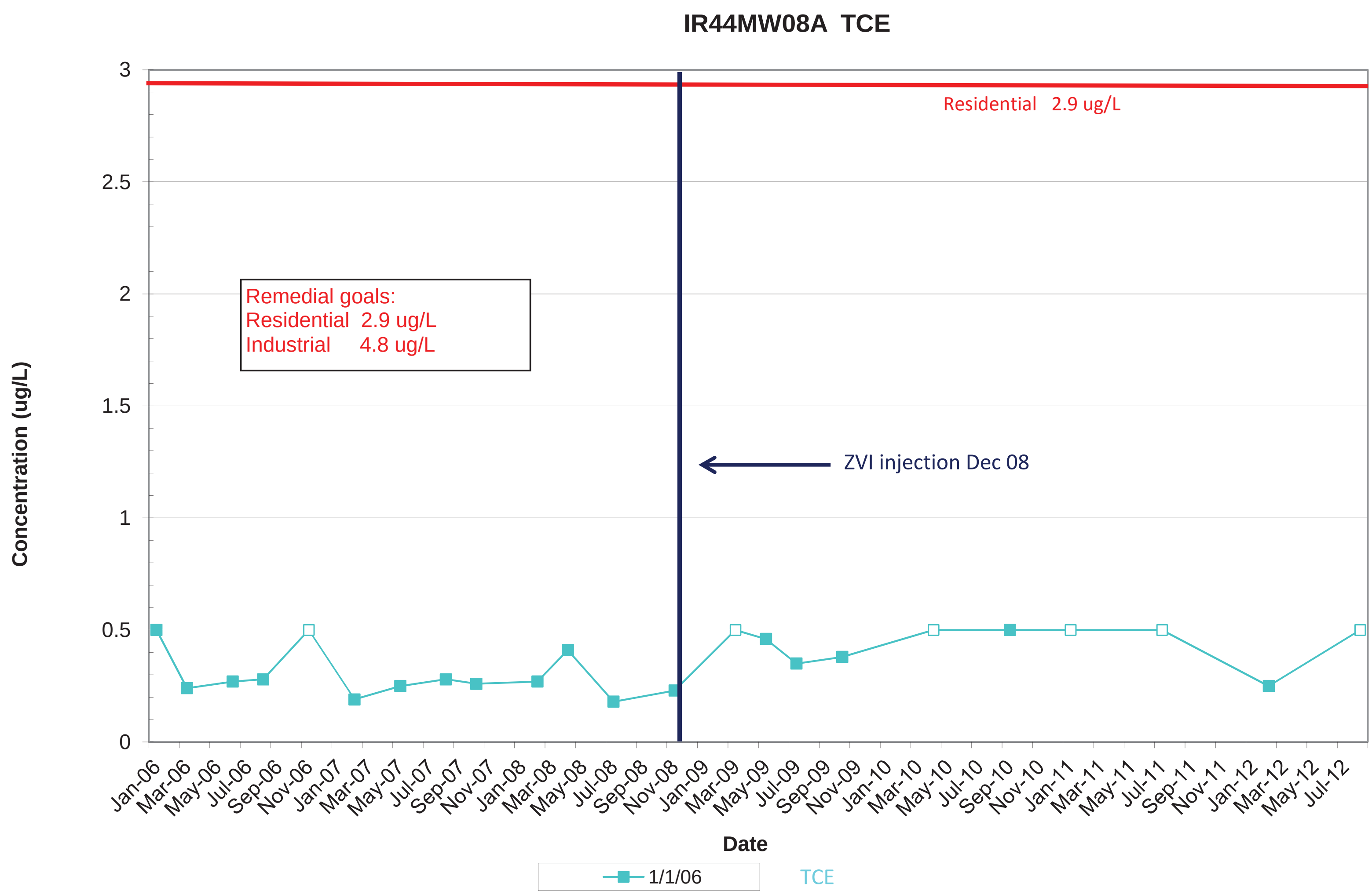


IR33MW65A Chloroform
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Residential 1.0 ug/L
Concentration (ug/L)
0
1
2
3
4
5
6
7
6/1/08
8/1/08
10/1/08
12/1/08
2/1/09
4/1/09
6/1/09
8/1/09
10/1/09
12/1/09
2/1/10
4/1/10
6/1/10
8/1/10
10/1/10
12/1/10
2/1/11
4/1/11
6/1/11
8/1/11
10/1/11
12/1/11
2/1/12
Date
6/1/08
Chloroform

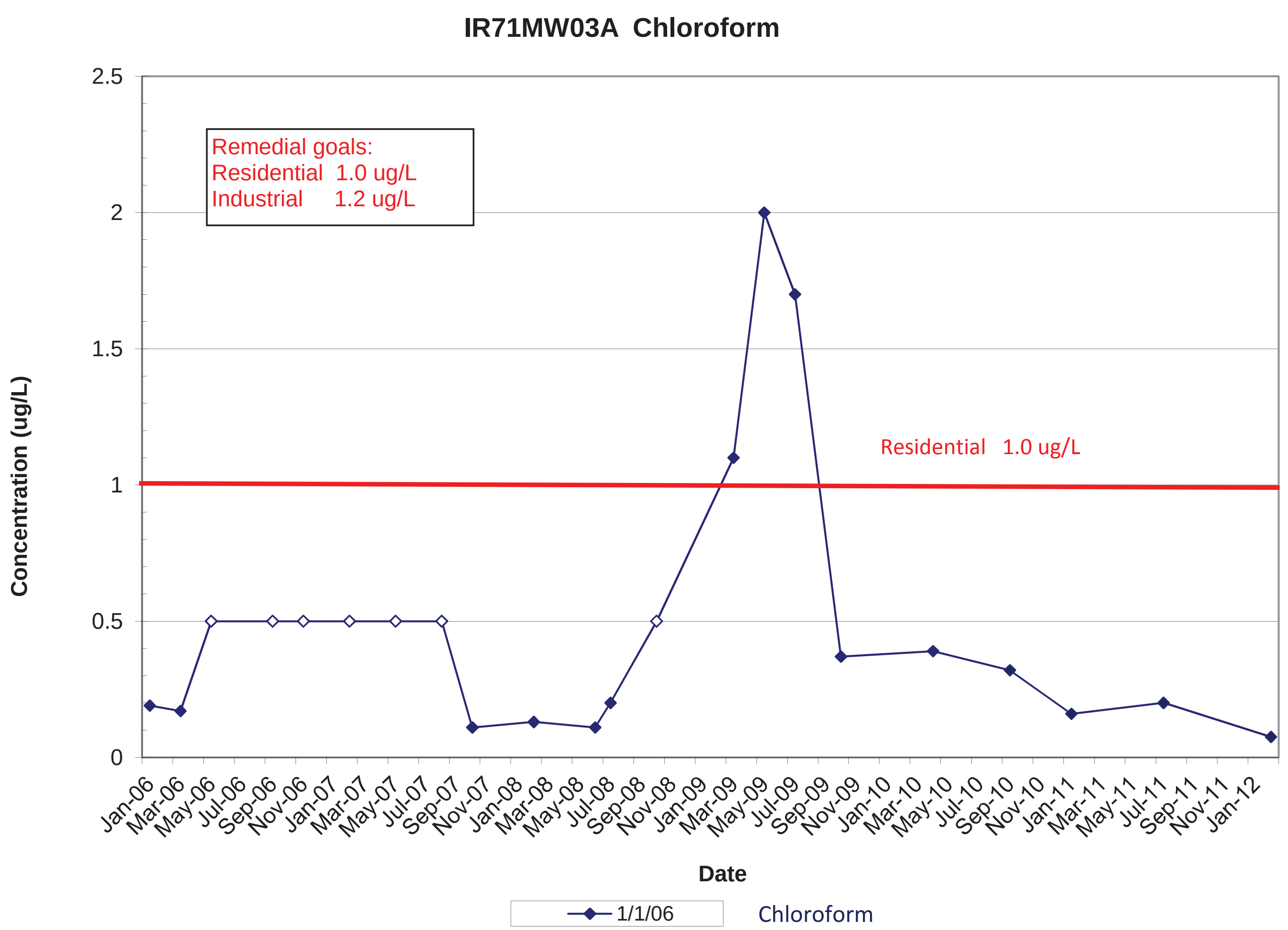

IR34MW36A Chloroform
Concentration (ug/L)
2.5
2
1.5
1
0.5
0
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Residential 1.0 ug/L
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Date
6/1/08
Chloroform

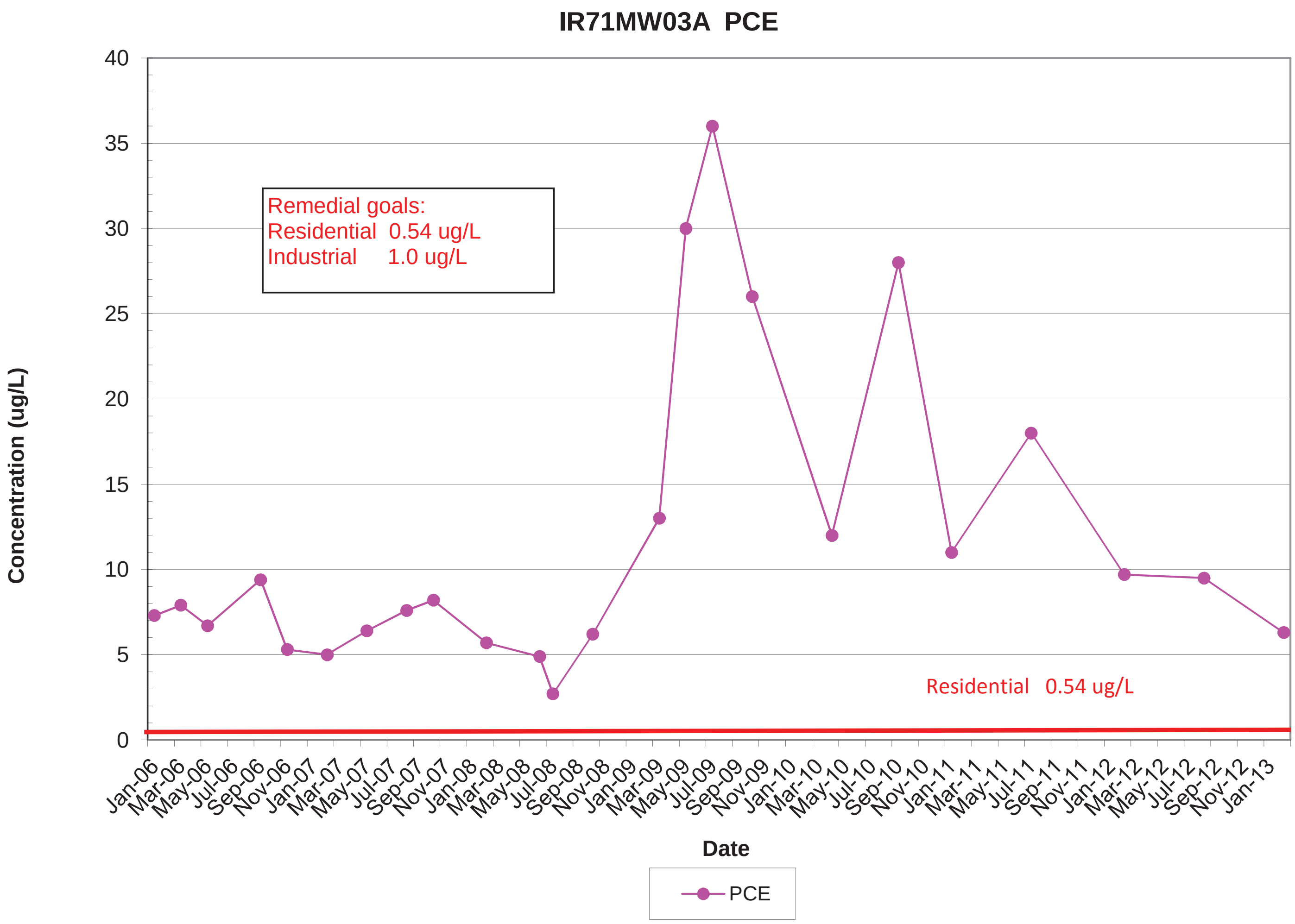


IR44MW08A Chloroform
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
ZVI injection Dec 08
Residential 1.0 ug/L
Concentration (ug/L)
0
2
4
6
8
10
12
14
16
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Date
1/1/06
Chloroform

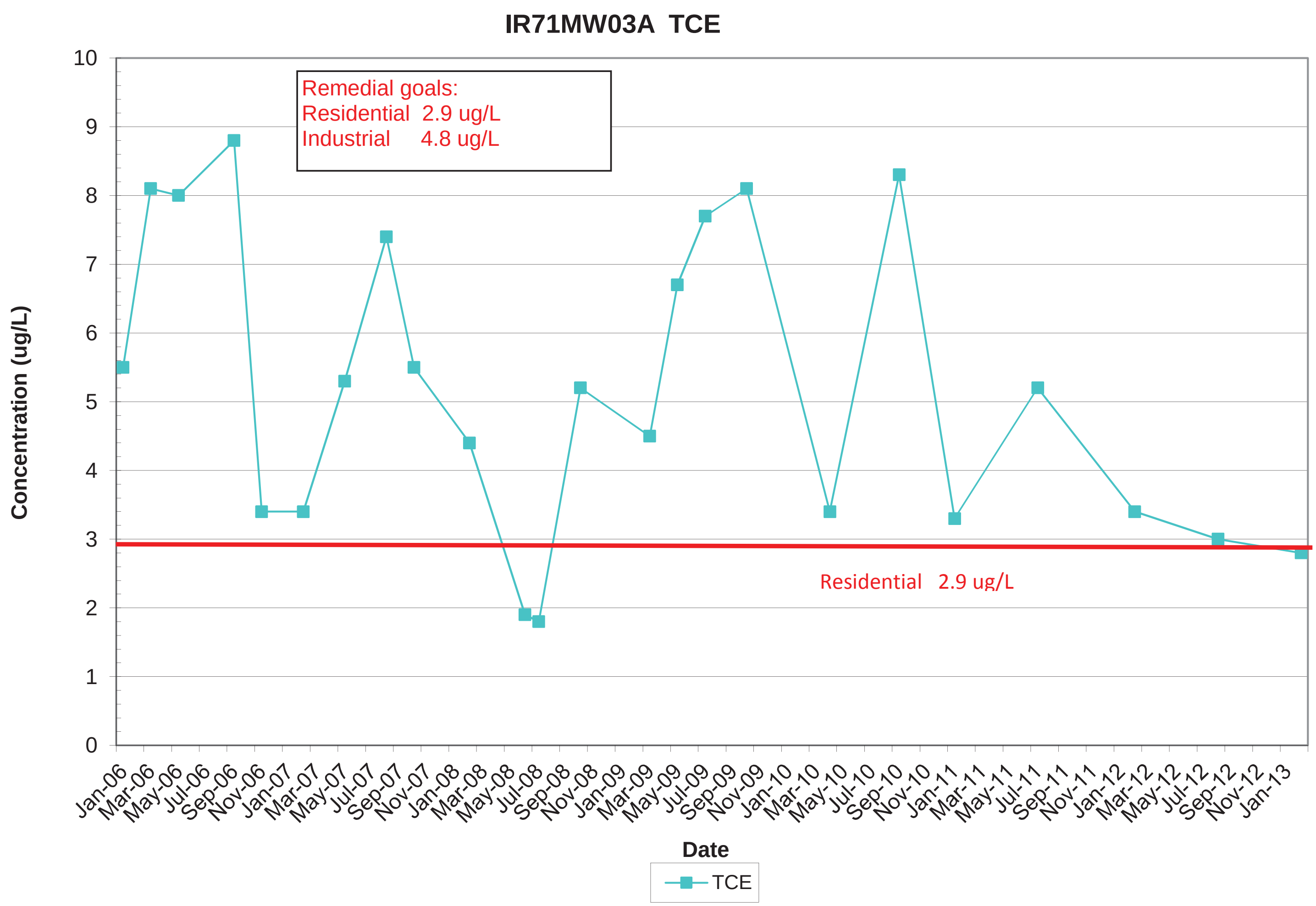


IR44MW08A TCE
Residential 2.9 ug/L
Remedial goals:
Residential 2.9 ug/L
Industrial 4.8 ug/L
ZVI injection Dec 08
Concentration (ug/L)
3
2.5
2
1.5
1
0.5
0
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Date
1/1/06
TCE


IR71MW03A Chloroform
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Residential 1.0 ug/L
Concentration (ug/L)
0
0.5
1
1.5
2
2.5
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Date
1/1/06
Chloroform



IR71MW03A PCE
Concentration (ug/L)
40
35
30
25
20
15
10
5
0
Remedial goals:
Residential 0.54 ug/L
Industrial 1.0 ug/L
Residential 0.54 ug/L
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Date
PCE



IR71MW03A TCE
Remedial goals:
Residential 2.9 ug/L
Industrial 4.8 ug/L
Residential 2.9 ug/L
Concentration (ug/L)
Date
TCE
0
1
2
3
4
5
6
7
8
9
10
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
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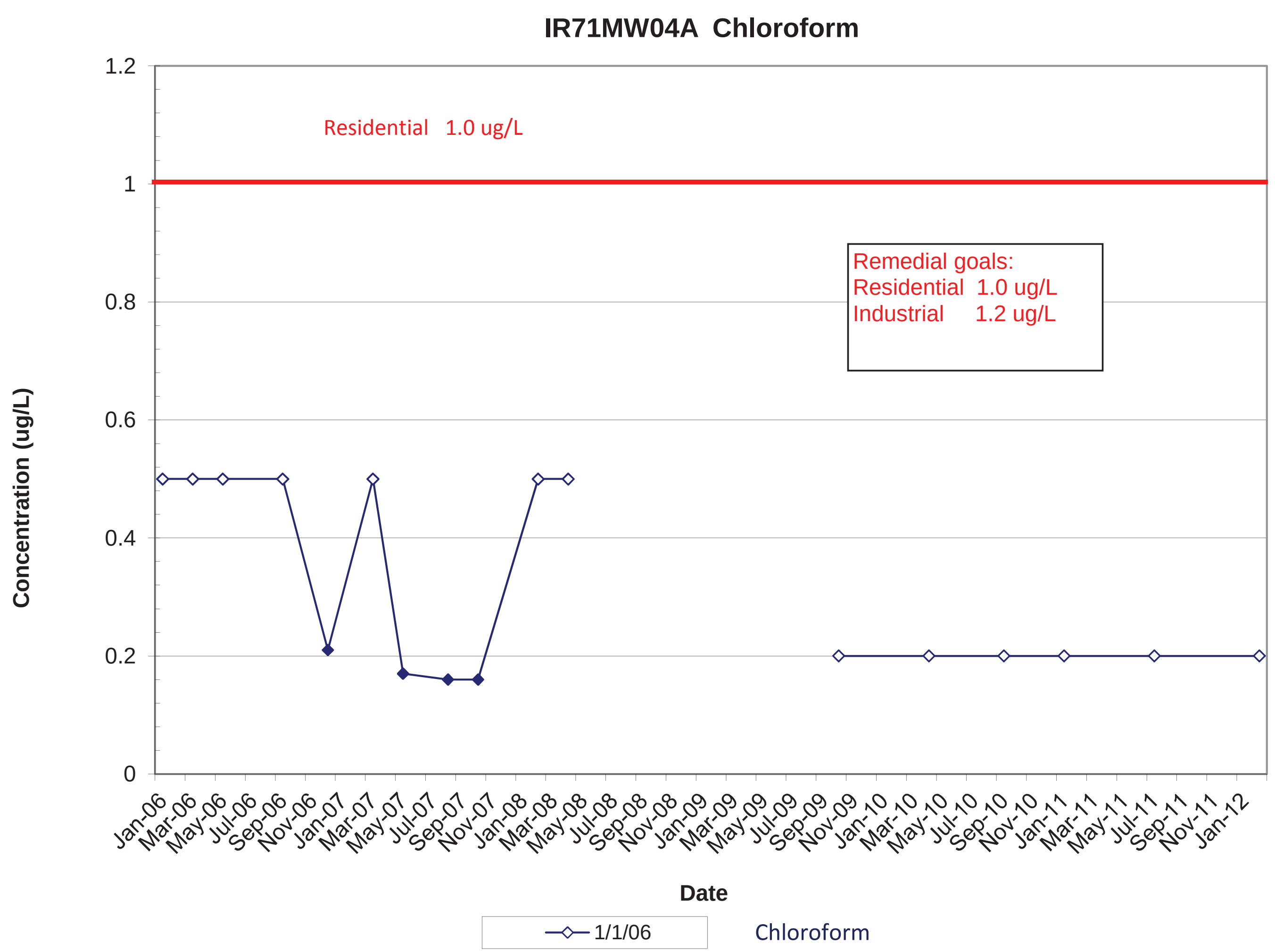
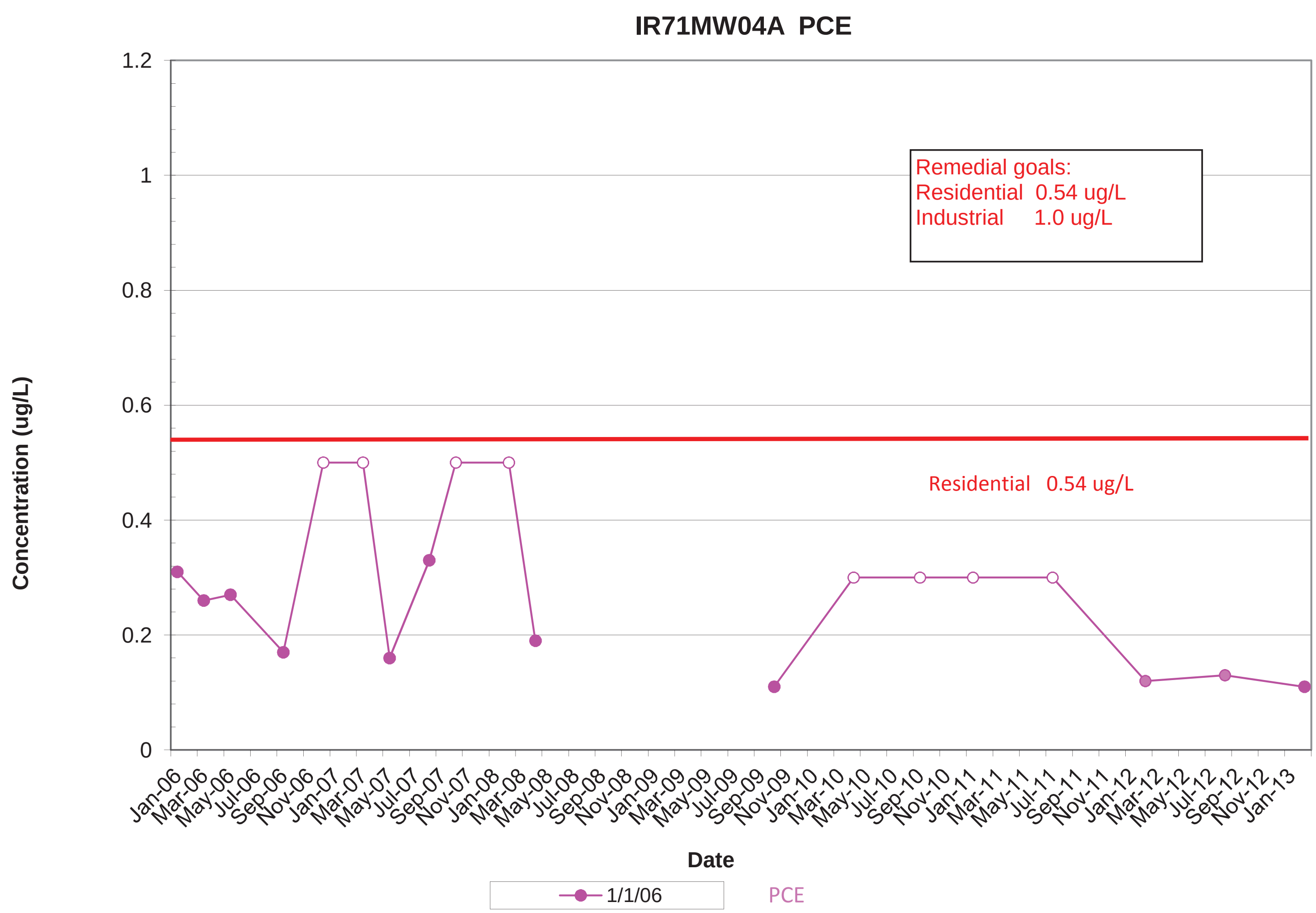
Jul-12
Sep-12
Nov-12
Jan-13


IR71MW04A Chloroform
Residential 1.0 ug/L
Remedial goals:
Residential 1.0 ug/L
Industrial 1.2 ug/L
Concentration (ug/L)
1.2
1
0.8
0.6
0.4
0.2
0
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Date
1/1/06
Chloroform



IR71MW04A PCE
Concentration (ug/L)
1.2
1
0.8
0.6
0.4
0.2
0
Remedial goals:
Residential 0.54 ug/L
Industrial 1.0 ug/L
Residential 0.54 ug/L
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
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Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
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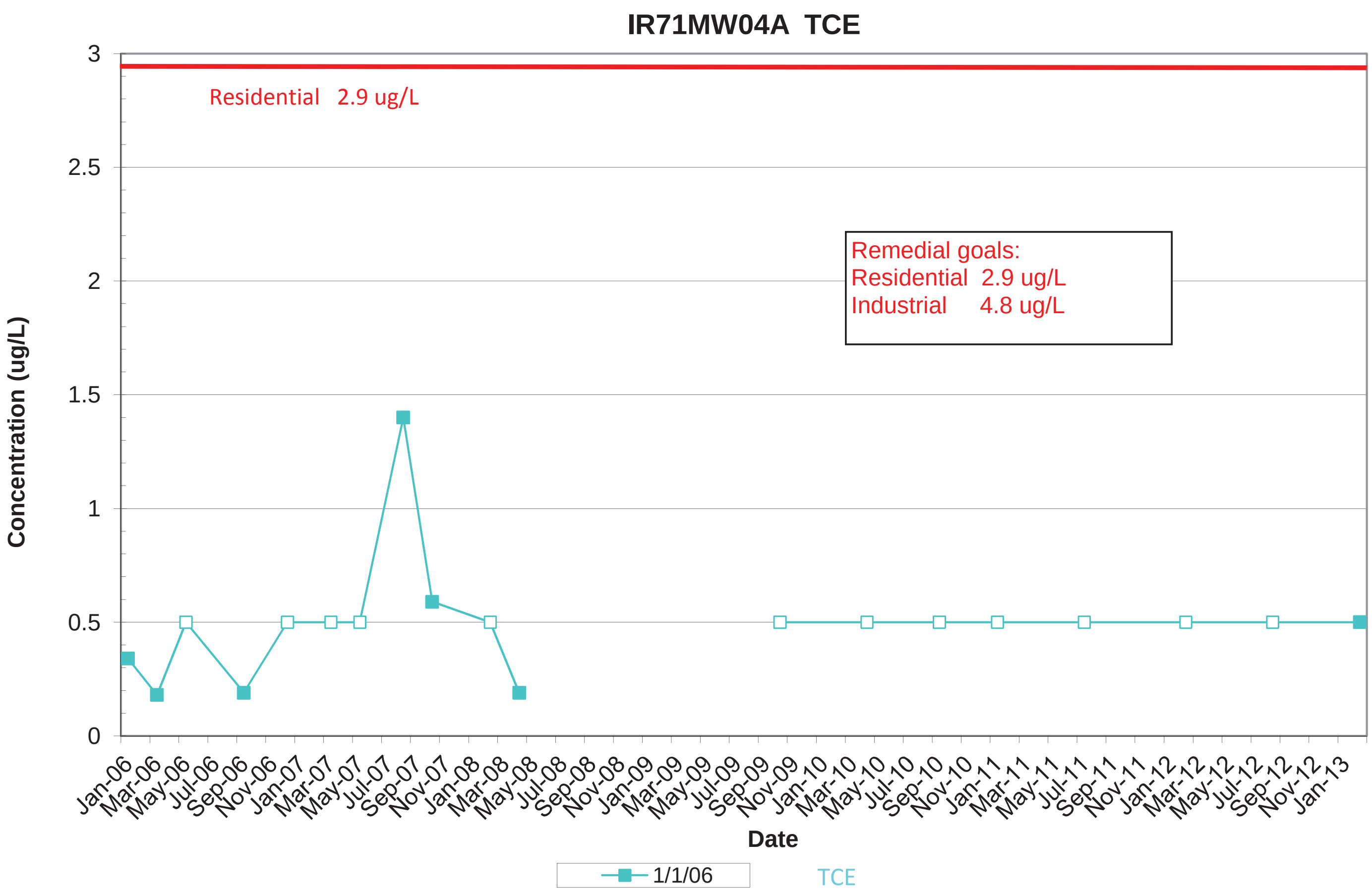
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Date
1/1/06
PCE



IR71MW04A TCE
Residential 2.9 ug/L
Remedial goals:
Residential 2.9 ug/L
Industrial 4.8 ug/L
Concentration (ug/L)
0
0.5
1
1.5
2
2.5
3
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
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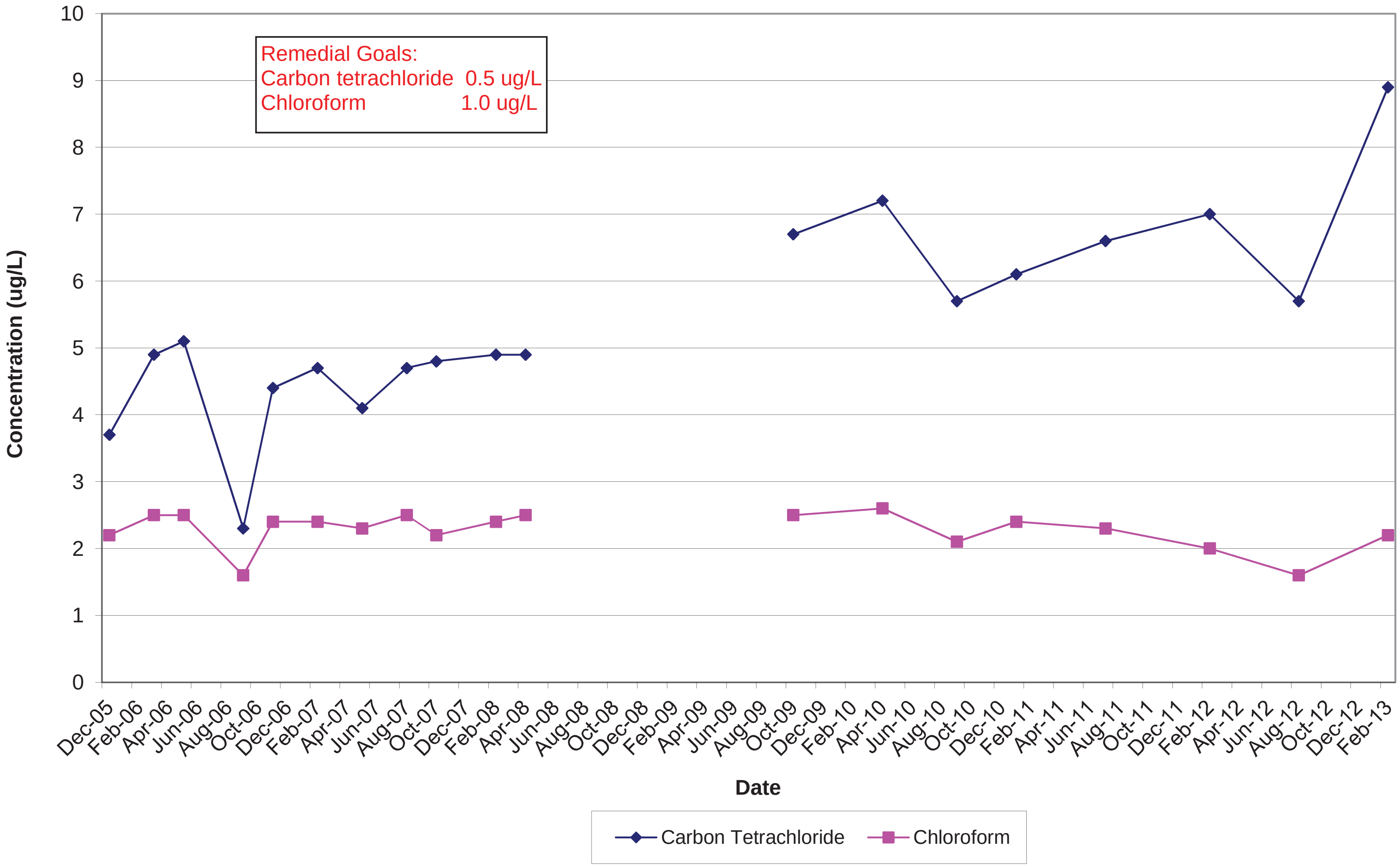
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Date
1/1/06
TCE

GRAPHS FOR PARCEL UC-2

IR06MW54F



Remedial Goals:
Carbon tetrachloride 0.5 ug/L
Chloroform 1.0 ug/L
Concentration (ug/L)
0
1
2
3
4
5
6
7
8
9
10
Dec-05
Feb-06
Apr-06
Jun-06
Aug-06
Oct-06
Dec-06
Feb-07
Apr-07
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
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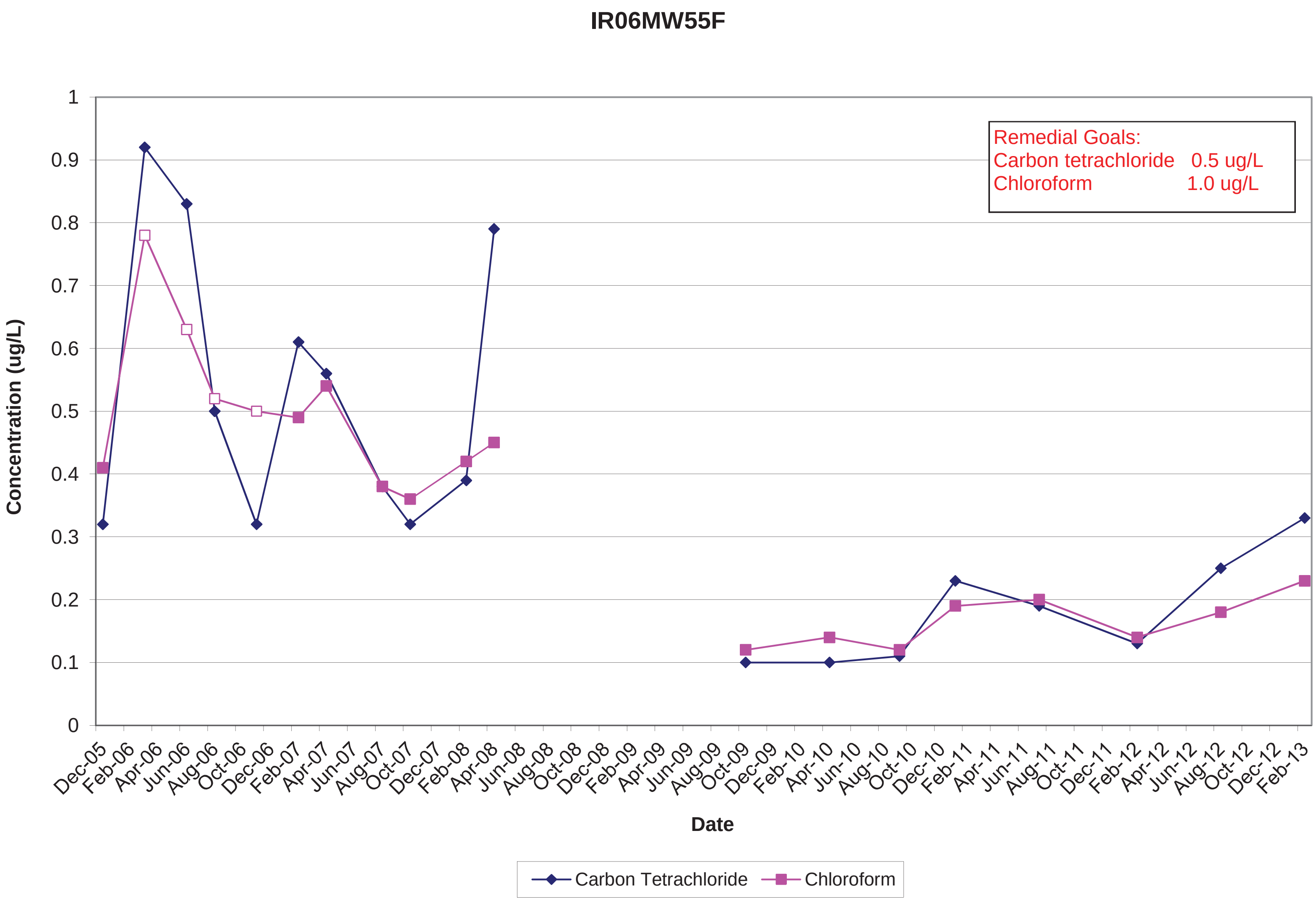
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Date
Carbon Tetrachloride
Chloroform



IR06MW55F
Remedial Goals:
Carbon tetrachloride 0.5 ug/L
Chloroform 1.0 ug/L
Concentration (ug/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Dec-05 Feb-06 Apr-06 Jun-06 Aug-06 Oct-06 Dec-06 Feb-07 Apr-07 Jun-07 Aug-07 Oct-07 Dec-07 Feb-08 Apr-08 Jun-08 Aug-08 Oct-08 Dec-08 Feb-09 Apr-09 Jun-09 Aug-09 Oct-09 Dec-09 Feb-10 Apr-10 Jun-10 Aug-10 Oct-10 Dec-10 Feb-11 Apr-11 Jun-11 Aug-11 Oct-11 Dec-11 Feb-12 Apr-12 Jun-12 Aug-12 Oct-12 Dec-12 Feb-13
Date
Carbon Tetrachloride
Chloroform

APPENDIX E
SITE INSPECTION CHECKLIST

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site Name: Hunters Point Naval Shipyard	**Date of Inspection**: March 1, 2013
Location and Region: San Francisco, California	**EPA ID**: CA1170090087
Agency, office, or company leading the five-year review: U.S Department of Navy	**Weather/ Temperature**: Foggy then clearing, mid to upper 60s

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment (Parcel E-2) ☒ Monitored natural attenuation ☒ Institutional controls
☒ Access controls ☐ Groundwater containment ☐ Vertical barrier walls
☐ Groundwater pump and treatment ☐ Surface water collection and treatment ☒ Groundwater monitoring
☒ Other Cover/containment remedies apply at multiple parcels; however, these covers are not traditional landfill caps (except for Parcel E-2). Cover remedy completed only for IR Sites 7 and 18 at Parcel B and Parcels UC-1 and UC-2. Others (rest of Parcel B and Parcels C, D-1, E, E-2, G) are in varying stages of planning or construction. Other remedies also include soil vapor extraction (SVE) and in situ groundwater treatment using polylactate injection (both at Parcel B).

Inspection focuses on the completed remedy at IR Sites 7 and 18 and Parcels UC-1 and UC-2.

Attachments: ☐ Inspection team roster attached ☒ Site map attached (see Figure 2 of main report)

II. INTERVIEWS (Check all that apply)

O&M site manager

John Sourial of ERRG	Professional Engineer (Civil)	3-1-13
Name	Title	Date

Interview: ☒ at site ☐ at office ☐ by phone phone no.________________________

☐ Report attached: _____First year O&M activities at IR Sites 7 and 18 summarized in "Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B" by ERRG dated October 2012.

Problems, regulations or policy changes, suggestions:

O&M staff

Name	Title	Date

Interview: ☐ at site ☐ at office ☐ by phone phone no.________________________

☐ Report attached: _________________________________

Problems, suggestions:

Local regulatory authorities and response agencies (that is, State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

	Name	Title	Date
Agency	San Francisco Department of Public Health		
Contact	Amy Brownell	Environmental Engineer	12-11-12

Interview: ☐ at site ☐ at office ☒ by phone (email) phone no._____(415) 252-3967_________

☒ Report attached: ___See Appendix A______

Problems, suggestions:

Other interviews (optional)

_Community residents, EPA, DTSC, and Water Board (see Appendix A)______________________

☒ Report attached: ___See Appendix A______

Problems, suggestions:

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

A. O&M Documents

☒ O&M manual	☒ Readily available	☒ Up-to-date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up-to-date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up-to-date	☐ N/A

Remarks: Documents are available in the Administrative Record and the information repositories. Post construction O&M manual available for IR Sites 7 and 18 at Parcel B; pre-construction O&M manuals available as part of remedial designs for other parcels (rest of B, D-1, G, UC-1, and UC-2). As-built drawings are available in remedial action completion report for IR Sites 7 and 18 and for Parcels UC-1 and UC-2.

B. Site-Specific Health and Safety Plan	☒ Readily available	☒ Up-to-date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up-to-date	☒ N/A

Remarks: Health and safety plans confirmed for contractors with continuous site presence (TtEC, ERRG, and Arcadis).

C. O&M and OSHA Training Records:	☒ Readily available	☒ Up-to-date	☐ N/A

Remarks: OSHA training records confirmed for contractors with continuous site presence (TtEC, ERRG, and Arcadis).

D. Permits and Service Agreements:

☐ Air discharge permit	☐ Readily available	☐ Up-to-date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up-to-date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up-to-date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up-to-date	☒ N/A

Remarks:

E. Gas Generation Records: ☐ Readily available ☐ Up-to-date ☒ N/A

Remarks:

F. Settlement Monument Records: ☒ Readily available ☒ Up-to-date ☐ N/A

Remarks: Two settlement monuments were installed during construction of the soil cover at IR Sites 7 and 18. Other settlement monuments are planned to be installed as other covers are completed. Survey completed after 1 year indicated no settlement at IR Sites 7 and18; survey results are available in the "Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B" by ERRG dated October 2012.

G. Groundwater Monitoring Records: ☒ Readily available ☒ Up-to-date ☐ N/A

Remarks: Historical groundwater monitoring records are readily available in the Administrative Record and the information repositories.

H. Leachate Extraction Records: ☐ Readily available ☐ Up-to-date ☒ N/A

Remarks:

I. Discharge Compliance Records:

☐ Air ☐ Readily available ☐ Up-to-date ☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up-to-date ☒ N/A

Remarks:

J. Daily Access/Security Logs: ☐ Readily available ☐ Up-to-date ☒ N/A

Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to HPNS. City of San Francisco provides security and maintains access logs.

IV. O&M COSTS ☒ Applicable ☐ N/A

A. O&M Organization

☐ State in-house ☐ Contractor for State

☐ PRP in-house ☐ Contractor for PRP

☐ Federal Facility in-house ☒ Contractor for Federal Facility

☐ Other____

Remarks: O&M activities are applicable only for IR Sites 7 and 18 at Parcel B and for Parcels UC-1 and UC-2. All other remedies (that involve action) are not yet completed. ERRG provided O&M for IR Sites 7 and 18 for 1 year included in this five-year review. Details of quarterly inspections are provided in the "Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B" by ERRG dated October 2012. The first year of O&M has not yet been completed for Parcels UC-1 and UC-2.

B. O&M Cost Records (IR Sites 7 and 18 only)

☒ Readily available ☒ Up-to-date

☐ Funding mechanism/agreement in place

Original O&M cost estimate: ☐Breakdown attached

Annual O&M cost estimated to be $13,400 in the Technical Memorandum in Support of a Record of Decision Amendment (TMSRA) (see Table D-5B in TMSRA). Cost included an annual drive-by inspection, enforcement of deed restrictions, and oversight of risk management plan.

Total annual cost by year for review period:

From					
	October 10, 2011	To	July 20, 2012	$62,645	☐Breakdown attached
From		To			☐Breakdown attached
From		To			☐Breakdown attached
From		To			☐Breakdown attached
From		To			☐Breakdown attached

C. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: Differences between O&M costs estimated in TMSRA and actual costs for IR Sites 7 and 18 caused by: (1) Original estimate assumed a single annual inspection and report while actual cost reflects quarterly inspections and reports, and (2) Original estimate did not include costs for annual mowing, off-schedule repair events (two for fence vandalism and one for cover damage), or decommissioning of five methane monitoring probes.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

☐ Fencing damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Access to IR Sites 7 and 18 at Parcel B is controlled by a perimeter fence and locked gate. Fencing controls access to Parcels UC-1 and UC-2 along the top of the hillside slope. The overall perimeter of HPNS is also controlled by a fence. Other interior areas of HPNS are also fenced to control access in areas of active construction or in radiologically controlled areas. The fencing at IR Sites 7 and 18 and Parcels UC-1 and UC-2 was inspected and found in good condition.

B. Other Access Restrictions

☒ Signs and other security measures ☐ Location shown on site map ☐ N/A

Remarks: Signs are posted around the perimeter of IR Sites 7 and 18 and Parcels UC-1 and UC-2 warning against ground disturbance. The signs were legible and in good condition. Signs are also posted throughout HPNS warning of hazardous and radioactive materials.

C. Institutional Controls (IC):

1. **Implementation and Enforcement:**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (e.g., self-reporting, drive-by): __Inspection and maintenance at IR Sites 7 and 18 and Parcels UC-1 and UC-2___

Frequency: ___Quarterly

Responsible party/agency: _____ERRG____

Contact:	John Sourial	Civil Engineer	October 4, 2012	(415) 848-7103
	Name	Title	Date	Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached

IC compliance monitoring report for IR Sites 7 and 18 at Parcel B found all aspects of ICs in compliance. This report is Appendix C of "Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B" by ERRG dated October 2012.

2. **Adequacy:** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks:

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: Vandalism and trespassing were not evident during the site inspection; however, reports of vandalism and trespassing are routine at HPNS. Fence breaches and theft (often of copper wiring) have been reported.

2. **Land use changes on-site** ☒ N/A

Remarks:

3. **Land use changes off-site** ☒ N/A

Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Water collects in some low areas on roads during storms according to past reports by site workers.

B. Other Site Conditions:

VII. COVERS ☒ Applicable ☐ N/A

(inspected only for completed cover at IR Sites 7 and 18 at Parcel B and cover at Parcels UC-1 and UC-2)

VII(a). IR Sites 7 and 18

A. Cover Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident

Areal extent____Approximately 14 acres__________ Depth_no settlement___________

Remarks: The surface topography at IR Sites 7 and 18 slopes steeply then gently from southwest to northeast, with surface elevations ranging from about 60 feet above mean sea level (msl) near the southwestern corner of the site, to 14 feet above msl in the northeastern portion of the site. A shoreline riprap revetment extends from 14 feet above msl to 0 msl in the northeastern portion of the site along the shoreline with the San Francisco Bay. A small area (about 60 feet by 130 feet) in the northeastern corner of the site is paved with asphalt. No settlement evident in any area of the cover.

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths____________ Widths___________ Depths__________

Remarks: There are no cracks evident in the cover.

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Areal extent______________ Depth____________

Remarks: Erosion from storm events is not evident.

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Areal extent______________ Depth____________
Remarks: Minor holes were observed. Most holes were 1 to 2 inches in diameter and did not appear to extend much below surface. Occasional holes that are 3 to 4 inches in diameter are repaired during ongoing O&M.

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: Vegetation on the soil cover is well established. No trees observed growing on the cover.

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks: Riprap revetment along the shoreline observed to be in good condition. Small, asphalt-paved area observed to be in good condition.

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent______________ Height____________
Remarks: No bulges were evident.

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent ______________
☐ Ponding ☐ Location shown on site map Areal extent ______________
☐ Seeps ☐ Location shown on site map Areal extent ______________
☐ Soft subgrade ☐ Location shown on site map Areal extent ______________

Remarks:

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent______________
Remarks: No evidence of slope instability observed, including the steeper slopes along the southwestern sides of the site.

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface water runoff and intercept and convey the runoff to a lined channel.)

1. **Flow Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks:

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks:

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks:

C. Letdown Channels ☒ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

Remarks: A drainage channel exists along the toe of the steeply sloped portion of the cover and was observed in good condition.

1. **Settlement** ☐ Location shown on site map ☒ No evidence of settlement
Areal extent______________ Depth____________
Remarks:

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
Material type_______________ Areal extent_____________
Remarks:

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent_______________ Depth_____________
Remarks:

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent_______________ Depth_____________
Remarks:

5. **Obstructions** ☐ Location shown on site map ☒ No obstructions
Type_______________ Areal extent_____________ Size_____________
Remarks:

6. **Excessive Vegetation Growth** ☐ Location shown on site map ☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
Type_______________ Areal extent_____________
Remarks:

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks:

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks:

3. **Monitoring Wells** (within surface area of cover)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: Two wells (IR07MW24A and IR07MW26A) are routinely sampled. Remaining wells are only monitored for groundwater elevation. Wells were observed in good condition.

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks:

5. **Settlement Monuments** ☒ Located ☒ Routinely surveyed ☐ N/A
Remarks: Two monuments surveyed 1 year after completion of cover. Survey measurements indicated no settlement. Reported in "Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B" by ERRG dated October 2012.

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs maintenance
Remarks:

2. **Gas Collection Wells, Manifolds, and Piping**
☐ Good condition ☐ Needs maintenance
Remarks:

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs maintenance ☐ N/A
Remarks:

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks:

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks:

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** ☐ Siltation not evident ☐ N/A
Areal extent______________ Depth____________
Remarks:

2. **Erosion** ☐ Erosion not evident ☐ N/A
Areal extent______________ Depth____________
Remarks:

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks:

4. **Dam** ☐ Functioning ☐ N/A
Remarks:

H. Retaining Walls ☒ Applicable ☐ N/A

Remarks: A small retaining wall is part of the cover on the steep hillside slope. Wall observed in good condition.

1. **Deformations** ☐ Location shown on site map ☒ Deformation not evident
Horizontal displacement______________ Vertical displacement____________
Rotational displacement____________
Remarks:

2. **Degradation** ☐ Location shown on site map ☒ Degradation not evident
Remarks:

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

Remarks: Perimeter ditch exists on northwestern side of site.

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident
Areal extent______________ Depth____________
Remarks:

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
☐ Vegetation does not impede flow
Areal extent______________ Type____________
Remarks:

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent______________ Depth____________
Remarks:

4. **Discharge Structure** ☒ Functioning ☐ N/A
Remarks:

VII(b). Parcels UC-1 and UC-2

A. Cover Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent____Approximately 5 acres__________ Depth_no settlement___________
Remarks: The surface topography at Parcels UC-1 and UC-2 slopes steeply from the hillside of former Parcel A down to Spear Avenue (Parcel UC-1) and Fisher Avenue (Parcel UC-2), with surface elevations ranging from about 30 feet above msl at the top of the slope to about 10 feet above msl on the roadway surfaces. The covers consist of the soil slopes which are vegetated and the roadway surfaces which are paved with asphalt. No settlement evident in any area of the cover.

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths____________ Widths___________ Depths__________
Remarks: There are no cracks evident in the cover.

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent______________ Depth____________
Remarks: Erosion from storm events is not evident.

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Areal extent______________ Depth____________
Remarks: No holes were observed.

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: Vegetation on the soil cover is fairly well established in the northern reaches of Parcel UC-2 and is becoming well established in the remaining areas.

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks: Asphalt paving on the roadway surfaces observed to be in good condition.

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent______________ Height____________
Remarks: No bulges were evident.

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent ______________
☐ Ponding ☐ Location shown on site map Areal extent ______________
☐ Seeps ☐ Location shown on site map Areal extent ______________
☐ Soft subgrade ☐ Location shown on site map Areal extent ______________

Remarks: Minor silt and mud on pavement observed in a small area near the boundary between Parcels UC-1 and UC-2, on the north side of the roadway, where ponding reportedly occurs during rainstorms. No damage evident to asphalt.

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent______________
Remarks: No evidence of slope instability observed.

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface water runoff and intercept and convey the runoff to a lined channel.)

1. **Flow Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks:

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks:

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks:

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

Remarks: .

1. **Settlement** ☐ Location shown on site map ☒ No evidence of settlement
Areal extent______________ Depth____________
Remarks:

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
Material type______________ Areal extent____________
Remarks:

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent______________ Depth____________
Remarks:

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent______________ Depth____________
Remarks:

5. **Obstructions** ☐ Location shown on site map ☒ No obstructions
Type______________ Areal extent____________ Size____________
Remarks:

6. **Excessive Vegetation Growth** ☐ Location shown on site map ☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
Type______________ Areal extent____________
Remarks:

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks:

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks:

3. **Monitoring Wells** (within surface area of cover)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: Three wells (IR06MW54F, IR06MW55F, and IR06MW56F) at Parcel UC-2 are routinely sampled. Wells were observed in good condition. There are no wells at Parcel UC-1.

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
Remarks:

5. **Settlement Monuments** ☒ Located ☒ Routinely surveyed ☐ N/A
Remarks: Two monuments installed on the covers (that is, two on each parcel) and are planned to be surveyed annually.

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs maintenance
Remarks:

2. **Gas Collection Wells, Manifolds, and Piping**
☐ Good condition ☐ Needs maintenance
Remarks:

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs maintenance ☐ N/A
Remarks:

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks:

2. **Outlet Rock Inspected**	☐ Functioning	☐ N/A
Remarks:		
G. Detention/Sedimentation Ponds	☐ Applicable	☒ N/A
Remarks:		
1. **Siltation**	☐ Siltation not evident	☐ N/A
Areal extent_______________ Depth_____________		
Remarks:		
2. **Erosion**	☐ Erosion not evident	☐ N/A
Areal extent_______________ Depth_____________		
Remarks:		
3. **Outlet Works**	☐ Functioning	☐ N/A
Remarks:		
4. **Dam**	☐ Functioning	☐ N/A
Remarks:		
H. Retaining Walls	☒ Applicable	☐ N/A
Remarks: A small retaining wall is part of the cover on the steep hillside slopes. Wall observed in good condition.		
1. **Deformations**	☐ Location shown on site map	☒ Deformation not evident
Horizontal displacement_______________ Vertical displacement_____________		
Rotational displacement_____________		
Remarks:		
2. **Degradation**	☐ Location shown on site map	☒ Degradation not evident
Remarks:		
I. Perimeter Ditches/Off-Site Discharge	☒ Applicable	☐ N/A
Remarks: HDPE pipe conveys water from upslope areas across Parcel UC-2 and discharges into Parcel C.		
1. **Siltation**	☐ Location shown on site map	☒ Siltation not evident
Areal extent_______________ Depth_____________		
Remarks:		
2. **Vegetative Growth**	☐ Location shown on site map ☐ Vegetation does not impede flow	☒ N/A
Areal extent_______________ Type_____________		
Remarks:		
3. **Erosion**	☐ Location shown on site map	☒ Erosion not evident
Areal extent_______________ Depth_____________		
Remarks:		
4. **Discharge Structure**	☒ Functioning	☐ N/A
Remarks:		

1

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent______________ Depth____________

Remarks:

2. **Performance Monitoring** ☐ Performance not monitored ☐ Evidence of breaching
Type of monitoring___________________________
Frequency___________________________________
Head differential______________________________

Remarks:

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A
(Groundwater remedies applicable to Parcels B, C, D-1, G, and UC-2)

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells located ☐ Needs maintenance ☐ N/A
Remarks:

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs maintenance
Remarks:

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks:

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs maintenance
Remarks:

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs maintenance
Remarks:

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks:

1

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters____
☐ Additive (e.g., chelation agent, flocculant)____
☐ Others: ____
☐ Good condition ☐ Needs maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually____
☐ Quantity of surface water treated annually____

Remarks:

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks:

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks:

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks:

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored

Remarks:

D. Monitoring Data

1. **Monitoring Wells**

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks:

2. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

Remarks:

3. **Monitoring Data Suggest:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

Remarks: Refer to Section 6.4 of the main report for evaluation of groundwater monitoring data.

E. Monitored Natural Attenuation

1. **Monitoring Wells**

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks:

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: A soil vapor extraction system is present inside Building 123. The remedy for Parcel B includes expansion and pulsed operation of this system. However, these activities have not yet been implemented. Likewise, in situ treatment of groundwater contaminated by chlorinated solvents (primarily trichloroethene) using polylactate is part of the remedy for Parcel B but has not yet been implemented.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.)

The remedy at IR Sites 7 and 18 at Parcel B includes durable covers to prevent exposure to contaminants in soil and sediment, removal of a methane source area, removal of radiologically impacted storm drain and sanitary sewer lines, groundwater monitoring and ICs. Inspection of the site and review of relevant data indicate that all components of the remedy as outlined in the amended ROD have been implemented and are functioning as intended.

The remedy at Parcels UC-1 and UC-2 includes durable covers to prevent exposure to contaminants in soil, monitored natural attenuation for groundwater, removal of radiologically impacted storm drain and sanitary sewer lines, and ICs. Inspection of the site and review of relevant data indicate that all components of the remedy as outlined in the ROD have been implemented and are functioning as intended.

B. Adequacy of O&M

Describe issues and observations relating to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long term protectiveness of the remedy.

Inspections at IR Sites 7 and 18 at Parcel B and Parcels UC-1 and UC-2 found all remedy components in good condition and O&M of the covers has been effective.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost of scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

No early indicators of potential problems were identified.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

The network of groundwater monitoring wells at IR Sites 7 and 18 at Parcel B and at Parcel UC-2 provides sufficient data to assess the condition of groundwater at these areas. No opportunities to optimize the groundwater monitoring plan for IR Sites 7 and 18 or Parcel UC-2 were identified during the 2012 optimization evaluation (CE2-Kleinfelder 2012b), and the data analysis conducted during this five-year review confirmed those recommendations. Monitoring of the IR-10 area at Parcel B will be optimized in conjunction with the remedial action (lactate injection) planned for the VOC plume there.

APPENDIX F
PHOTOGRAPHIC LOG

Photograph 1. Sign at the entrance to IR-07/18.
Photographs 1 through 44 taken on March 1, 2013.

Photograph 2. Entry gate to IR-07/18.

Photograph 3. Looking northwest from inside gate. Cover vegetation. Access road at right.

Photograph 4. Looking southwest from inside gate. Cover side slope and vegetation. Access road at right. Donahue Street at left. Overall foggy conditions.

Photograph 5. Cover settlement monument at IR-07/18.

Photograph 6. Close-up view of cover settlement monument.

Photograph 7. Revetment looking east from central portion.

Photograph 8. Revetment looking northwest from central portion. End of revetment is visible in the distance.

Photograph 9. Revetment looking east from near the western end. Accumulation of sand at revetment toe.

Photograph 10. Revetment looking northwest at the western end of the revetment from western portion.

Photograph 11. Western boundary fence looking north toward the bay. Cover side slope and vegetation. Revetment crest is visible at top right.

Photograph 12. Western boundary fence looking south. Cover side slope and vegetation.

Photograph 13. End of the western boundary fence looking north down the revetment slope toward the bay.

Photograph 14. Small burrows (1 to 2 inches in diameter) in the cover in the northwestern portion of the cover.

Photograph 15. Large, collapsed burrow near revetment crest in central portion. Second burrow entry at lower left corner of photograph. Burrow scheduled for repair.

Photograph 16. Western boundary fence looking south up the hillside at IR-18. Innes Avenue at the top of the slope.

Photograph 17. Hillside at IR-18 at the southwestern corner of the cover looking southeast. Black is turf reinforcement matting that is not yet completely vegetated.

Photograph 18. Looking east-northeast down the axis of the drainage swale.

Photograph 19. Concrete retaining wall adjacent to the fence boundary with Parcel A in the southwestern portion of the cover.

Photograph 20. Hillside at IR-18 at the southwestern corner of the cover looking west.

Photograph 21. Hillside looking east toward the corner of Donahue Street and Galvez Avenue.

Photograph 22. Overall view of cover looking northwest. Photograph 35 shows a similar perspective later in the day after the fog had lifted.

Photograph 23. Overall view of cover looking north. Photograph 36 shows a similar perspective later in the day after the fog had lifted.

Photograph 24. Outfall protection at the end of the drainage swale. Perimeter fence and Donahue Street in the background.

Photograph 25. Gravel-lined drainage swale in foreground. Asphalt cover over small portion of the northeastern part of IR-07 in the background. Looking east.

Photograph 26. Revetment tie in between IR-07 and IR-23, looking northeast.

Photograph 27. Monitoring well IR07MWS-4.


Photograph 28. Monitoring well IR07MW24A.

Photograph 29. Close-up view of well IR07MW24A.

Photograph 30. Monitoring well IR18MW100B.

Photograph 31. Monitoring well IR18MW21A.

Photograph 32. Monitoring well IR07MW20A1.

Photograph 33. Sign along eastern fence at IR-07/18.

Photograph 34. Overall view of cover at IR-07/18. Looking west from the corner of Donahue Street and Galvez Avenue.

Photograph 35. Overall view of cover at IR-07/18. Looking west-northwest from the corner of Donahue Street and Galvez Avenue.

Photograph 36. Overall view of cover at IR-07/18. Looking northwest from the corner of Donahue Street and Galvez Avenue.

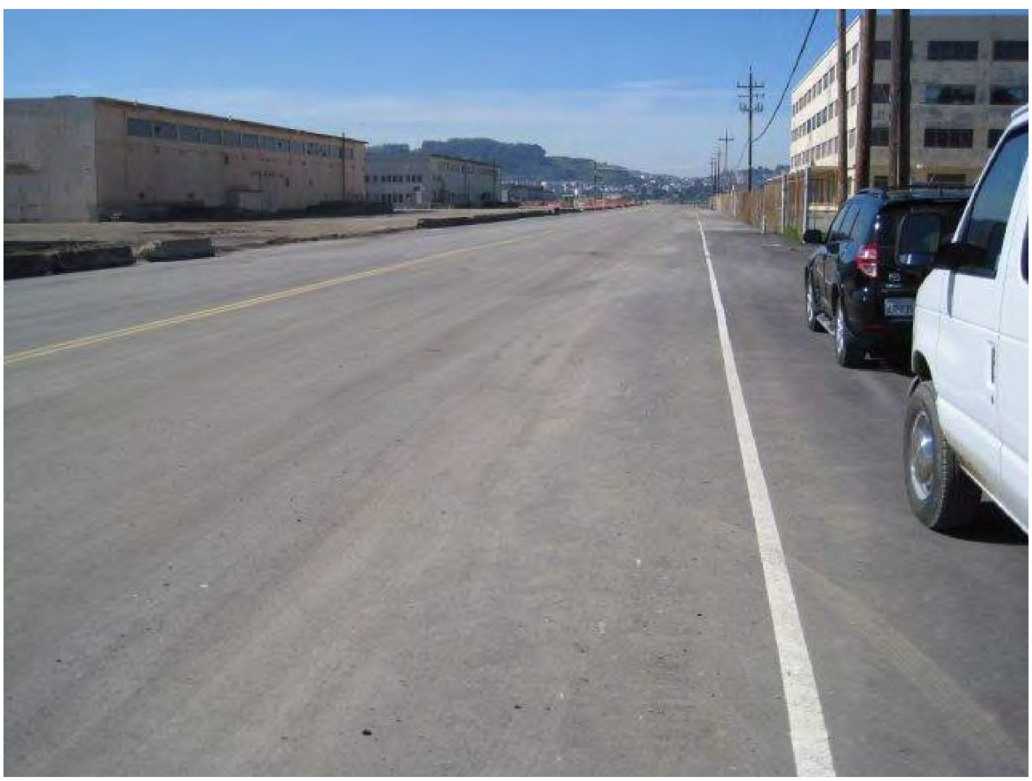
Photograph 37. Roadway (Fisher Avenue) at Parcel UC-2 looking southwest from the intersection with Robinson Street.

Photograph 38. Roadway (Robinson Street) at Parcel UC-2 looking northwest from the intersection with Fisher Avenue.

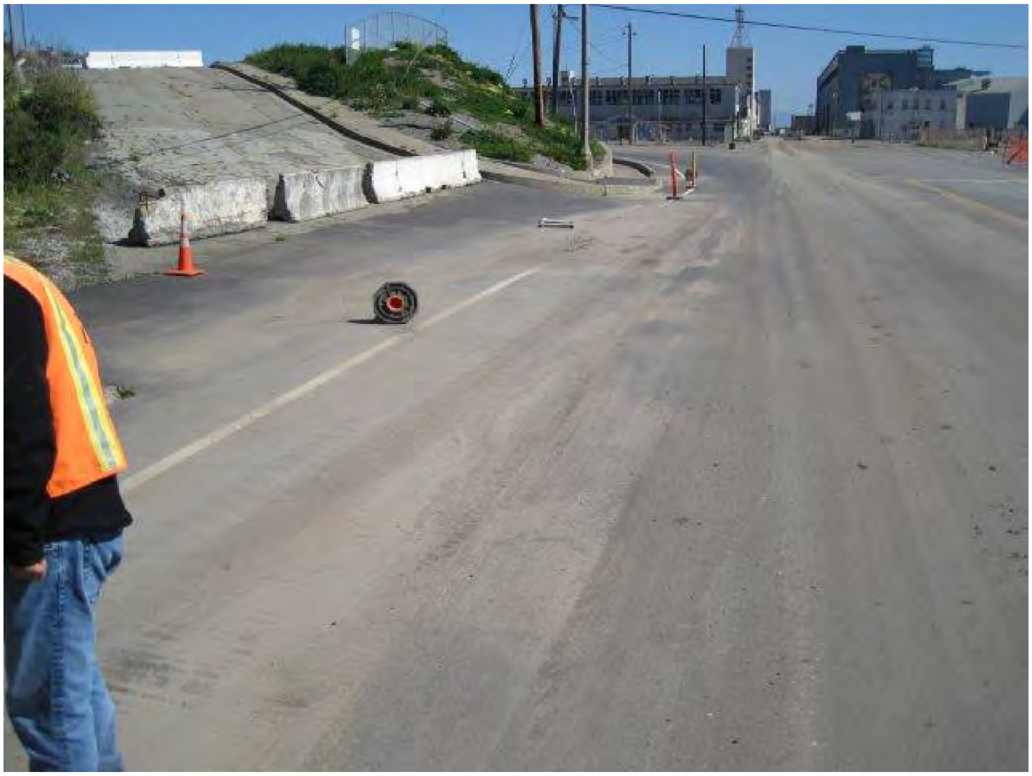
Photograph 39. Hillside slope and fence at Parcel UC-2, looking southwest.

Photograph 40. Looking down the hillside slope of Parcel UC-2 at roadway (Fisher Avenue) from the parking lot adjacent to Building 101.

Photograph 41. Asphalt pavement and seal coat (darker gray) covers in parking lot at Building 101 at Parcel UC-2. Looking north.



Photograph 42. Roadway at Parcel UC-1 (Spear Avenue) looking southwest.



Photograph 43. Roadway at Parcel UC-1 (Spear Avenue) looking northeast. Lighter color on left is silt deposited from previous storm water ponding on the north side of the roadway.

Photograph 44. Monitoring well IR06MW56F at Parcel UC-2.

Photograph 45. Well IR01MW31A at Parcel E-2. Photographs 45 through 67 taken by groundwater sampling teams between February 21 and March 21, 2013.

Photograph 46. Well IR01MW62A at Parcel E-2.

Photograph 47. Well IR01MW64A at Parcel E-2.

Photograph 48. Well IR01MW403B at Parcel E-2.

Photograph 49. Well IR06MW54F at Parcel UC-2.

Photograph 50. Well IR06MW56F at Parcel UC-2.

Photograph 51. Well IR07MW24A at Parcel B.

Photograph 52. Well IR09MW07A at Parcel G.

Photograph 53. Well IR09MW39A at Parcel G. Well box had been buried.

Photograph 54. Well IR10MW13A1 at Parcel B.

Photograph 55. Well IR10MW31A1 at Parcel B.

Photograph 56. Well IR10MW59A at Parcel B.

Photograph 57. Well IR10MW61A at Parcel B. Well box had been buried.

Photograph 58. Well IR10MW71A at Parcel B. Water inside well box.

Photograph 59. Well IR22MW16A at Parcel D-1.

Photograph 60. Well IR24MW07A at Parcel B.

Photograph 61. Well IR25MW62A at Parcel C.

Photograph 62. Well IR28MW125A at Parcel C.

Photograph 63. Well IR28MW355F at Parcel C.

Photograph 64. Well IR28MW475A at Parcel C.

Photograph 65. Well IR33MW64A at Parcel G.

Photograph 66. Well IR55MW02A at Parcel D-1.

Photograph 67. Well IR71MW20A at Parcel D-1. Water inside well box.

APPENDIX G
COMMUNITY MEETING PRESENTATION, JUNE 26, 2013

Hunters Point Naval Shipyard

Navy's Five-Year Review of Progress at Hunters Point Naval Shipyard

Hunters Point Naval Shipyard

Community Meeting

June 26, 2013

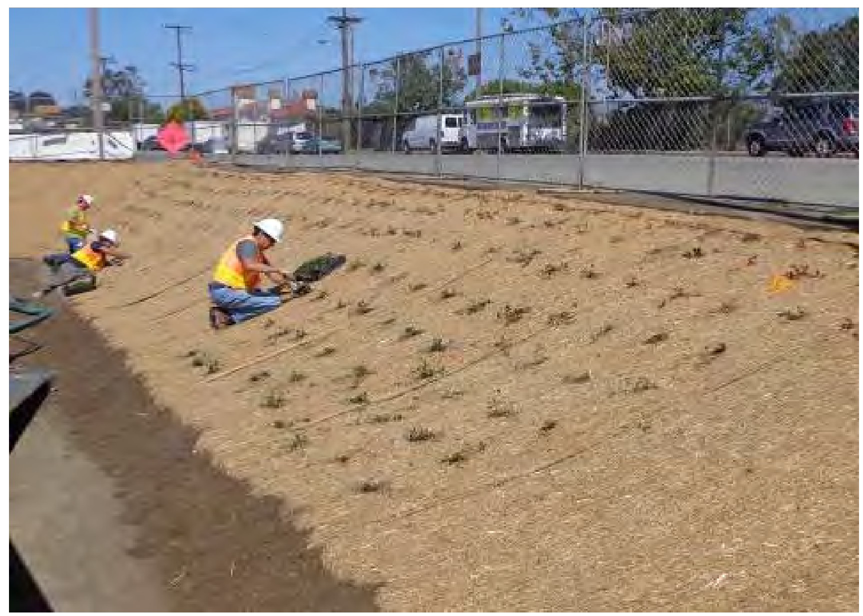
Welcome and Introductions

Navy Team Members

Keith Forman
BRAC Environmental Coordinator
Hunters Point Naval Shipyard

John Scott
Community Meeting Facilitator
Hunters Point Naval Shipyard

Five-Year Review of Remedial Actions



Overview

- What is a Five-year review and why is it needed?
- Five-year review process
- Technical assessment questions and answers
- Protectiveness statement
- Progress of cleanup actions, by parcel

What is a 5-Year Review and Why is it Needed?

- Superfund law (CERCLA) requires a review of the effectiveness of cleanup actions every 5 years for sites where the selected remedies will not allow unlimited use of the land and unrestricted exposure to users.
- This is the third 5-year review for Hunters Point Naval Shipyard.
- The review focuses on parcels where cleanup actions are complete or in progress – Parcels B, C, D-1, G, UC-1, and UC-2.
- The review is a technical assessment of whether the cleanup actions adequately protect human health and the environment

Five-Year Review Process

- Document and data review
  - Key documents included records of decision, remedial (cleanup) designs, and remedial action completion reports
  - Data review included evaluation of chemical concentration trends in groundwater

- Site inspection
  - Conducted by the Navy with the BCT on 3/1/13

- Interviews with stakeholders
  - BCT members and SF Dept of Public Health
  - Local community members and base tenants
  - Operation and maintenance contractors

- Formulation of protectiveness statements, by parcel

Technical Assessment Questions and Answers

- Question A – Is the remedy functioning as intended by the record of decision (ROD)?
  - Yes, for Parcels B, C, D-1, G, UC-1, and UC-2 where remedies have been undertaken

- Question B – Are exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?
  - Yes

- Question C – Has any other information come to light that could call into question the protectiveness of the remedy?
  - No

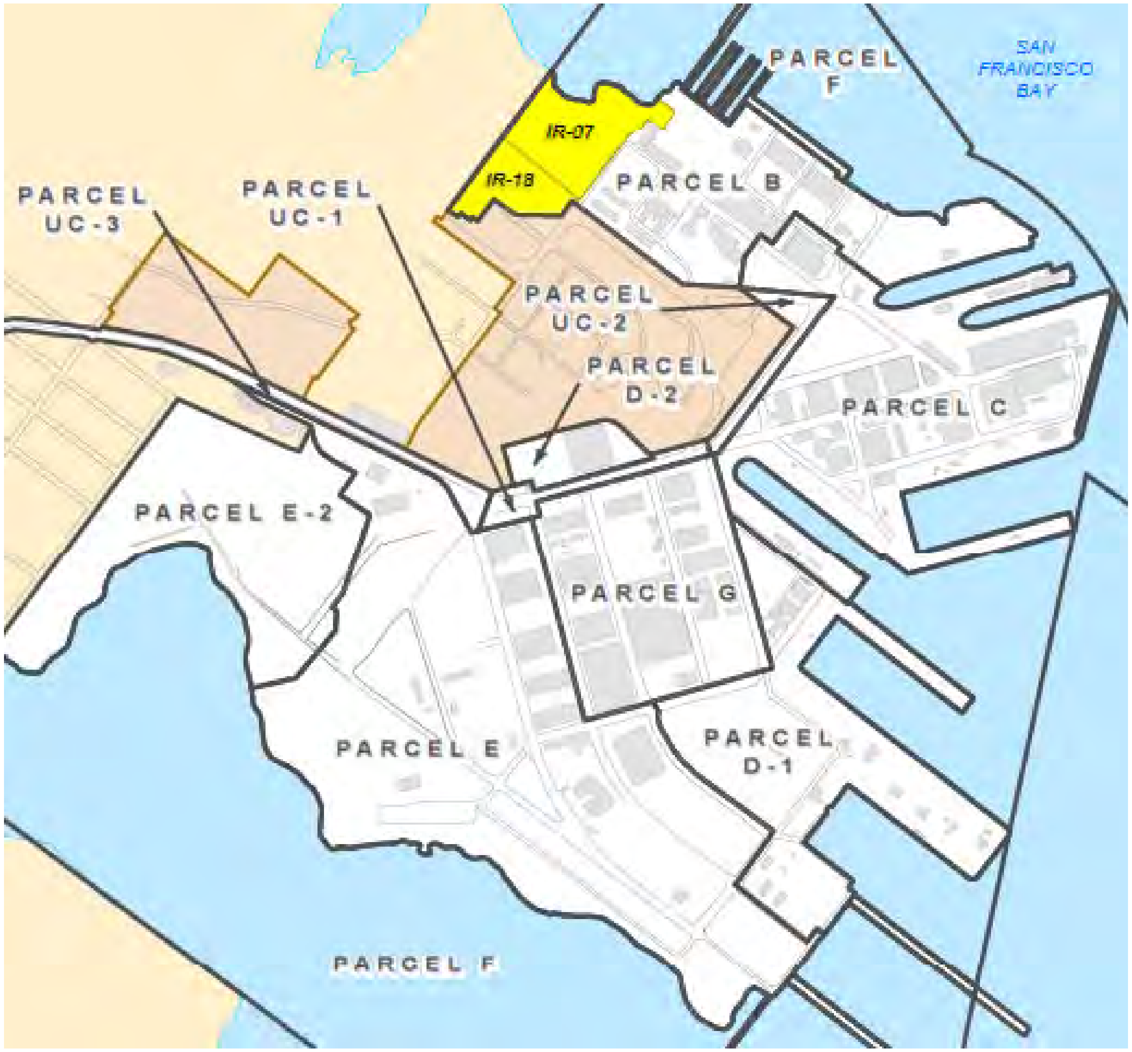
Protectiveness Statement

- The remedy is protective of human health and the environment.
  - Parcel B (IR-07/18)
- The remedy is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.
  - Parcels B (remainder), C, D-1, G, UC-1, and UC-2

Progress of Cleanup by Parcel

- The 5-year review focuses on parcels where remedial actions are complete or in progress = Parcels B (including IR-07/18 and the remainder of B), C, D-1, G, UC-1, and UC-2
  - Cleanup process includes:
    - Select the remedy in the record of decision
    - Design the remedy in construction plans in the remedial design
    - Build or implement the remedy and document in a remedial action completion report

Location of Parcels



Parcel B, Original Remedy (1997)

- Excavation and off-site disposal
  - Removed about 101,600 cubic yards (cy) (about 7,300 truckloads) from 106 excavations and disposed off site from July 1998 to December 2001
  - Excavated a large portion of the surface of Parcel B (green areas)
- Remedy revised to covers over soil in amended ROD in 2009

Parcel B, IR Sites 7 and 18 [All Completed]

- Cover
  - 14 acres of soil cover, 2 to 3 feet thick, 115,000 tons of soil
- Shoreline revetment
  - About 900 linear feet, 15,000 tons of riprap rock
- Methane
  - Excavated 17,000 cy (1,200 truckloads) in 2008 and disposed off site; found methane related to natural organic material in native Bay Mud layer
  - Monitored soil gas for methane 2008-2012, no detections so removed probes
- Monitor groundwater
  - On-going semiannually
- Scan and remediate radionuclides
  - Scanned the entire surface before building cover/revetment

IR Sites 7 and 18
5-Year Review Progress

Original shoreline with concrete, metal, and wood debris

Completed shoreline revetment; all debris removed and shoreline stabilized with riprap rock

IR Sites 7 and 18
5-Year Review Progress

Original site was poorly vegetated

Final soil cover vegetated with native wildflowers and grasses

Remainder of Parcel B

- Excavate hot spots [completed]
  - Soil removed and disposed off site from 3 locations (about 150 cy)
  - Mercury – soil removed to bedrock at IR-26, about 6,000 cy disposed off site
- Covers [75% complete]
  - 43 acres of covers, 3 acres hillside soil 2 feet thick, 40 acres asphalt 6 inches thick (2 inches pavement over 4 inches road base foundation)
  - Repairs to building foundations and crawl spaces to block access to soil
- Shoreline revetment [90% complete]
  - About 1,600 linear feet, riprap rock similar to IR-07/18
- Groundwater [active phase complete, monitoring ongoing]
  - Injected about 6,300 pounds of biological growth enhancer (lactate) to treat volatile organic compounds (VOC) in groundwater
- Radionuclides in storm drains/sanitary sewers and buildings [completed]
  - Removed about 65,200 cy (4,500 truckloads) of soil from 24,800 linear feet of trench
  - Scanned and released 6 buildings, 3 former building sites, and pump house discharge channel
  - About 2,900 cy low-level radioactive waste (LLRW) disposed off site

Remainder of Parcel B
5-Year Review Progress

Original shoreline with concrete and metal debris

Completed shoreline revetment; all debris removed and shoreline stabilized with riprap rock

Remainder of Parcel B
5-Year Review Progress

Original vegetated slopes in Parcel B

New 2-foot soil cover installed over slope; vegetation establishment in progress

Parcel C

- Excavate hot spots [previous removals, current planned removals yet not started]
  – About 8,800 cy soil removed along with subsurface fuel and steam lines removed in 2001 to 2002
  – Soil to be removed and disposed off site from 27 locations (about 26,300 cy or 1,900 truckloads)
  – Preparing an explanation of significant differences (ESD) to allow soil with very low risk to remain in place, protected by a durable cover
- Covers [not started]
  – 56.5 acres of covers, 1.5 acres hillside soil, 55 acres asphalt
- Groundwater [active phase in progress]
  – Inject zero-valent iron (ZVI) or lactate to treat VOCs
- Soil gas [10% complete]
  – Implement soil vapor extraction (SVE) at 8 locations
- Radionuclides in storm drains/sanitary sewers and buildings [75% complete]
  – Removed about 44,200 cy (3,200 truckloads) of soil from 24,000 linear feet of trench

Parcel C
5-Year Review Progress

Injection of lactate solution in wells near Building 258 in the RU-C2 areas

Parcel D-1

- Excavate hot spots [nearly completed]
  - Soil removed and disposed off site from 4 locations (about 300 cy); one soil stockpile also removed. Two small hot spots remain beneath radiological screening pads.
  - Over 150 tons of solid and liquid waste and 175 tons of scrap metal were removed in 1994 to 1996 from the pickling/plating yard at IR-09
  - Pickling vault removed in 2010; 31,000 pounds of ZVI added to excavation for additional groundwater treatment
- Covers [not started]
  - 46 acres of covers
  - Repairs to building foundations and crawl spaces to block access to soil
- Groundwater [active phase complete, monitoring ongoing]
  - Injected about 57,000 pounds of ZVI to treat VOCs in groundwater in 2008
  - More than 3 million gallons of groundwater has been treated since 2009
- Radionuclides in storm drains/sanitary sewers and buildings [50% complete]
  - Removed about 18,300 cy (1,300 truckloads) of soil from 13,000 linear feet of trench

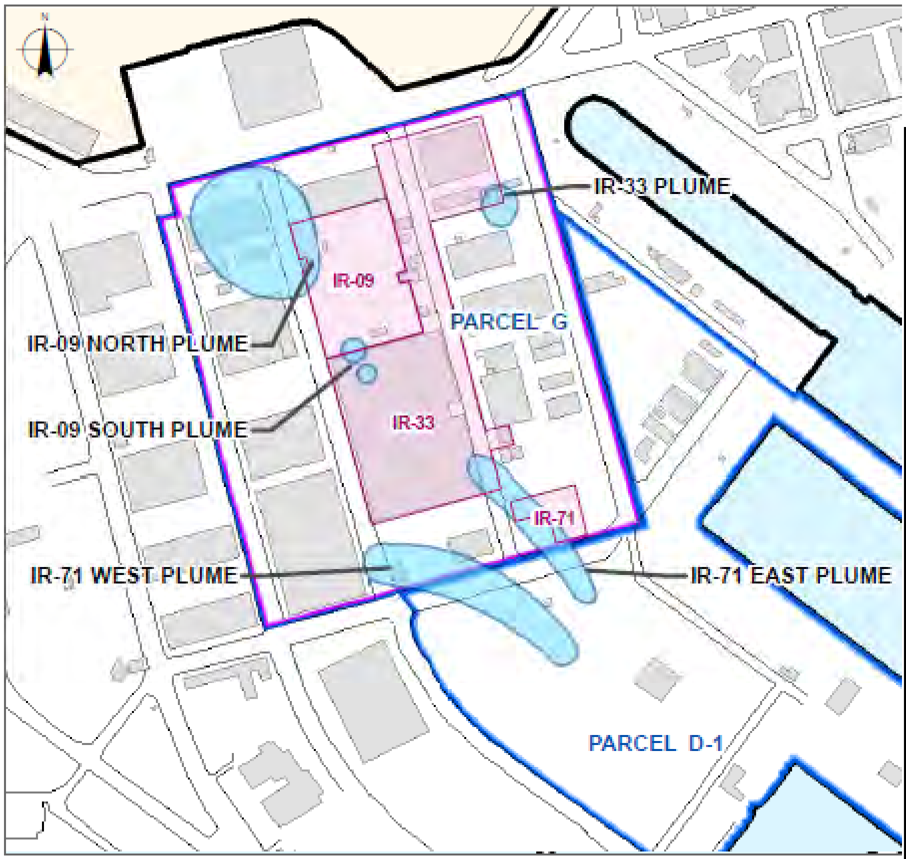
Parcel D-1
5-Year Review Progress

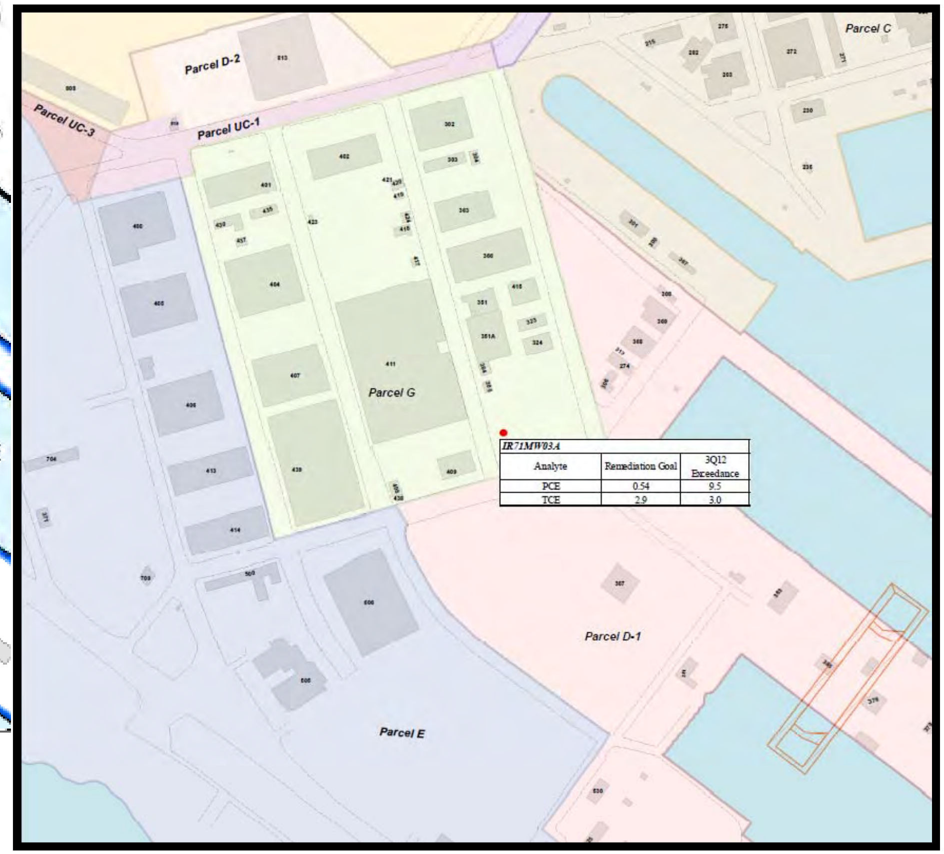
Excavation of hot spot soil areas and removal of soil stockpile

Parcel D-1
5-Year Review Progress

Injection of zero-valent iron to treat VOCs in groundwater

Parcel D-1
5-Year Review Progress





Analyte	Remediation Goal	3Q12 Exceedance
PCE	0.54	9.5
TCE	2.9	3.0

Successful groundwater treatment. Plumes (above) no longer present (right).

Parcel G

- Excavate hot spots [completed]
  - Soil removed and disposed off site from 2 locations (about 150 cy)
- Covers [completed]
  - 26 acres of asphalt
  - Repairs to building foundations and crawl spaces to block access to soil
  - Surface swales added/upgraded to promote drainage of rainwater
- Groundwater [active phase complete, monitoring ongoing]
  - Injected about 57,000 pounds of ZVI to treat VOCs in groundwater in 2008
  - More than 3 million gallons of groundwater has been treated since 2009
- Radionuclides in storm drains/sanitary sewers and buildings [completed]
  - Removed about 50,700 cy (3,600 truckloads) of soil from 23,200 linear feet of trench
  - Scanned and released 9 buildings and 1 former building site
  - About 2,800 cy LLRW disposed off site

Parcel G
5-Year Review Progress

Completed paving and drainage swale at Parcel G

Paving at Parcel G

Parcel G
5-Year Review Progress

Repairing building foundations to act as covers

Parcels UC-1 and UC-2

- Covers [completed]
  - About 8 acres of covers, 1 acre hillside soil 2 feet thick, 7 acres asphalt (repairs to Fisher and Spear Avenues)
- Groundwater [monitoring ongoing]
  - Low levels of VOCs in a small groundwater plume at Parcel UC-2 (beneath Robinson Street) are being monitored as the chemicals naturally attenuate
  - Only risk to human health is from infiltration of vapors into buildings so there is no risk since the plume is beneath a road
- Radionuclides in storm drains/sanitary sewers and buildings [completed]
  - Removed about 20,700 cy (1,500 truckloads) of soil from 6,400 linear feet of trench
  - Scanned and released 1 building
  - About 900 cy LLRW disposed off site

Parcels UC-1 and UC-2
5-Year Review Progress

Planting newly covered hillslope with native plants

Asphalt pavement repair

Status of Other Parcels

- Parcel D-2
  - Radiological cleanup completed
    - Removed about 1,400 cy of soil from 2,000 linear feet of trench
    - Scanned and released 1 building
    - About 45 cy LLRW disposed off site
  - No further action was required by the ROD
  - Finding of suitability to transfer completed

Status of Other Parcels (con't)

- Parcel E
  - Removed about 60,700 cy (4,300 truckloads) of soil from two areas in 2005 to 2007
  - Radiological removals underway
  - Proposed plan complete
  - Draft ROD issued June 20, 2013. Remedy includes:
    - Excavation of hot spots and off site disposal of soil
    - Covers over soil
    - Closure of fuel and steam lines
    - Shoreline protection
    - Soil vapor extraction
    - Groundwater treatment

Status of Other Parcels (con't)

- Parcel E-2
  - Interim cap constructed in 2000 to 2001; inspections and maintenance ongoing since then
  - Landfill gas control system installed in 2002 to 2003 along northern edge to prevent gas migration onto nearby University of California, San Francisco compound; monthly monitoring since installation
  - Removed about 98,700 cy (7,000 truckloads) of soil from areas adjacent to the cap in 2005 to 2012

Status of Other Parcels (con’t)

- Parcel E-2 (con’t)
  - ROD finalized November 2012; design in preparation
  - Remedy will include:
    - More digging to remove hot spots (estimated 23,000 cy or 1,600 truckloads)
    - Engineered covers over soil, including synthetic layers to limit infiltration of water
    - Removal and treatment of landfill gas
    - Below-ground barrier to groundwater flow
    - Create wetlands
    - Shoreline revetment
  - Soil gas survey underway to support the design

Parcel E-2 Landfill O&M

Active extraction at the perimeter of the landfill

Mowing the landfill cap

Landfill gas monitoring in UCSF compound

Parcel E-2
5-Year Review Progress

Installing soil gas monitoring probe

Completed probe

Soil gas sampling

Status of Other Parcels (con't)

- Parcel F (under water)
  - Under investigation
    - Some contamination of sediment by chemicals (PCBs, mercury)
    - No contamination by radionuclides found
  - Finalized feasibility study to evaluate options for cleanup in 2012; prepare radiological addendum in 2013
  - Next step is proposed plan
  - Wooden piers and remnants of wooden ship berths, quay walls, and wharves removed adjacent to Parcels B and C in 2011

Status of Other Parcels (con't)

- Parcel UC-3
  - Radiological cleanup completed
    - Removed about 18,000 cy (1,300 truckloads) of soil from 18,400 linear feet of trench
    - About 790 cy LLRW disposed off site
  - Proposed plan completed; ROD in preparation (draft due at the end of this week). Remedy will include:
    - Excavation of hot spots and off site disposal of soil
    - Covers over soil
    - Closure of steam lines
    - Soil gas and groundwater monitoring

5-Year Review Report Schedule

- Draft report submitted May 13, 2013
- Comments from BCT due June 28, 2013
- Final report scheduled October 29, 2013
- Reports available at the HPNS information repositories
  – SF Main Library, 100 Larkin Street, 5th floor
  – HPNS Office Trailer, 690 Hudson Street (near main gate)
  – Or Navy's website: www.bracpmo.navy.mil

Open Forum

Questions

- Please **raise your hand** if you have a question.
- Please **wait to be recognized** by presenters before asking your question.
- Please **state your name** and if you are associated with a particular interest group.
- Please **limit yourself to one question** when speaking.
- Please **be respectful** of fellow community members and presenters while they are speaking.

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